A Festschrift Recognizing Thomas J. Henry for a Lifetime of Contributions to Heteropteran Systematics

edited by

Alfred G. Wheeler Jr.

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EDITORIAL

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Thomas J Henry: longtime friend, colleague, and preeminent heteropterist

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Tom Henry came to the Pennsylvania Department of Agriculture, Bureau of Plant Industry (Harrisburg), in 1972. He recently had earned a B.S. degree in Entomology from Purdue University and was hired to identify insects, mainly those submitted by the bureau's plant inspectors in different areas of the state. It did not take long for his entomological colleagues in Harrisburg to recognize his remarkable talents as a taxonomist.

I had been hired the previous year to work on bionomics of insects associated with ornamental trees and shrubs and had collected a mirid on Scots pine (*Pinus sylvestris* L.), which had defied identification. Tom accepted the challenge of trying to identify the mystery plant bug. A trip to examine Miridae in the National Museum of Natural History in Washington, DC, resolved the issue: the conifer bug was *Camptozygum aequale* (Villers), a species new to North America (Wheeler and Henry 1973). To become more familiar with the local mirid fauna, we began to spend our lunch breaks sampling conifers and other trees in nearby ornamental plantings. The detection of *C. aequale* was followed by the discovery of additional Palearctic conifer-feeding plant bugs in Pennsylvania. Tom soon described his first new species: two pine-associated mirids of the diverse genus *Phytocoris* (Henry 1974). Gaining confidence and momentum, he published 27 additional papers on Heteroptera by decade's end, including a review of the orthotyline genus *Reuteria* (Henry 1976), ten new species of the Neotropical mird genus *Hyalochloria* (Henry 1978), a new genus and species of cardiastethine Anthocoridae (Henry and Herring 1978), and new species of the isometopine genus *Corticoris* (Henry and Herring 1979).

Tom's entry into heteropteran systematics caught the attention of prominent North American specialists, such as Richard Froeschner, John Lattin, and James Slater. He was encouraged to apply for the Heteroptera position with the Systematic Entomology Laboratory (SEL), Agricultural Research Service, US Department of Agriculture, which had become available with J. L. Herring's retirement in August 1979. In selecting Tom for the position, the search committee must have valued his publication record and recognized his taxonomic prowess; committee members were not dissuaded by his lack of the ordinarily requisite PhD (he was finishing his MS studies at Penn State). The decision to hire Tom Henry proved auspicious for SEL.

Tom began his work at SEL in June of 1980. Productivity characterized his performance in the 1980s. He continued taxonomic research on plant bugs of the Orthotylinae and on the subfamily Isometopinae, describing three new genera (Henry 1980). Highlighting the decade was the 1988 publication of the first catalog of North American Heteroptera since 1917. Henry and Froeschner (1988) accomplished what other heteropterists had attempted to do but ultimately found too daunting. A novel feature of their catalog, which some systematists initially considered inappropriate, was the use of write-ups and photos of representative species at the beginning of each family treatment. Biological control specialists, ecologists, and others not well versed in heteropteran taxonomy found the introductory material particularly valuable. His early trips for fieldwork and visits to major insect collections eventually involved nearly all U.S. states, Asia, Australia, Canada, Europe, India, Mexico, South America, and the West Indies.

Tom continued to prosper in the 1990s despite pursuing a doctoral degree while working full-time. He received his PhD in 1995 from the University of Maryland. Prominent among his accomplishments during the decade were taxonomic revisions of mirid genera (Henry 1991, 1994) and a phylogenetic analysis of the infraorder Pentatomomorpha, involving 34 family groups, which resulted in the recognition of 11 families in a previously composite and paraphyletic Lygaeidae (Henry 1997a). His substantial reclassification of the Pentatomomorpha now is followed in text books, world catalogs, and applied and taxonomic literature. He emphasized the family Berytidae, completing three major works: a cladistic analysis and revision of world genera (Henry 1997b), a monograph of the stilt bugs of the Western Hemisphere (Henry 1997c), and a catalog of the world species (Henry and Froeschner 1998). Tom coauthored a book on the North American mirids considered naturally Holarctic or adventive, either immigrant or intentionally introduced (Wheeler and Henry 1992), and edited a Festschrift of approximately 250 pages that honored the renowned Brazilian miridologist José Carvalho (Henry and Wheeler 1995).

Perusal of the appended list of Tom's publications will confirm his prominence among world heteropterists. Collaborative projects with other specialists and promising newcomers became routine in the new century (e.g., Henry and Schuh 2002, Henry and Costa 2003), along with more generic revisions (Henry 2006; Ferreira and Henry 2010; Henry 2012, 2015, 2018; Dellapé et al. 2016). Key contributions included the berytid chapter (Henry 2000) in *Heteroptera of Economic Importance* (Schaefer and Panizzi 2000), a comprehensive treatment of Cuban Miridae (Hernández and Henry 2010), chapters on the Miridae (Ferreira et al. 2015) and Lygaeoidea (Henry et al. 2015) in *True Bugs (Heteroptera) of the Neotropics* (Panizzi and Grazia 2015), and an online world catalog of the Lygaeoidea (Dellapé and Henry 2017).

A typical work day for Tom includes a delivery of "urgents", specimens of Heteroptera intercepted at US ports of entry that need to be identified promptly. He also curates the collection under his care and supervises technicians and volunteers who work with the collection. Tasks expected of a professional entomologist are dealt with promptly, such as reviewing manuscripts at the request of journal editors, providing pre-submission manuscript reviews for colleagues and writing letters in support of their tenure, serving on committees, and participating in the affairs of scientific societies. Tom edited the *Proceedings of the Entomological Society of Washington* from 1992 to 1995 and began a second stint as editor in 2015, which continues. He is a founding member of the International Heteropterists' Society and will become President at its 6th quadrennial meeting in La Plata, Argentina, in December 2018. He is generous with his time in encouraging and mentoring younger workers and assisting students and established specialists who visit the Heteroptera collection. Tom and his wife Kathryn (Katy) often invite visitors to their home for a meal.

How is Tom able to be so productive? For one thing, he possesses a sterling work ethic. He's efficient, passionate about natural history and systematics, and strives for excellence. A typical day begins at 4:30 am; he works at home for an hour or two on his own manuscripts or reviews those of others, before he leaves for the museum. He is focused, and patient, even though he often must stop what he is doing to answer visitors' questions or respond to e-mails and phone requests.

Numerous projects on Heteroptera await Tom's attention. We can anticipate a flurry of papers in the coming years. It is a pleasure to present this special issue of *ZooKeys* that conveys the respect of his colleagues and honors his 70th birthday.

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Thomas J Henry, as viewed by his son, daughter, and wife

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When Al Wheeler told me that he was organizing a Festschrift to honor Tom, I (K.H.) thought, how is it possible that it could be time for a Festschrift already? It seems like I just met Tom yesterday. When Al asked me to write an introductory article for the journal, I wondered if I could manage that and called Tom's children, Tommy (T.A.H.) and Angela (A.H.T.), asking for their help. They both agreed and we began a wonderful collaboration to honor their Dad. As with any life, certain stories and remembrances stand out, and that person's characteristics and traits are known to some people, but perhaps not to others. We thought about how he enriched our lives through his generosity and guidance and how he influenced our professional lives with sound advice and counsel. We thought about his childhood and the special bond he had with his family, one steeped in the traditions of hard work and a drive to achieve desired goals. We (T.A.H. and A.H.T.) have chosen to focus on some of the highlights of our Dad's remarkable career and events that show his love of natural history. Included are certain early events, as recounted by our Grandmother.

Tom Henry quietly slipped out the back door of his uncle's farmhouse in rural Indiana. His goal was to catch one of the chickens roaming in the barnyard. Carefully holding the prize chicken in his arms, he proudly showed it to his younger sister, Debbie (Fig. 1). Dad was three years old.

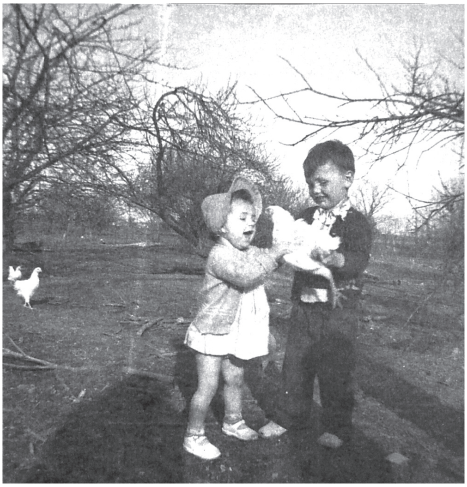

Figure 1. "Here you are the real hero. You are brave enough to hold a real chicken for Debbie to see." (Aunt Phyllis Henry, 1951).

In class at his elementary school, Dad's name was called over the loudspeaker; he was told to report to the principal's office immediately. From there, he was sent home. As our Grandmother told the story, every surface in the house was moving—the drapes, the walls, even the upholstery. The praying mantis egg cases that he had collected and kept in his bedroom had all hatched. He was the most popular kid at school the next day when he brought in newly hatched praying mantids for the teacher to raise in the classroom. Dad was ten years old.

Other childhood stories could be told, but one common factor is consistent throughout them all: our Dad loves nature. From his earliest years to the present, he has pursued his interest in nature through his studies, his work, and his hobbies. His love of the natural world quickly developed into his true passion, the study of insects.

Thomas Joseph Henry was born in Logansport, Indiana, a small town between the Wabash and Eel Rivers. His parents, Joseph Fouts Henry and Betty Vitello Henry, both grew up in the area and remained there to raise their family. Dad is the eldest child, and most of his siblings and extended family still reside in the area.

Growing up in a small town allowed Dad tremendous freedom. Both Logansport and the Henry family farm provided perfect places for a kid to explore and pursue great adventures and to collect specimens for the insect collection he began as a child. Dad still has a small, spiral-bound notebook he used for field notes that included dates of collection, brief descriptions, and measurements in millimeters. His interest in natural history, however, was broad. He was equally fascinated with skeletons of animals he found, as well as live animals and plants.

Dad would spend long summer days wading or floating on his raft down the Wabash River fishing, observing plants and animals, and always looking for and collecting insects. The emergence of praying mantids aside, our Grandmother was a huge influence in Dad's life. Although she may not have always understood his interests in natural history, throughout his childhood she always encouraged and supported his efforts. Fish tanks, snakes, turtles, and insects were all welcomed as long as nothing else escaped from his bedroom to other parts of the house. As he grew older, she continued to support him and was extremely proud of his many accomplishments.

By his early high school days, Dad was well regarded for his achievements in academics and sports (with five varsity letters). A teacher familiar with Dad's knowledge of biology and insects suggested that he apply to Purdue University to study entomology.

At the time, Dad did not know that the study of entomology could eventually lead to a paid position. The encouragement from that teacher propelled Dad on his career path, one he's never wavered from.

In 1972, we were two- (A.H.T.) and four-years-old (T.A.H.) when our family moved to Pennsylvania. Dad had been hired as an insect taxonomist with the Pennsylvania Department of Agriculture (PDA) in Harrisburg. While still working in Harrisburg, he completed a master's degree at The Pennsylvania State University. Two or three times each week during the fall and spring semesters, he made the 180-mile round trip to attend classes.

Dad met Al Wheeler (Dr. Alfred G. Wheeler) at the PDA, and they have remained good friends and colleagues to this day. Throughout the years, they have collaborated on numerous projects. It is with great appreciation and affection that we thank Al for his support and hard work in making this journal issue possible.

In 1980, Dad accepted a position as Research Entomologist with the U.S. Department of Agriculture, Systematic Entomology Laboratory, at the Smithsonian's National Museum of Natural History in Washington, DC. He earned his Ph.D. from the University of Maryland while working in the SEL. He remains there today, still as focused on Heteroptera as he was when he began there thirty-seven years ago. Early in Dad's career with the USDA, he became close friends with Dick Froeschner (Dr. Richard C. Froeschner), a Smithsonian colleague. Together they edited the *Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States*, a significant work for both of them that was published in 1988.

He met his wife, Katy, on a blind date over thirty years ago, and that meeting began a whole new chapter in both their lives. We met her a few weeks later and knew it was a serious relationship even then, possibly before they did. They were certainly made for each other. Today they are still partners in everything and inspiring for us to watch.

Although our interests led us to professions different from our Dad's, we have the same drive and passion to succeed as he does. He was lucky enough to know as a young child what he loved to do and was able to turn that love into a life-long career.

Over the years, we have had to explain to some people what the word entomology means and what our father does in his work. Responses have varied. Some people are fascinated by his work, but others wonder how anyone could work with insects. We lovingly refer to him as a "Rock Star" of entomology, a title one of us (T.A.H.) bestowed on him years ago. All three of us are very proud of him and are honored that he named a new insect species after each of us: *Epipolops angelae*, *Epipolops thomasi*, and *Epipolops kathrynae*.

Dad's contributions, research, and publications are well documented. What isn't as well known is his patience and kindness to others, including colleagues and professional staff, interns and volunteers, and friends and family. He is always willing to help, whether it involves a work-related task or assisting a neighbor in need. Also, he is an excellent listener. Months after a conversation, he might inquire about something that was said, wanting to know if an issue had been resolved and if the outcome was good.

Figure 2. Tom Henry collecting Heteroptera in Hawaii, 2017.

Figure 3. Left to right: Izya Kerzhner, Al Wheeler, and Tom Henry working in the West Virginia cabin, 1994.

We know that nothing at all will change for Dad if he ever decides to retire. He will continue his research and writing just as he has always done. He will continue to travel the world to collect and identify new species of insects (Fig. 2). He will attend conferences and serve on panels and give presentations just as he has throughout his career. He will continue to acquire new colleagues, specifically heteropterists with whom he will willingly share his knowledge of the group. Other interests will also continue to be pursued. He loves to work in his beautiful yard and gardens; each spring he plants a large vegetable garden that produces an abundance of his favorite onions and hot peppers. For years he has maintained freshwater aquariums (twenty-six and counting), where he breeds tropical fish and grows aquatic plants. He will continue building and completing projects on his cabin, a quiet retreat in the mountains of West Virginia (Fig. 3). Dad has always found more time in a day than most other people do. His enthusiasm for life and dedication to his work are, in our eyes, unsurpassed.

But, given all of his interests, one fact is indisputable. If you need to find our father, Dr. Thomas J. Henry, either now or eventually in retirement, chances are that he will be following his truest passion, the study of Heteroptera, in a world he was born to be in, doing what he loves best for as long as possible.

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Catching the bug: the influence of Thomas Henry on a young entomologist

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When I was asked to write an appreciation of Tom Henry, I was a little bit overwhelmed. How can one person describe more than ten years of mentoring, collaboration, and friendship? Tom and I have worked together on several scientific papers, but this is the first time I have had to write about the influence he has had on my life.

My connection with Tom Henry started with luck. Growing up, I was always one of those nerdy kids who loved being outside and playing with nature. My special fondness was insects and other small creatures, which was noticed by my next-door neighbors in northern Virginia, both professional entomologists who worked with the Smithsonian. They suggested that if I wanted to know what it was like doing research on insects, I try volunteering at the Smithsonian Institution's Entomology Department in Washington, DC. At the time, I had no idea that entomology was a real job, and that museums were for more than just exhibits, so I emailed the Entomology Department via the website, asking if anyone wanted a young college-age volunteer.

Tom Henry was the first person to reply to my email that first summer before I started college. He wrote that he oversaw the Heteroptera collection (I had no idea what that was), and that he was part of the United States Department of Agriculture that worked at the Smithsonian. Other offers came from the Diptera collection, but since I have never liked maggots, I decided bugs were a better choice. Tom's Collection Manager at the time, Michele Touchet, worked with me to get my paperwork started to volunteer at the Smithsonian.

Entering the Smithsonian with my newly printed badge and ready to start my first day, I wasn't sure what to expect. My first thoughts were that maybe I was working for someone like Indiana Jones, who works in museums and keeps his stuff there but travels the world collecting little jeweled bugs. Or one of those crazy entomologists you see in your mind waving a net chasing anything that moves. In a way, both are true, but the man I met was a lot more real and tough. Tom came swinging through the big glass doors with his characteristic fast-paced walk and museum-work uniform of button-down shirt tucked into his jeans and open-toed sandals (always with socks), to pick me up to bring me to the collection with a bright smile and a hello. He was disarming in that he looked like a normal person, but had the charisma of someone I could relate to. Nervousness was quickly replaced by excitement, as I tried to keep up with him heading up to the collection. In many ways since that first day, I still feel it is almost impossible to keep up with Tom: his encyclopedic knowledge, his intense focus, and his work ethic are hard to beat, even for a 'youngin' like me.

That first summer working with Tom as a volunteer was pivotal in my life as an entomologist. He showed me that it was possible to open a whole other world of beauty and intrigue, if I took the opportunity to look, and that it was an exciting world. Every day that I volunteered or worked at the Smithsonian, no matter how tired Tom was from identifying the endless flow of "urgent identifications" that arrived on his desk, when I visited his office with a question or a specimen, he would always perk up at the opportunity to talk bugs. Sometimes, I would come with a question about a specimen just to hear him tell a story about it, such as his travels with Al Wheeler throughout the eastern United States, or climbing up a canopy tower in South America to collect odd bugs in the forest. He was always patient and accommodating, even when I probably was taking more of his time than he could spare.

Tom also encouraged me to grow as a professional entomologist. He and Michele taught me the basics of working in a museum and on collections while databasing nearly the entire Heteroptera collection, but Tom got me into bugs. Going through drawer after drawer, learning the names, the diversity, and being able to ask Tom questions about how he collected them, what they do, and why they are the way they are, led me on the path to becoming an expert. He fostered my curiosity of the group by having me sort bugs to family, then teaching me how to sort them to subfamily. Tom showed me the correct way to point-mount a bug, demonstrating from the constantly growing tower of glue on his desk how to do it the correct way. When I asked him a question he wasn't sure about, he would do his characteristic eyebrow frown, swiftly turn from the research office, and find me an answer from his extensive reprint collection. There were not many questions he didn't have answers to, since I have yet to meet someone else with such extensive knowledge of North American and South American bugs. He didn't have to answer my questions, or give me as much personal attention, but he did, which showed me his kindness. We sometimes went out for lunch together to continue our talks about bugs outside of work, either getting sushi at the old All You Can Eat place that used to be in Rosslyn or meeting his wife Katy nearby at the Sculpture Garden, where he could also slyly tap the plants nearby looking for tingids.

Collecting bugs is Tom Henry's forte, and I learned much from him on how to collect. It wasn't until graduate school that I had the chance to be in the field with him, but Tom taught me all the tricks and tips on how to collect bugs. Seeing him in action is inspiring. In 2006, we all converged on Switzerland for a Plant Bug Inventory Planetary Biodiversity Inventory meeting, and did a short collecting trip in the Swiss Alps. All the bug stars were there: Gerry Cassis, Christiane Weirauch, Toby Schuh, Michael Schwartz, Tomohide Yasunaga, Denise Wyniger, and Tom Henry. With their nets out, it was all-out war who could catch the most and with the highest diversity. Everybody spread out and took out their best tricks of the trade, and I watched and learned. Ultimately, Tom got the most specimens and the highest diversity, winning the mirid scavenger hunt of the trip. Later, everyone celebrated their catches and shared stories of bug collecting over drinks and, for Tom and Tomohide, cigars.

After working at the Smithsonian, I maintained contact with Tom throughout my graduate school years, sending him specimens from Texas while at Texas A&M for my masters, and later when I joined the Plant Bug Planetary Biodiversity Inventory as a PhD student. We would sometimes visit the Smithsonian to help sort and catalog, and I would catch up with Tom and Katy. He is always a gracious host, and he and Katy showed their grace and thoughtfulness by hosting the International Heteropterist Symposium at the Smithsonian in 2014. It was a tremendous meeting, and he showed all of us how to not only be expert scientists, but expert hosts for colleagues from all over the world.

My hope is to continue to work with Tom on projects for years to come, and to keep picking his brain for knowledge and expertise. To me, Tom is irreplaceable, and it fills me both with happiness that as he approaches retirement he can spend less time on urgent requests and paperwork and more time on bugs, but also sadness, since I feel as if I have only just started to fully appreciate all his accomplishments as a professional scientist. I appreciate every ounce of knowledge and mentoring he has had for me, and treasure having him be a part of my life.

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RESEARCH ARTICLE

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A new *Xenicocephalus* species from Ecuador (Heteroptera, Enicocephalomorpha, Enicocephalidae)

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Abstract

Xenicocephalus tomhenryi **sp. n.** (Insecta: Hemiptera: Heteroptera: Enicocephalomorpha: Enicocephalidae) is established for a single macropterous female from Ecuador. The enigmatic genus now includes three species known from only two Neotropical adults and an incomplete female specimen. The new species is described and illustrated, extensive comparative diagnoses for *Xenicocephalus* species are provided, and nomenclature, distribution, and biology of the genus are reviewed. The architecture of the raptorial forelegs of *Xenicocephalus* is unique among Enicocephalomorpha, and the genus is classified as subfamily *incertae sedis*.

Keywords

Abdomen, biology, differential diagnoses, distribution, Ecuador, forelegs, Hemiptera, new species

Introduction

A new Neotropical genus and species of Enicocephalidae (Enicocephalinae), *Xenicocephalus giganticus* Wygodzinsky & Schmidt, 1991, was well described and illustrated by Wygodzinsky and Schmidt (1991) from a single incomplete female specimen from Colombia. Wygodzinsky and Schmidt (1991) also provided miscellaneous notes on the taxon and described the larvae, and we liberally use data from their paper. Štys (2002) included *Xenicocephalus* in a global key to genus-group taxa of the infraorder Enicocephalomorpha. Štys and Baňař (2008a) described a second species of the genus, *Xenicocephalus josifovi* Štys & Baňař, from Suriname based on a single male, discussed various aspects of morphology and provided a new diagnosis of the genus. Nothing else has been written on this strange taxon, and only one and a half adult specimens are known. Wygodzinsky's prediction "I am hopeful that adult material will soon become available and that a more complete description can be made"(Wygodzinsky and Schmidt 1991) is marginally met by our discovery of a single female specimen of a new species from Ecuador, which is described and discussed herein.

Owing to the specimen's uniqueness, we could not study its anatomy in depth. Our descriptions of the head, antennae, pronotum and forelegs in an adult female, however, are the first for the genus. The female holotype of *X. giganticus* lacked these body parts, and the genus description had to be supplemented (Wygodzinsky and Schmidt 1991) by data from the last instar larva (probably conspecific and a female), which best approximates the female condition.

In the Discussion we emphasize some systematic issues concerning *Xenicocephalus* that have never been considered, comprehensively review certain aspects of biology, and briefly mention the construction of the fore leg of *Xenicocephalus*, which is unique among Enicocephalomorpha. Their architecture will be considered in a separate paper assessing the suprageneric phylogenetic classification of the Enicocephalomoropha (Štys and Baňař, in prep.).

Materials and methods

The term ocular index refers to the ratio of the minimum interocular distance to the maximum width of the eye; it is best calculated if measured as twice minimum interocular distance/maximum width across the eyes, minus minimum interocular distance. Measurements were taken using a SZP 11 ZOOM stereoscopic microscope with an eyepiece micrometer.

Color photographs of the newly described species were taken with a Leica MSV266 camera. Scanning electron micrographs of a gold-coated left foreleg were taken using a JEOL 6380 LV scanning electron microscope.

Label data are cited verbatim, including potential errors, using a slash (/) to separate lines on the label; different labels are mentioned and indicated by a double slash (//). Our notes are in [square brackets].

For simplicity, our nomenclature for veins and cells follows that used by Štys (2002: Figure 1).

Abbreviations used in the text:

DLTG	dorsal laterotergite;
F	female;
L	larva of the fifth instar;
M	male;
MTG	mediotergite.

Taxonomy

Infraorder Enicocephalomorpha Stichel, 1955
Family Enicocephalidae Stål, 1860

Genus *Xenicocephalus* Wygodzinsky & Schmidt, 1991

Type species. *Xenicocephalus giganticus* Wygodzinsky & Schmidt, 1991 by original designation.

Xenicocephalus tomhenryi sp. n.

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Figures 1–6

Description. Measurements (in mm) of female holotype; L = length; W = width. Total body L 8.60. Head: total L (without neck) 1.31; posterior lobe, L 0.51, posterior lobe, W 0.71; distance eye-apex of antennifer 0.37; maximum width across eyes 0.67; dorsal minimum interocular distance 0.33; ventral minimum interocular distance 0.20; eye L 0.22. Labium total L 0.60. Antenna: Segment I L 0.40; segment II L 0.96, segment III L 0.89, segment IV L 0.82. Pronotum: total L (maximum) 1.64; collum, L (median) 0.28, maximum W 0.78; midlobe, L (median) 0.64, midlobe, W (maximum) 1.42; hindlobe, L (maximum) 0.87, hindlobe, L (median) 0.40; hindlobe, W (maximum) 2.02. Foreleg: femur L 1.49, femur, maximum W 0.51, tibia L 1.36, tibia maximum W 0.29. Forewing L 5.95, W 2.18. Hindwing L 4.94, W1.92.

Coloration dark brown (Figure 1A), legs, labium, antennomere IV and base of forewing paler, light brown.

Pilosity. Antennae densely covered with short, semi-erect setae, dorsal and lateral parts of head covered with long, semi-erect setae of variable orientation, mixed with shorter, erect setae similar to those on antennae and compound eyes. Venter of head with long semi-erect setae. Vestiture on pronotum, lateral, and ventral parts of thorax similar to that on dorsum of head. Forelegs with numerous long semi-erect setae of different orientation, setae on ventral face of foretibia shorter and erect. Forewing veins with short semi-erect to erect setae; hindwing veins bare. Dorsum of abdomen with semi-erect and erect setae, longest on "outer" laterotergites, becoming shorter to nearly absent toward medial parts of mediotergites. Lateral faces of laterotergites only with short, erect setae. Venter of abdomen densely covered with vestiture, becoming denser and longer towards apex of abdomen.

Texture. Body faces, including forewing, densely covered with countless cuticular microgranules, giving a matt appearance. Foretibia along almost entire ventral face (except proximal sixth) with two rows (posterior and anterior one) of irregularly placed large, semi-globular to slightly conical, strongly sclerotized granules (Figure 3D, E), appearing under lower magnification as impression of two deeply brown to blackish lines (Figure 1F). Forefemur similar but with anterior row of large granules, more developed, situated on slightly elevated rim; granules in posterior row smaller, nearly subglobular proximally, becoming lens-like platelets distally. Surface of forefemoral concavity with countless lens-like platelets.

Structure. ***Head.*** Rather narrow, strongly elongate (Figs 1B, C, 5A, B). In dorsal view, preocular margins (formed largely by antennifers) strongly diverging distad, moderately convex, much shorter than strongly produced medial clypeo-mandibular projection. Eyes prominent, semiglobular, with numerous separate, convex facets, eye width much shorter than synthlipsis, dorsal ocular index 1.94. Postocular part and postocular constriction (long and shallow) hardly distinguishable from each other, long, laterally strongly concave, about as long as antero-posterior length of eye. Postocular lobe short and broad, widest in middle, slightly wider than transocular width, lateral sides broadly rounded. Ocellar tubercles strikingly large and prominent, large ocelli directed anterolaterad: ocellar tubercles in Enicocephalomorpha bear ocelli dorsally or dorsolaterally; entire dorsal surface of ocellar tubercles sometimes occupied by ocelli with their tubercles hardly indicated. Tubercles and ocelli are mostly not distinguished in descriptive papers (including some of ours). Interocellar distance 1.5 times as long as distance of ocellar tubercle to eye. Neck simple. Eyes in ventral view strongly produced laterad and sunken mesad, longest axis strongly diagonal and directed antero-laterad, eye much wider than minimum interocular distance, ventral ocular index 0.85.

Antennae. Insertion nearly subterminal, segment 1 with a large prescapite, segment itself strongly widening distad, much surpassing apex of head, segment 2 terete, slightly thickening distad, segments 3 and 4 long, thinner, but less than subflagelliform. Antennal formula (longest segment first): II:III:IV:I.

Labium. Short, reaching anterior margins of eyes. Labial formula (longest segment first) III-IV-II=I. The dorsal (morphologically ventral) outline of segment III moderately convex, ventral one straight.

Pronotum (Figure 1D). Lateral and posterior outlines of collum large and moderately sized, wider midlobe strongly convex, midlobe laterally much exceeded by moderately convex lateral margins of hindlobe. Convex posterior margin of hindlobe subdivided into two separately convex parts by deep subtriangular median gulf reaching nearly half length of hindlobe median. Details of surface shape of pronotal lobes undetectable. Ratio width to median length of collum 2.78; of the midlobe 2.22 and ratio of maximum width of hindlobe to maximum length 2.32.

Other parts of thorax. Fore acetabula widely separated and widely open. Mesoscutellum broadly triangular, apex not produced but provided with transversely oval swelling with marginally radiating macrotrichia. Mesonotum and metanotum (Figure 1E).

Forelegs. Foretrochanter (Figs 1F, 3A, B) produced as subtriangular process over anterior base of forefemur, anterior margins of latter diagonal and thickened by marginal inversely L-shaped ridge; posterior margins of process perpendicular to femur, posterior face of process concave. Only areas ventral to process and small inner angles of inversely L-shaped ridges with granules, remainder of trochanter smooth.

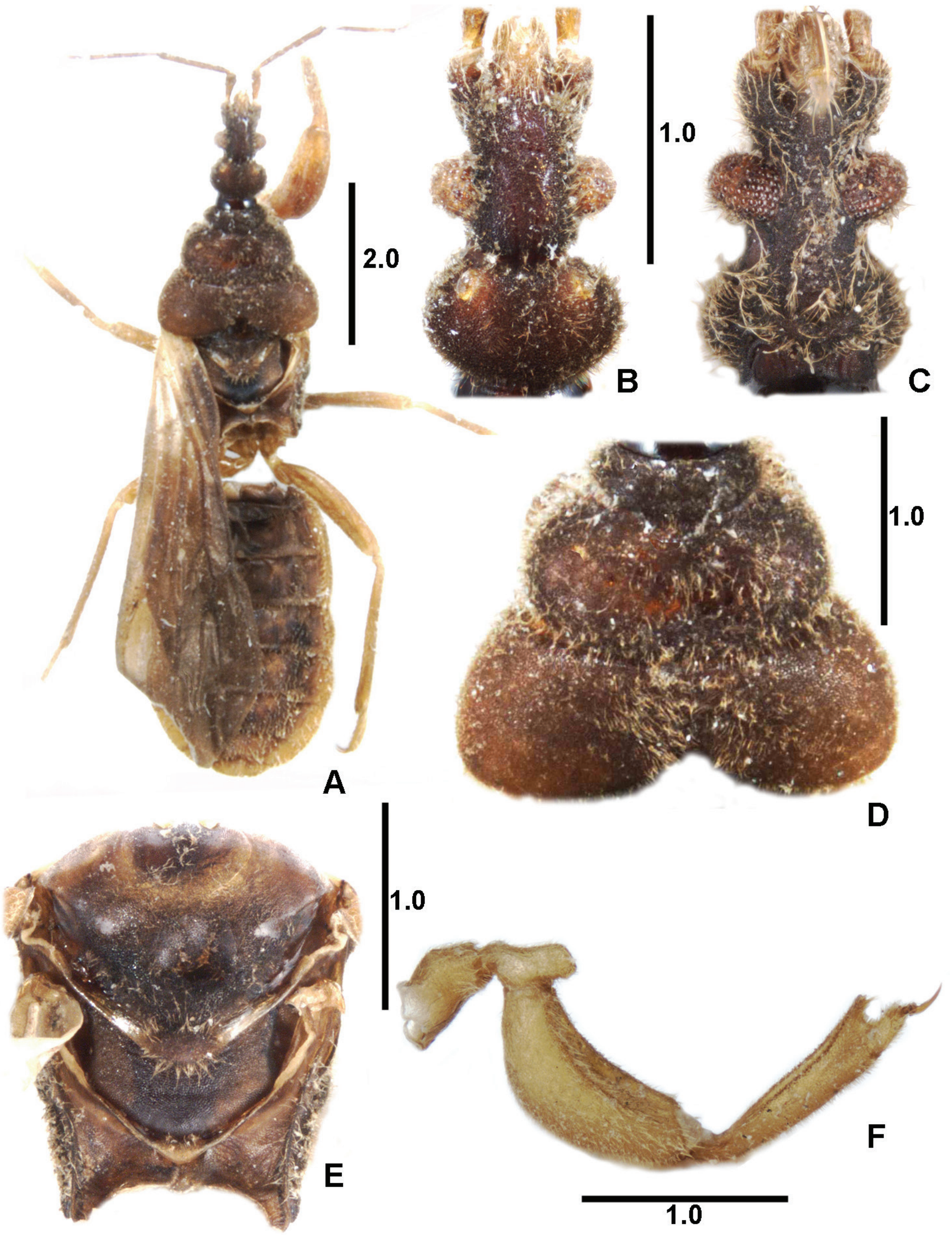

Figure 1. *Xenicocephalus tomhenryi* sp. n., female holotype **A** dorsal habitus **B** head, dorsal view **C** head, ventral view **D** pronotum, dorsal view **E** pterothorax, dorsal view **F** left foreleg, posterior view. Scale bars in mm.

Forefemur (Figs 1F, 3C) strikingly thick and curved, arcuate, dorsal face convex, ventral face deeply and percurrently concave; groove delimited by two marginal rows of densely packed minute subglobular platelets, surface of concavity densely pilose. (Neopatella [cf. Štys and Baňař 2007] not studied.)

Foretibia (Figs 1F, 3D) thick, flattish, rather uniformly broad, very moderately arcuate, ventral face deeply percurrently concave and densely pilose, concavity about as long as that of forefemur, margins of concavity delimited as in forefemur by subglobular platelets (Figure 3E). Apicitibial armature (Figs 4A, C, D, 6A, B). Tibial process long and thin, about as long as foretarsus, strikingly delimited from remainder of tibia by concavity containing medial part of bristle-comb formed by ca. 28 palisade-like spines (Figure 4B). Apiciventral tibial spines formed by two groups: (a) more dorsal cluster of four long, thin, slightly curved spines (their proximal parts with parallel grooves), cluster separated from (b) more ventral area by shorter, thicker, and less pointed, finger-shaped spine above conspicuous ventral-most rounded projection of process. Foretarsus. Tarsus with four (Figs 4B, 6C) somewhat thicker setae (two anterior + two posterior = two dorsal + two ventral) distributed among normal macrotrichia, not longer than these, and recognizable only by presence of longitudinal grooving.

Midlegs and hindlegs short and robust, first tarsomeres very short. Apices of middle and hind tibiae with two bristle combs, anterior and posterior ones each consisting of ca. 12–15 isomorphic setae, and two or three much longer, ventrally placed setae.

Post-tarsi could not be studied in detail. Fore post-tarsus with strikingly split unguitractor plate along median. Claws heteromorphic, strikingly slender and short, longest at foreleg (posterior claw reduced to stump), shortest at midleg. Fore claw and hind claws nearly straight, middle claw basally thick and distally regularly arcuate.

Forewing (Figure 2A) veins with short, semi-erect to erect setae. Basal and discal cells closed; indistinct ambient vein marginal, coinciding with wing margin; costal fracture (or node) absent. Veins C+Sc and R and R1 so strongly thickened that anteradial furrow displaced laterad at inner edge of C&Sc. Medial furrow (= postradial furrow) absent. Basal anchor-like vein short and thick; distinctly diagonal, vein-like r-m entering MA in middle of discal cell (r-m teratologically doubled on right wing). M and Cu branching rather proximally; basal cell thus long and pointed but still slightly shorter than pointed discal cell. Discal cell nearly reaching wing margin, connecting with it by very short M&Cu1a and longer Cu1b; cu-an entering discal cell much more proximally relative to branching point of Cu1a and Cu1b. AA1+2 and AA3+4 meeting to form joint distal sector of AA in ca. 2/5 length of AA before joining cu-an. Entire wing diffusely melanized except base.

Hindwing (Figure 2B). ***Pregenital abdomen*** moderately broad, oval, apex nearly pointed. ***Dorsum*** with peculiar system of elevated longitudinal (lateral and medial) rails and transverse rungs resembling lattice of ladder (Figure 2C). MTG I subdivided into two hemitergites by median desclerotization; separate LTG lacking. MTG II very short, strongly thickened, forming first rung of "ladder"; LTG I & II laterally embracing MTG I. Mediotergites III–VIII each with rung along posterior margin (extending on segments III–VI to connexival margin). Segments III–VII with strong lateral rails forming lateral margins of MTG, separating them from DLTG area subdivided in inner DLTG (= lateral-most parts of MTG?) and outer DLTG; subdivision of DLTG area indistinct on dorsite VIII. MTG III–V with distinct and wide (VI with indistinct and diffusing) median rail. Dorsites VIII and IX simple. Opening of dorsal gland at anterior margin of MTG IV formed by semicircular depression provided with pair

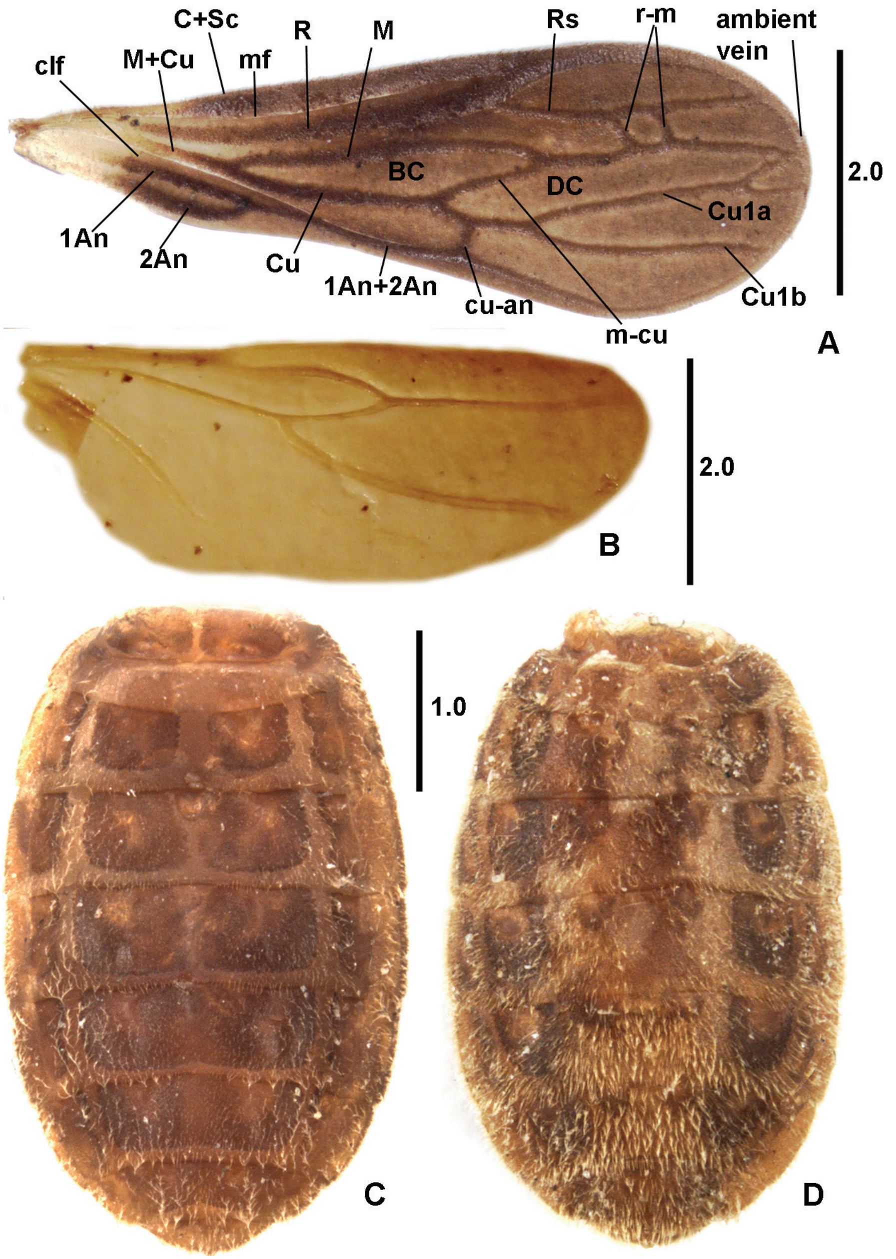

Figure 2. *Xenicocephalus tomhenryi* sp. n., female holotype **A** forewing **B** hindwing **C** abdomen, dorsal view **D** abdomen, ventral view. Scale bars in mm.

(sic!) of large, posterior, nearly contiguous openings. Venter (Figure 2D). Details of ventrite I not discernible. Ventrites II–VII with more complex lattice than on dorsum but details not studied. Transverse, narrow, and long genital slit between ventrites VII and VIII; any other genital or proctigeral structures not observed.

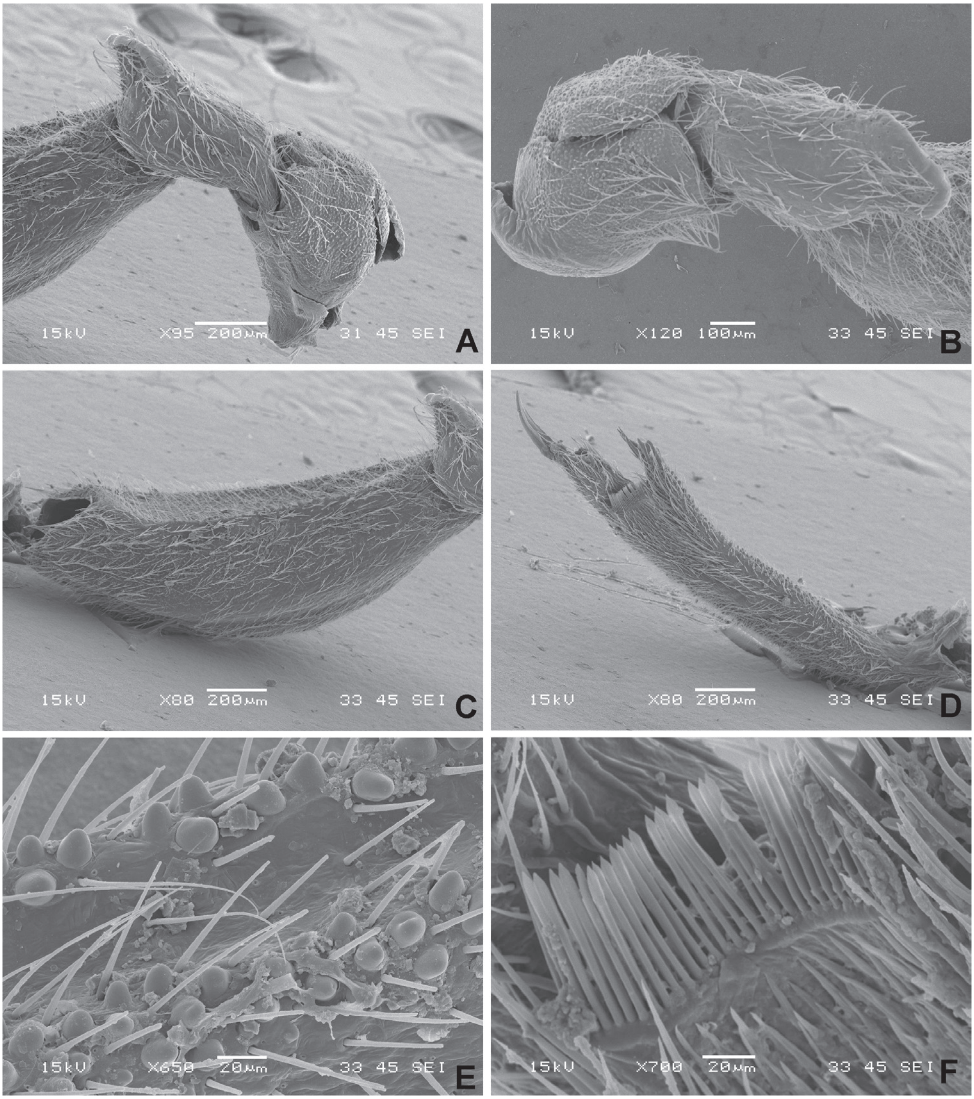

Figure 3. *Xenicocephalus tomhenryi* sp. n., female holotype, left foreleg, scanning electron micrographs **A** coxa, trochanter and basis of femur, anterior view **B** coxa and trochanter, ventral view **C** femur, anterior view **D** tibia, anterior view **E** detail of ventral concavity of tibia **F** bristle comb of tibial apex, anterior view.

Type material. ***Holotype*** female, labelled: 'Ecuador camino / Aloag-Tandapi / Pr. Pichincha 2600m / 12.II.1983 A. Roig [handwritten] // Drake Colln. ex / J. Maldonado C. / Coll. 1996 [printed] // Xenicocephalus / sp. nov. / P. Baňař det. 2014 [handwritten, partly printed] // HOLOTYPE / *Xenicocephalus* / *tomhenryi* sp. nov. / P. Štys & P. Baňař det. 2018 [printed red label]'. Dry-mounted, left foreleg and right wings mounted separately; right middletarsus missing. Deposited in Department of Entomology of National Museum of Natural History, Washington, D.C. (USNM).

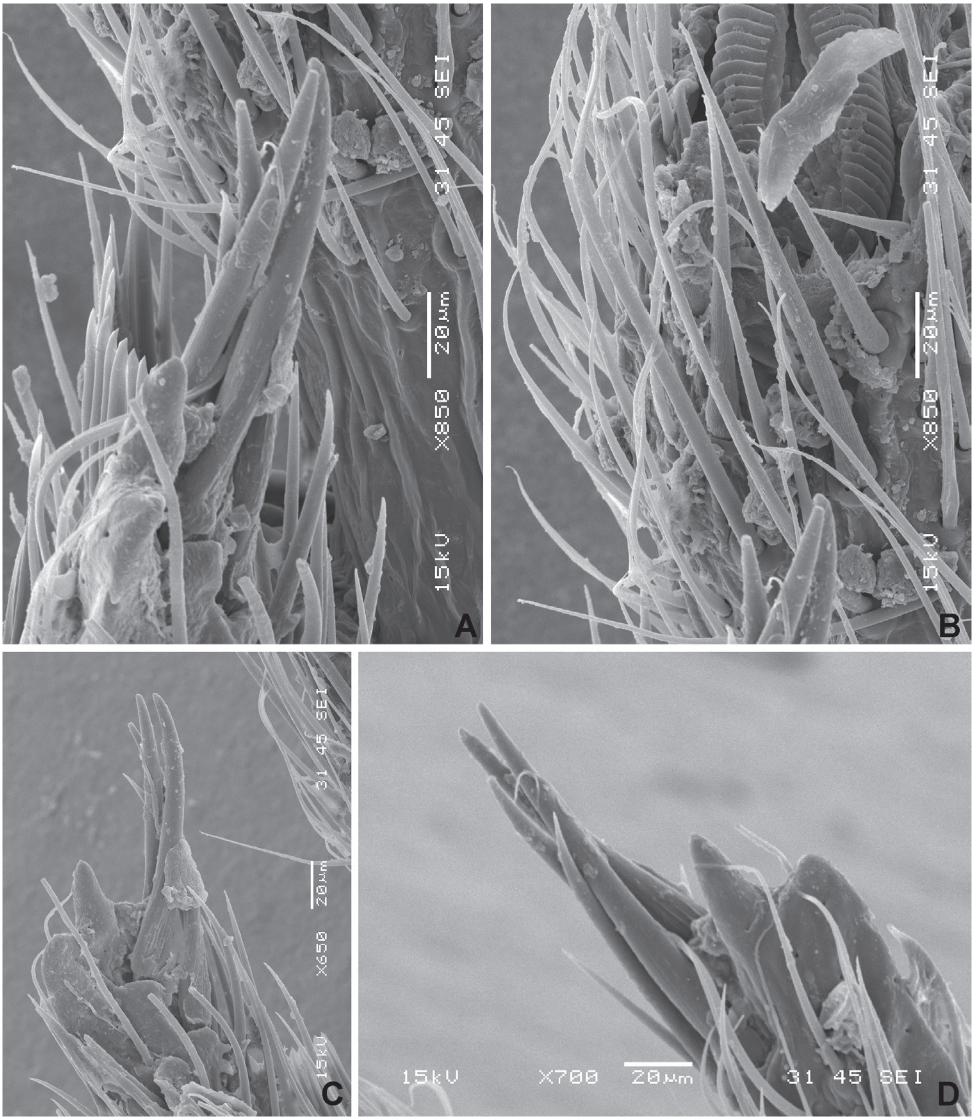

Figure 4. *Xenicocephalus tomhenryi* sp. n., female holotype, left foreleg, scanning electron micrographs **A** apicitibial armature, ventral view **B** tarsal armature, ventral view **C** apicitibial armature, posterior view **D** apicitibial armature, anterior view.

Etymology and dedication. Dedicated to our dear colleague Thomas J. Henry, eminent student of the Heteroptera, for long-standing cooperation and friendship. Pavel will always remember Tom´s and Katy´s hospitality and kind assistance during his stay at their house in Silver Spring, Maryland, after his mishap in 2014.

Species comparison. The following comparative paragraphs are intended to serve as a diagnosis and comparative diagnosis. Because of the paucity of material, we could not always determine whether the differences are species-specific, sex-specific, or repre-

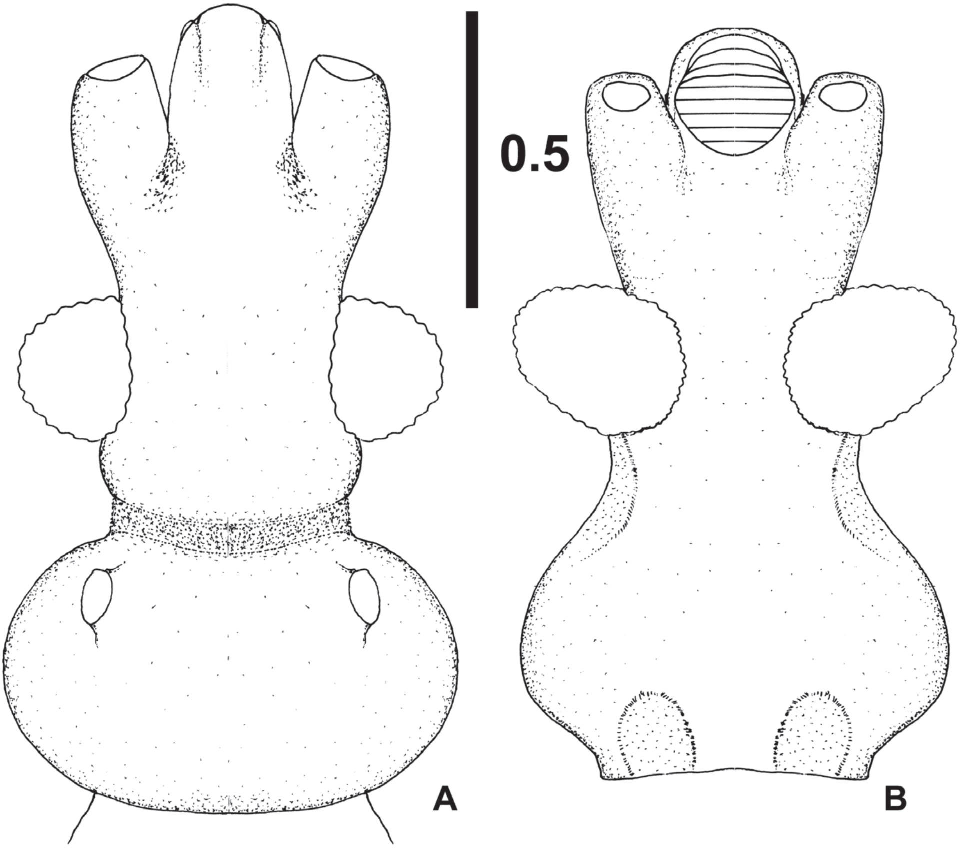

Figure 5. *Xenicocephalus tomhenryi* sp. n., female holotype, head **A** dorsal view **B** ventral view. Scale bar in mm.

sent individual variation. The last alternative may particularly involve characters of the forewing venation, which is notoriously variable and subject to teratological mutations (cf. Štys 1980, Wygodzinsky and Schmidt 1991, Štys and Baňař 2008b).

The data on *Xenicocephalus* species are organized as follows: (1) *X. tomhenryi* female from Ecuador (holotype), (2) *X. josifovi* male from Suriname (holotype), (3) *X. giganticus* female from Colombia (incomplete holotype), (4) *X.* sp., larva 5 from Colombia: (Santa Marta: San Sebastian de Marago) assumed by Wygodzinsky and Schmidt (1991) to be conspecific with *X. giganticus* and used by them in completing the diagnosis of *Xenicocephalus*. The important autapomorphic diagnostic character states are in boldface type.

Antennae

(1) X. tomhenryi F – **segment I long, strikingly thickening distad**; II long, terete, slightly thickening distad, about as long as head.

(2) X. josifovi M – segment I short, thick, not thickening distad; II short, thicker but not thickening distad, about 1.5 times as long as head.

(3) X. giganticus F – ?

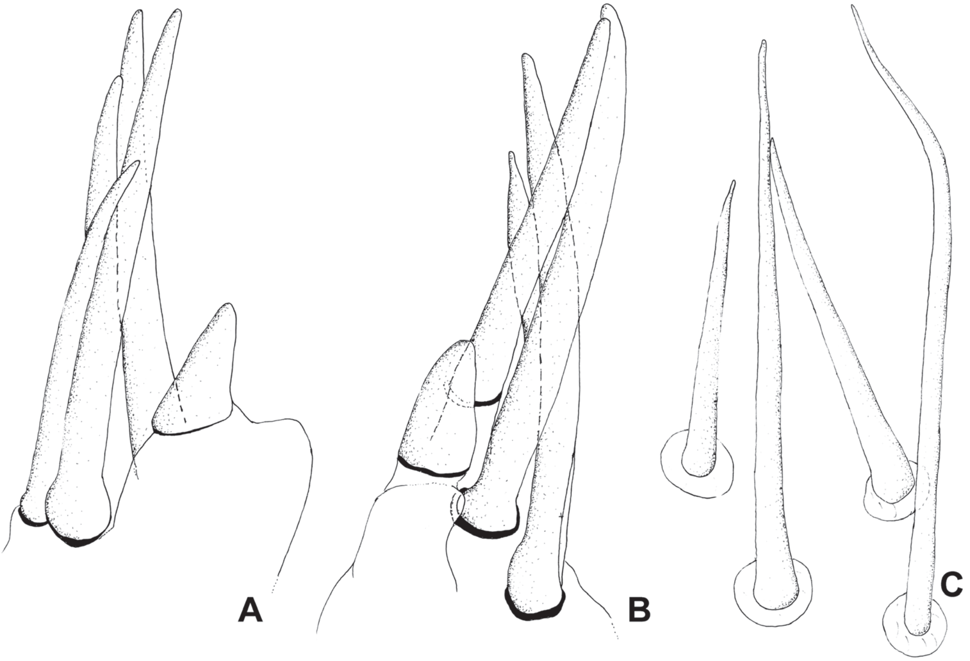

Figure 6. *Xenicocephalus tomhenryi* sp. n., female holotype, left foreleg, schemes, not measured. **A** apicitibial armature, antero-ventral view **B** apicitibial armature, ventral view **C** tarsal armature, ventral view, other macrotrichia omitted.

(4) X. giganticus (?) L 5 – segment I short, thickening distad; II long, terete, not thickening distad, about as long as head.

Head (size of eyes sexually dimorphic?)

(1) X. tomhenryi F – preocular part of head long, eyes short, distances anterior margin of eye-insertion of antenna and posterior margin of eye-ocellus longer than maximum length of eye; **postocular part of anterior lobe & transverse constriction strikingly long**; ocelli submarginal.

(2) X. josifovi M – preocular part of head short, eyes long, distance anterior margin of eye-insertion of antenna and posterior margin of eye-ocellus much shorter than maximum length of eye; **postocular part of anterior lobe not present, constriction narrow**; ocelli marginal.

(3) X. giganticus F – ?

(4) X. giganticus (F?) L 5 – preocular part of head long, eyes minute, lateral, distance anterior margin of eye-insertion of antennae as long as maximum length of eye; **postocular part of anterior lobe nearly as long as eye;** constriction deep and narrow; ocelli not mentioned in original description, but their rudiments indicated (Wygodzinsky and Schmidt 1991: fig. 149B, p. 206).

Pronotum

(1) X. tomhenryi F – **posterior margin of collum strongly convex, encroaching onto midlobe region**; hind lobe "entire," median part not differentiated; **anterolateral**

parts of hindlobe embracing posterolateral parts of midlobe, posteromedial notch of hind lobe ca. twice as deep as maximum median length of hindlobe.

(2) *X. josifovi* M – posterior margin of collum transverse; **hindlobe "bipartite," creating impression of two opposite leaves attached to broad and weakly sclerotized median region;** anterolateral parts of hindlobe not extending cephalad, posteromedial notch of hind lobe ca. half as deep as maximum median length of hindlobe.

(3) *X. giganticus* F – ?

(4) *X. giganticus* (?) L 5 – posterior margin of collum very moderately convex; mid- and hindlobes not differentiated.

Mesoscutellum

(1) *X. tomhenryi* F – broadly rounded, **apex with transversely oval swelling with radiating marginal macrotrichia.**

(2) *X. josifovi* M – amply triangular, apically mucronate.

(3) *X. giganticus* F – amply triangular, apically mucronate.

(4) *X. giganticus* (?) L 5 – 0.

Forewings (individual variation and most potential teratologies could not be assessed). We are not certain about the presence of AP in any *Xenicocephalus* species (contrary to our previous statement on *X. josifovi* (Štys and Baňař 2008a).

(1) *X. tomhenryi* F – C&Sc, R and Rs extremely strongly thickened, **anteradial furrow along edge of C&Sc**; veins delimiting base of discal cell (part of M and part of Cu proximal to cu-an) unequally long, M about three times as long as Cu; **r-m vein-like**; **apex of discal cell close to wing margin, 2 short distal veins entering wing margin**; fork Cu1a-Cu1b far distad to cu-an. Forewing macropterous, conspicuously exceeding apex of abdomen.

(2) *X. josifovi* M – C&Sc, R and Rs moderately thickened, anteradial furrow within subcostal cell; veins delimiting base of discal cell (part of M and part of Cu proximal to cu-an) equally long; **r-m point-like;** apex of discal cell close to wing margin,1 hardly distinct distal vein entering wing margin; fork Cu1a-Cu1b coinciding with position of cu-an. Forewing macropterous, exceeding apex of abdomen.

(3) *X. giganticus* F – C&Sc, R and Rs extremely strongly thickened but anteradial furrow within subcostal cell; veins delimiting base of discal cell (part of M and part of Cu proximal to cu-an) equally long; **r-m vein-like;** apex of discal cell distant from wing margin,1 distinct vein reaching wing margin; fork Cu1a-Cu1b far distad to cu-an. Forewing submacropterous, not exceeding apex of abdomen.

(4) *X. giganticus* (?) L 5 – 0.

Foretrochanter (perceived shape strikingly dependent on angle of observation).

(1) *X. tomhenryi* F **– broadly rounded, apex with transversely oval swelling with radiating marginal macrotrichia.**

(2) *X. josifovi* M – ventral side with prominent ridge terminating in **small ventral tubercle** exceeding base of femur ventrad and only inconspicuous distad.

(3) *X. giganticus* F – ?

(4) *X. giganticus* (?) L 5 – ventral side with prominent strongly sclerotized **ridge-like projection** exceeding base of femur ventrad but not distad.

Forefemur

(1) X. tomhenryi F – strikingly thick and curved, arcuate, dorsal face convex, ventral face deeply and percurrently concave; groove delimited by two marginal rows of densely packed minute subglobular platelets of stronger sclerotization, anterior row of large granules more developed, on slightly elevated rim, granules in posterior row smaller, nearly subglobular proximally, becoming lens-like platelets distally, appearing in lower magnification as impression of two deeply brown to blackish lines. Surface of forefemoral concavity with countless lens-like platelets, heavily sclerotized, blackish, **the surface of the concavity densely pilose**. No other blackish platelets or granules present.

(2) X. josifovi M – distinctly curved, moderately C-shaped; ventral face concave, **with vestiture lacking**, parallel-sided and sharply delimited at anterior and posterior edges by row of macrotrichia and irregularly distributed black granules intermixed with row of conspicuous, high, non-setigerous conical tubercles.**Ventral concavity with numerous small, broad, transverse scale-like structures**. Blackish granules also on distal two thirds of lateral and dorsal faces.

(3) X. giganticus F – ?

(4) X. giganticus (?) L 5 – conspicuously curved, bearing numerous cuticular granules dorsally and ventrally.

Foretibia

(1) X. tomhenryi F – thick, flattish, rather uniformly broad, very moderately arcuate, ventral face deeply percurrently concave and **densely pilose**, concavity about as long as that of forefemur, margins of concavity delimited as in forefemur by subglobular platelets. Foretibia along ventral face (except proximal sixth) with two rows (posterior and anterior) of irregularly placed large, semi-globular to slightly conical, strongly sclerotized granules, appearing in lower magnification as impression of two deeply brown to blackish lines. No other blackish platelets or granules present.

(2) X. josifovi M –cylindrical, of uniform width, only dorsal outline slightly curved. **Entire ventral face moderately concave, vestiture lacking,** edges of tibial concavity less sharply delimited than those of femoral one. Anterior edge with 14, posterior edge with numerous conical tubercles of same shape as on femur. Anterior face with ca. 50 black granules, posterior face with several hundred. **Ventral concavity with numerous small, broad, transverse scale-like structures**.

(3) X. giganticus F – ?

(4) X. giganticus (?) L 5 –inner apical angle in form of pointed, strongly sclerotized projection bearing 3–5 straight, slender spines inserted below apex. Apex of central portion of inner surface of foretibia with field of short, stout setae.

Apicitibial and tarsal armature of foreleg

(1) X. tomhenryi F – tibial process **long and narrow, strikingly differentiated** from remainder of distal tibial edge, with **four slender and more dorsal spines, and one ventral thick, short, conical spine from more ventral tubercle.** Tarsal armature from four somewhat thicker setae (two anterior + two posterior = two dorsal

+ two ventral) distributed among normal macrotrichia, not longer than these, and recognizable only by presence of longitudinal grooving.

(2) *X. josifovi* M – tibial projection moderately large, rounded, with seven slender subapical spines, four in ventral row, three in dorsal row; tarsal armature from four spines, three of them very long and slender, one stout and conspicuously shorter.

(3) *X. giganticus* F – ?

(4) *X. giganticus* (?) L 5 – tibial projection acutangular but not markedly differentiated from distal edge of tibia; with 3–5 slender subapical spines.

Pregenital abdomen, dorsum (a comparative study required)

(1) *X. tomhenryi* F – **complex lattice system (elevated rails and rungs)** present.

(2) *X. josifovi* M – lattice absent.

(3) *X. giganticus* F – lattice absent.

(4) *X. giganticus* (?) L 5 – lattice absent.

Discussion

Nomenclatural and taxonomic notes. Wygodzinsky and Schmidt (1991) did not explicitly exclude material of all the larvae of *X. giganticus* available to them (from Costa Rica, Panama, Colombia, and Guyana) from the type series of *X. giganticus*; these larvae must be considered paratypes, though their species identity is doubtful. The larva V from Colombia (Santa Marta: San Sebastian de Marago) used for completing the generic description and diagnosis of *Xenicocephalus* and illustrated by Wygodzinsky and Schmidt (1991: fig. 149) is also one of the paratypes of *X. giganticus*.

We cannot be certain which interspecific differences (Wygodzinsky and Schmidt 1991, Štys and Baňař 2008a, present paper) are real, and which should be interptreted as sexual dimorphism or intraspecific variation. However, the three adult specimens available are so different that their assignment to different species is beyond doubt. The architecture of the forelegs in *Xenicocephalus* and lattice system of abdominal carinae in *X. tomhenryi* are unique in the Enicocephalomorpha. We provisionally classify the genus as subfamily incertae sedis in the Enicocephalidae.

The distribution of *Xenicocephalus* can be characterized as "southern continental Central America and northern South America" (Wygodzinsky and Schmidt 1991), viz. Costa Rica; Panama: Canal Zone; Colombia: Cundinamarca, Magdalena (*X. giganticus*; Santa Marta; Ecuador: Pichincha (*X. tomhenryi*); Guyana; Suriname (*X. josifovi*). Only larvae of uncertain species identity are known from the areas with no species name provided. Species of *Xenicocephalus* species surely occur in the intervening and surrounding areas, and the number of species probably is higher than currently known.

Only scant information is available on the biology of *Xenicocephalus*. For example, pteygopolymorphism (adults of the three species are submacropterous to macropterous) and swarming are unknown. The male *X. josifovi* from Suriname was taken at light, whereas the other specimens were collected accidentally or in pitfall traps in lowland to montane forest (to 2600 m). The scattered data on collection dates do not provide useful information. However, the peculiar and, among Enicocephalomorpha (and perhaps all other Heteroptera), unique shapes of the forefemur and foretibia in *Xenicocephalus* suggest a specialized and unique mode of catching and handling a certain kind of prey. We predict that the curved, raptorial forefemora and foretibiae, both provided with an extensive and deep concave area on their ventral face, are suited for holding and possibly cracking strongly sclerotized, convex and rounded prey (as in similarly shaped beetles).

The larvae of species of *Xenicocephalus* (cf. Wygodzinsky and Schmidt 1991: fig. 149A) have the attributes of other larval Enicocephalidae. They are prothetelic, with distal parts of the forewing pads mutually contiguous and the mesoscutellar area distinctly circumscribed. The only available illustration of a larva of the genus also shows the small triangular apex of the mesoscutellum as sharply delimited on all sides, similarly structured, and probably sclerotized; this character has not been examined in other enicocephalid taxa.

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RESEARCH ARTICLE

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Synopsis of Schizopteridae (Hemiptera, Heteroptera, Dipsocoromorpha) from the United States, with description of seven new species from the US and Mexico

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Abstract

Because species diversity of the small true bug family Schizopteridae is greatest in tropical and subtropical areas, it is not surprising that only four species have been described from the United States. As part of a larger project on the taxonomy and phylogenetics of Schizopteridae, 178 specimens from the United States were examined. This material contained representatives of the previously described species *Glyptocombus saltator* Heidemann, 1906, *Corixidea major* McAtee & Malloch, 1925, *Nannocoris arenarius* Blatchley, 1926, and *Schizoptera bispina* McAtee & Malloch, 1925, but also six undescribed species. These new taxa are described as *Glyptocombus halbertae* **sp. n.,** *Glyptocombus suteri* **sp. n.,** *Nannocoris anophorus* **sp. n.,** *Nannocoris brevipilus* **sp. n.,** *Schizoptera* (*Cantharocoris*) *rileyi* **sp. n.,** and *Schizoptera* (*Schizoptera*) *henryi* **sp. n.** Habitus images and genitalic illustrations of the previously described and the new species are provided as well as a map showing distribution ranges of these species in the United States and Mexico. To provide a comprehensive treatment of the small genus *Glyptocombus* Heidemann, 1906, *Glyptocombus mexicanus* **sp. n**. is also described that, to our knowledge, occurs only in Mexico, and the female of one additional undescribed *Glyptocombus* species is documented from Mexico.

Keywords

biodiversity, minute litter bug, Nearctic region, systematics, true bug, taxonomy

Introduction

The small true bug family Schizopteridae (Hemiptera: Heteroptera) in the infraorder Dipsocoromorpha contains approximately 355 described species (Emsley 1969, Hill 1984, McAtee and Malloch 1925, Weirauch et al. 2018, Wygodzinsky 1955). Although several species occur in temperate regions in Japan, Tasmania, and New Zealand, the great majority of species have been described from wet tropical and subtropical areas around the globe (Emsley 1969, Knyshov et al. 2016, Wygodzinsky 1951). The fauna of Schizopteridae in the United States could therefore be expected to be relatively small. Consistent with this prediction, only four species representing four genera were described during the first quarter of the 20th century and these are currently the only species known to occur in the United States (Henry 1988, 2010). The four species appear to have relatively large distribution ranges in the eastern and southeastern United States including one that was originally described from Guatemala (Henry et al. 2010, Allen and Carlton 1989, Heidemann 1906, Hoffman et al. 2005, Roble and Hoffman 2000, Hoffman et al. 2007, McAtee and Malloch 1925).

Heidemann (1906) described the monotypic genus *Glyptocombus* Heidemann, 1906 to accommodate *Glyptocombus saltator* Heidemann, 1906 described from specimens collected on Plummers Island in Maryland. This species was subsequently recorded from Arkansas, the District of Columbia, Michigan, Tennessee, Virginia and Washington DC (Henry 1988, Allen and Carlton 1989, Roble and Hoffman 2000). Heidemann (1906) noted the resemblance of this species to *Hypselosoma* Reuter and it is classified in the Hypselosomatinae (Emsley 1969). It has remained one of only a handful of New World genera in this subfamily (Uhler 1894, Emsley 1969, Carpintero and Dellapé 2006).

The three remaining species of Schizopteridae recorded from the US belong to the Schizopterinae and are classified in the speciose genera *Corixidea* Reuter, 1891, *Nannocoris* Reuter, 1891, and *Schizoptera* Fieber, 1860. Distributions of species in the three genera range from the southern parts of South America to the US. In addition to the currently described species (9 in *Corixidea*, 12 in *Nannocoris*, and ~80 in *Schizoptera*: Emsley 1969, Leon and Weirauch 2016a,b), we examined specimens representing a large number of undescribed species from across the New World during taxonomic revisions that are ongoing (Weirauch Lab, unpublished data). *Corixidea major* McAtee & Malloch, 1925 was described from Clarksville in Tennessee and has been recorded from Florida, Virginia, Arkansas and Oklahoma (Hoffman et al. 2005, Henry et al. 2010). *Nannocoris arenarius* Blatchley, 1926 is known from Georgia, North Carolina, and Virginia (Hoffman et al. 2007), but was originally described from Florida (Blatchley 1926). Neither species is known to occur outside the US and both are clearly differentiated from congeneric species in Central America by head shape, wing type and venation (*Nannocoris*) and size, coloration and male genitalic structures (*Corixidea*). The situation is less clear for *Schizoptera bispina* McAtee & Malloch, 1925 that was originally described from Guatemala and recorded from Mexico (McAtee and Malloch 1925) and subsequently reported from Florida (Blatchley 1926). McAtee and Malloch (1925) indicated that the lateral spines on the male subgenital plate were shorter in the Mexican specimen compared to the holotype, but nevertheless treated them as conspecific. The species was originally classified in the subgenus *Schizoptera* (*Lophopleurum*) that contained six additional species from Central America and Trinidad (McAtee and Malloch 1925, Emsley 1969, Costas et al. 2015). Based on the lack of reciprocal monophyly and diagnostic features, *Schizoptera* (*Lophopleurum*) was recently synonymized with *Schizoptera* (*Cantharocoris*) (Leon and Weirauch 2017) that contains an additional six species from the Caribbean, Central and Northern South America including Trinidad (McAtee and Malloch 1925, Emsley 1969). Species in the subgenus *Schizoptera* (*Cantharocoris*) are recognized by the glabrous area associated with the scent gland groove extending to or beyond the midline of the metapleuron; in species of *Schizoptera* (*Schizoptera*) the glabrous area is restricted to the ventral margin of the scent gland groove.

We here provide an updated synopsis of the Schizopteridae occurring in the United States. We have examined >8,000 specimens of New World Schizopteridae as part of a project on the biodiversity and systematics of this group. The majority of specimens were curated from ethanol-preserved residues of passive trap samples, but we also borrowed point and card-mounted specimens from various collections. The 178 U.S. specimens of Schizopteridae that we have located and examined are mostly point-mounted and were borrowed from seven collections. Texas A&M and the Florida State Collection of Arthropods provided the bulk of the material, with 89 and 53 specimens, respectively. We also examined specimens of *Corixidea*, *Nannocoris*, and *Schizoptera* (*Cantharocoris*) from Mexico and other countries in Central America to assure that our synopsis of previously described and new taxa treated in this paper is as thorough as possible with respect to distribution ranges that extend beyond the administrative borders of the U.S. Additional undescribed species of the three schizopterine genera from Mexico and Central America will be treated as part of separate, genus-focused publications. In contrast, the revision of *Glyptocombus* presented as part of this study is comprehensive based on the available material and includes a new species known only from Mexico. We here provide a synopsis of the ten species of Schizopteridae that occur in the US, describe six of them as new, provide habitus images and genitalic illustrations of previously described and new species, and document their distribution ranges.

Materials and method

We have examined approximately 8,000 specimens of Schizopteridae from the Nearctic and Neotropical regions as part of a US National Science Foundation project on the biodiversity and systematics of the true bug infraorder Dipsocoromorpha. Among these were 178 specimens from the United States, representing the four previously described species and several undescribed species in the genera *Glyptocombus*, *Corixidea*, *Nannocoris*, and *Schizoptera*. We surveyed point-mounted specimens belonging to these four genera from Mexico and other Central American

Table 1. Measurements of species of *Glyptocombus*, *Corixidea*, *Nannocoris*, and *Schizoptera* in mm.

Taxon		USI	Total length	Body length (ventral)	Head width across eyes	Synthlipsis	Pronotal width	Width forewings	Pronotum length	Pronotal collar length	LC:LP	Width between eyes	Fore femora depth/ height	Fore femora length	DFF:LFF	Hind tibia length	LHT:WP	a3 length	a4 length	a3:a4
G. halberti	♂	UCR_ENT 00012022	1.23	0.74	0.67	0.34	0.59	na	0.2	0.05	0.23	0.26	0.16	0.04	0.24	0.52	0.88	0.16	0.1	1.66
G. mexicanus	♂♂	UCR_ENT 00094271	1.74	1.74	0.72	0.38	0.58	na	0.24	0.08	0.32	0.31	0.09	0.37	0.23	0.63	1.09	0.31	0.34	0.9
		UCR_ENT 00094275	1.18	1.18	0.75	0.41	0.62	na	0.21	0.07	0.3	0.32	0.09	0.44	0.2	0.69	1.12	0.34	0.35	0.96
	♀	UCR_ENT 00094272	1.51	1.51	0.72	0.38	0.64	na	0.17	0.05	0.28	0.3	0.09	0.36	0.26	0.64	1	0.34	0.33	1.03
G. saltator	♂♂	UCR_ENT 00090440_ ED5195	1.52	1.52	0.72	0.38	0.57	na	0.18	0.06	0.33	0.27	0.09	0.4	0.23	0.66	1.16			
		UCR_ENT 00094270	1.14	1.04	0.74	0.39	0.6	na	0.23	0.06	0.25	0.3	0.08	0.38	0.21	0.56	0.94			
		UCR_ENT 00094273	1.2	0.93	0.74	0.39	0.61	na	0.21	0.05	0.25	0.31	0.09	0.47	0.2	0.64	1.04			
		UCR_ENT 00011915			0.74	0.4	0.61	na	0.15	0.05	0.35	0.29	0.1	0.44	0.22	0.68				
	♀♀	UCR_ENT 00090439_ ED5194	1.49	1.49	0.79	0.41	0.64	na	0.17	0.04	0.26	0.31	0.06	0.41	0.14	0.56	0.88			
		UCR_ENT 00090441_ ED5196	1.46	1.46	0.75	0.38	0.62	na	0.2	0.06	0.29	0.28	0.08	0.35	0.24	0.67	1.09			
G. suteri	♂	UCR_ENT 00090443_ ED5198	1.47	1.47	0.7	0.36	0.57	na	0.25	0.07	0.26	0.27	0.09	0.34	0.26	0.53	0.94	0.33	0.31	1.08
Corixidea major	♂♂	UCR_ENT 00093506	1.58	1.12	0.56	0.33	0.66	na												
		UCR_ENT 00012039	1.36	na	0.51	0.3	0.58	na												
	♀	UCR_ENT 00012040	1.42	na	0.53	0.32	0.61	na												
N. anophorus	♂	UCR_ENT00094264	1.16	na	0.32	0.22	0.52	na												
N. arenarius	♂♂	UCR_ENT 00124097	1.04	na	0.28	0.19	0.42	na												
		UCR_ENT 00120010	1.05	na	0.31	0.2	0.45	0.56												
		UCR_ENT 00124093	1.09	na	0.29	0.18	0.41	0.54												
	♀♀	UCR_ENT 00124094	1.01	na	0.28	0.18	0.42	0.55												
		UCR_ENT 00124095	1.02	na	0.29	0.18	0.41	0.52												
		UCR_ENT 00124096	1	na	0.28	0.19	0.41	0.54												
N. brevipilus	♂	UCR_ENT00094257	1.23	na	0.32	0.21	0.52	0.7												
	♀♀	UCR_ENT00094254	1.11	na	0.32	0.2	0.49	0.66												
		UCR_ENT00094250	1.23	na	0.32	0.2	0.48	0.67												
		UCR_ENT00094255	1.14	na	0.32	0.21	0.49	0.63												
S. (*C.*) *bispina*	♂	UCR_ENT 000934303	1.28	1.13	0.42	0.25	0.62	na												
S. (*C.*) *rileyi*	♂♂	UCR_ENT 00094298	1.42	1.2	0.53	0.31	0.73	0.82												
		UCR_ENT 00093720	1.48	1.13	0.52	0.32	0.71	0.77												
		UCR_ENT 00093725	1.44	1.1	0.51	0.3	0.75	0.82												
		UCR_ENT 00094300	1.44	na	0.49	0.28	0.67	0.76												
	♀♀	UCR_ENT 00093549	1.22	na	0.46	0.3	0.63	0.78												
		UCR_ENT 00093550	1.25	na	0.49	0.32	0.67	0.76												
		UCR_ENT 00094316	1.29	na	0.51	0.32	0.71	0.86												
		UCR_ENT 00094320	1.24	na	0.5	0.33	0.68	0.81												
		UCR_ENT 00093551	1.25	na	0.49	0.31	0.64	0.78												
S. (*S.*) *henryi*	♂♂	UCR_ENT 00093649	1.51	1.16	0.5	0.28	0.74	0.87												
		UCR_ENT 00093654	1.67	1.24	0.52	0.26	0.77	0.91												
		UCR_ENT 00093555	1.58	na	0.5	0.26	0.73	0.94												
		UCR_ENT 00093704	1.63	1.31	0.54	0.26	0.79	0.91												

countries as well as the Caribbean to ensure that this synopsis includes relevant material from outside the boundaries of the United States. Natural history collection acronyms are as follows:

ABS	Archbold Biological Station, Lake Placid, Florida, USA;
AMNH	American Museum of Natural History, New York, USA;
NHMUK	Natural History Museum, London, UK;
FMNH	The Field Museum of Natural History, Chicago, USA;
FSCA	Florida State Collection of Arthropods, Gainesville, USA;
NCSU	North Carolina State University Insect Collection, Raleigh, USA;
PURC	Purdue Entomological Research Collection, West Lafayette, USA;
TAMU	Texas A&M University, College Station, USA;
UCR	Entomology Research Museum, University of California, Riverside, USA;
USNM	National Museum of Natural History, Washington, D.C., USA;
VMNH	Virginia Museum of Natural History, Martinsville, USA.

Imaging, dissections, measurements, databasing, and distribution maps

Habitus images were taken using a Leica DFC 450 C Microsystems system (Leica, Wetzlar, Germany) with a Planapo 1.0× objective. Images of selected morphological characters were produced on the same system with a Planapo 2.0× objective. Individual images were combined using the Leica Application Suite V4.3 software or Zerene stacker V1.02 (Zerene Systems). Images were edited and assembled into image plates in Adobe Photoshop CS4 or CC2018.

To document male and female genitalia, the abdomen was separated from the body and cleared in hot 10% KOH. The male abdomen was temporarily mounted in glycerin on microscope slides, while the female abdomen was stained using Chlorazol Black E for 3 intervals of 30 seconds before slide mounting. Line drawings were prepared using a Nikon Eclipse 80i compound microscope (Nikon, Tokyo, Japan) with camera lucida.

Measurements are in mm (see Table 1; selected measurements and ratios are in text) were taken from the habitus images. Total length was measured from the anterior tip of the head to the tip of the apex of forewing, body length was measured from the anterior tip of the head to the apex of the abdomen, and width between eyes was measured in frontal perspective.

Unique specimen identifier (USI) matrix code labels with prefix and eight-digit number were associated with each specimen. Specimen information was databased using the American Museum of Natural History's Arthropod Easy Capture (AEC) database (http://www.research.amnh.org/pbi/locality/index.php). Specimen information is also available through the Heteroptera Species Pages (http://research.amnh.org/pbi/heteropteraspeciespage/) and the http://www.discoverlife.org/ website. Maps were prepared using SimpleMappr (http://www.simplemappr.net/) from coordinates exported from the AEC database and edited using Photoshop CS4.

Nomenclatural acts

This publication and the nomenclatural acts it contains have been registered in ZooBank, the online registration system for the ICZN. The ZooBank LSIDs can be resolved by appending them to the Web address http://zoobank.org/. The LSIDs for nomenclatural acts can be found in corresponding sections of this article.

Abbreviations and terminology

ag	anterior gonapophysis;
An1, An2	first and second anal veins of forewing;
ano	anophore;
anop	anophoric process;
at	anal tube;
bc	basal cell (cell posterior to R+M);
bcx	bursa copulatrix;
ca	conjunctival appendage;
Cu	cubitus;
cub	cubital cell (defined as cell bordered anteriorly by distal part of Cu);
dag	dorsal abdominal gland
dc	discal cell (defined as cell posterior to M);
dc1	discal cell 1 (defined as cell posterior to distal part of M);
g	gonoplac;
lca	left conjunctival appendage;
llt9	left laterotergite 9;
lp	left paramere;
ovg	opening of vertex gland;
pc	pronotal collar;
pg	posterior gonapophysis;
py	pygophore;
rc	radial cell removed from wing margin (defined as cell posterior to R or R2+3);
rc1-3	radial cells along costal margin (defined by cells posterior or distal to R1-R3);
rca	right conjunctival appendage;
rlt9	right laterotergite 9;
rp	right paramere;
Sc	subcostal vein;
scc	subcostal cell;
sp	spiracle;
spd	spermathecal duct;
spgl	spermathecal gland;
spgld	spermathecal gland duct;
spr	spermathecal reservoir;
st2-6	sternum 2–6;
st7	sternum 7 (=subgenital plate in male); sty median styloid;
t1-9	tergum 1–9;
t8p	tergum 8 process;
tc	trapezoidal cell (defined as cell bordered anteriorly by Cu+M);
v	vesica;
vp	vesical process.

A larger comparative survey of wing venation across Schizopteridae (Weirauch lab, unpublished data) has indicated that the terminology used in Hypselosomatinae and Schizopterinae is inconsistent. We here introduce a slightly modified terminology for wing veins in Hypselosomatinae from those in Hill (2013) and Hoey-Chamberlain and Weirauch (2016) that also differs from the terminology used for Schizopterinae in Weirauch and Frankenberg (2015) and Leon and Weirauch (2016a,b), but is largely consistent with the terminology for Ogeriinae used by Knyshov et al. (2016). The wing vein terminology is illustrated in Figure 2 for Hypselosomatinae and in Figs 6, 8 for Schizopterinae. More extensive documentation of schizopterid forewing veins is forthcoming as part of a combined morphological and molecular phylogenetic analysis (Knyshov et al., in prep.).

In several recent publications, we have referred to the ventral sclerite of the pregenital abdomen as "sternite," following, e.g., the terminology used by Emsley (1969). Here we use the terms "tergum" and "sternum" for all dorsal and ventral abdominal sclerites and "laterotergite" for a lateral subdivision of the tergum following recent papers on the morphology of the pregenital abdomen in Dipsocoromorpha (Knyshov et al. 2018) and a putatively closely related group of Heteroptera (Davranoglou et al. 2017).

We follow the genitalic terminology used in recent publications (e.g., Hoey-Chamberlain and Weirauch 2016; Knyshov et al. 2016, 2018; Leon and Weirauch 2016a, b).

Taxonomy

Key to Schizopteridae in the United States

1 Forewing with 4 closed submarginal cells (rc1, rc2, rc3, and dc1; Fig. 2A), eyes large, head wider than prothorax, labium 4-segmented (Fig. 1), male sternum 8 well developed (Fig. 3B), ovipositor well developed (Fig. 3C, D) **2**

– Forewing with fewer than 4 closed submarginal cells (i.e., rc1 and rc2 fused to rc1-2), eyes smaller, head not noticeably wider than prothorax, labium 3-segmented (Figs 4, 6, 8), male sternum 8 reduced (Fig. 9); ovipositor obsolete (Figs 5B, 7G)... **5**

2 Elytriform forewings (Figs 1 [*G. saltator*, *G. mexicanus*], 2B, C)..................**3**

– Macropterous forewings (Figs 1 [*G. halbertae*, *G. suteri*], 2A, D) **4**

3 Wing veins wider than cells (Fig. 2B), general coloration dark brown to black .... ***Glyptocombus mexicanus* sp. n.**

– Veins narrower than cells (Fig. 2C), general coloration reddish brown .... ***Glyptocombus saltator* Heidemann**

4 General dark coloration (Fig. 1, *G. halbertae*), desclerotized portion of C+Sc vein basal to junction with R1, Cu touching M at proximal corner of dc1, part of Cu distal to tc s-shaped, R2 slightly sigmoid, rc and dc ca. as long as bc (Fig. 2A) .... ***Glyptocombus halbertae* sp. n.**

– General coloration light brown (Fig. 1, *G. suteri*), C+Sc not desclerotized basal to junction with R1, Cu separated from M by m-cu cross vein, Cu distal to tc straight, R2 straight, rc and dc longer than bc (Fig. 2D) .... ***Glyptocombus suteri* sp. n.**

5 Labium truncated, pronotal collar absent (Fig. 4) …… ***Corixidea major* McAtee and Malloch**

– Labium tapering, pronotal collar usually present (Figs 6, 8) …… **6**

6 Head elongated, labium very slender, posterolateral spine on metepisternum absent, R1 obliquely approaching costal forewing margin (Fig. 6) …… **7 (genus *Nannocoris* Reuter)**

– Head short, labium stout, posterolateral spine on metepisternum well developed, R1 approaching costal forewing margin at right angle (Fig. 8) …… **9 (genus *Schizoptera* Fieber)**

7 Forewing veins with long setae (Fig. 6, *N. anophorus*), anophoric process long, reaching anteriorly to terga 5 or 6 (Fig. 7A, D) …… ***Nannocoris anophorus* sp. n.**

– Forewing veins with short setae (Fig. 6, *N. arenarius*, *N. brevipilus*), anophoric process short, reaching anteriorly only to tergum 7 (Fig. 7B, C, E, F) …… 7

8 Scutellum with lateral margins of elevated area gently convex (Fig. 6, *N. arenarius*), base of anophoric process slender (Fig. 7B, E) …… ***Nannocoris arenarius* Blatchley**

– Scutellum with lateral margins of elevated area drawn into posteriorly directed angles (Fig. 6, *N. brevipilus*), base of anophoric process stout …… ***Nannocoris brevipilus* sp. n.**

9 Glabrous cuticle on metapleuron restricted to ventral margin of scent-gland groove (Leon and Weirauch 2017: Fig. 4, left panel) …… ***Schizoptera* (*Schizoptera*) *henryi* sp. n.**

– Glabrous cuticle surrounding the scent-gland groove extending to or beyond the midline of the metapleuron (Leon and Weirauch 2017: Fig. 4, right panel) …… **9**

10 Subgenital plate with 2 small laterad-projecting, slender and acute processes (Fig. 9A) …… ***Schizoptera* (*Cantharocoris*) *bispina* McAtee and Malloch**

– Subgenital plate with large lateral process posteriorly beset with tuft of flattened and long setae and smaller acute posteriad oriented process (Fig. 9D) …… ***Schizoptera* (*Cantharocoris*) *rileyi* sp. n.**

Hypselosomatinae Esaki & Miyamoto, 1959

Glyptocombus Heidemann, 1906

Figures 1–3, 10

Type species. *Glyptocombus saltator* Heidemann, 1906

Revised diagnosis. Recognized among genera of New World Hypselosomatinae by dense setation on all surfaces of the tibia, extending from base to apex, first labial segment not dorsally expanded, and third and fourth labial segments without processes.

Revised description. Male (Figure 1): macropterous or with elytriform forewing, length**:** 1.14–1.74 mm; body ovoid. **Coloration:** general coloration tan to black. **Surface and Vestiture:** scape with 5 setae, clypeus with 3 long, stout setae, buccula and first labial segment each with pair of stout ventrolateral setae, second labial segment with pair of lateral setae (Figure 1), long, stout seta dorsoapically on third tarsal segment of all legs, anophore without distinctive setae (Figure 3A). **Structure: Head:** first labial segment not enlarged, clypeus simple. **Thorax:** tarsal formula 2-3-3, parempodia long and thin, bladder-like arolium absent. **Abdomen:** abdomen with 6 spiracles on left and 5 on right side, right side of tergum 8 with small projection containing spiracle, left side with large mitten-shaped projection with spiracle and long seta, sterna 7 and 8 distinct, posterior margin of sternum 7 simple, left side with triangular flap, sternum 8 rectangular-ovoid (Figure 3B). **Genitalia** (Figure 3A): right paramere long, stout with rounded apex and short, rounded process at base, left paramere scapula-shaped with large thumb-shaped projection, vesica of average length with one coil and small rounded conjunctival appendage at base, anophoric process crab claw-shaped, extending posteriorly on left side.

Female (Figure 1): with elytriform forewing, length: 1.42–1.51 mm; body ovoid. **Coloration:** general coloration tan to black. **Surface and vestiture:** scape with 5 setae, setae on clypeus, buccula and first and second labial segments as in male. **Structure. Head:** first labial segment and clypeus as in male. **Thorax:** tarsal formula 2-2-3, pretarsus as in male (Figure 1). **Genitalia** (Figure 3C, D): anterior gonapophysis with 3 teeth, without subapical serration, posterior gonapophysis with two teeth, median styloid bifurcate, gonoplac small, oriented ventrad, spermathecal gland spherical; spermathecal gland duct straight, spermathecal reservoir globular with one bend, spermathecal duct short and relatively straight.

Notes. This is the only genus of Hypselosomatinae with almost exclusive Nearctic distribution based on locality records of the single previously described and three new species, as well as one female specimen from Chiapas that represents an undescribed species. Specimens have been collected using Berlese extraction, hand collecting, yellow pan traps, pitfall traps (single and array, normal and dung), sifting leaf litter, suction traps, and UV lighting. Extracted substrates included beech humus, bottomland hardwood remnant, fallen leaves, “rubbish,” earth, and the forest floor of Palmetto-gumbo limbo upland.

Glyptocombus halbertae sp. n.

http://zoobank.org/6197776D-7A16-45A3-9823-1742B315B1E0
Figures 1–3, 10

Material. ***Type material.*** **Holotype:** male: USA: Florida: Collier Co.: Florida: Collier Co. Immokalee, 26.41853°N 81.41741°W, 04 Jul 2013 - 11 Jul 2013, Susan Halbert (UCR_ENT 00012022) (FSCA). **Paratype:** USA: Florida: Collier Co.: Florida: Collier Co. Immokalee, 26.41853°N 81.41741°W, 26 Jun 2014 - 03 Jul 2014, ED_4274, Susan Halbert, 1 male (UCR_ENT 00012051) (FSCA).

Diagnosis. Recognized among species of *Glyptocombus* by the macropterous male, contrasting dark brown and pale legs, desclerotized portion of C+Sc vein basal to junction with R1, Cu touching M at basal corner of dc1, part of Cu distal to tc s-shaped, R2 slightly sigmoid, rc and dc approx. as long as bc (Figure 2A). Most similar to *G. suteri* based on wing type in males, but differentiated by details of the wing venation.

Description. Male (Figure 1): macropterous, length: 1.23 mm; body ovoid. **Coloration:** head, pronotum, and forewings dark brown to black, scutellum dark brown with pale lateral and apical marks, coxae, femora, and base of tibiae dark brown, apex and base of tarsi pale to yellow, pretarsi brown, genital capsule and genitalia dark brown. **Surface and Vestiture:** in frontal orientation forefemur without anterior stout, long seta, hind tibia with 5 erect medium-length stout setae ventrally on distal half, second tarsomere of hind leg with stout seta anteroventrally (Figure 1). **Structure. Head:** disc steeply decurrent anteriorly. **Thorax:** ratio of pronotal collar length to pronotum length 0.23, collar depressed below rest of pronotum (Figure 1), postnotum subrectangular (i.e., freely projecting portion is straight along most of posterior margin, curving only laterally, as in *Rectilamina* Hill; this can be observed only when specimen is in ethanol and wings have been moved aside or removed), ratio of height of forefemur to length of forefemur 0.24, ratio of length of hind tibia to width of pronotum 0.88, venation of macropterous forewing as in Figure 2A, desclerotized portion of C+Sc vein basal to junction with R1, Cu touching M at basal corner of dc1, part of Cu distal to tc s-shaped, R2 slightly sigmoid, rc and dc approx. as long as bc (Figure 2A). **Abdomen and genitalia:** as in genus description (Figure 3A, B).

Female. Unknown.

Etymology. Named for the collector of both known specimens of this species, Susan Halbert.

Distribution. Known only from Collier County in Florida (USA).

Glyptocombus mexicanus sp. n.

http://zoobank.org/728E6BFD-6C7C-4A3C-A0B7-89E7F1A60338

Figures 1–3, 10

Material. ***Type material.*** **Holotype:** male: MEXICO: Quintana Roo: Res. Ecologica El Eden 25km NNE Leona Vicario, 21.21667°N 87.18333°W, 13 Oct 1998 - 28 Oct 1998, A. Blanco (UCRC_ENT 00038403) (UCR). **Paratypes:** Tamaulipas: Estacion Biol. Los Cedros, Gomez Farias, 22.88629°N 99.0255°W, 350 m, 26 Jul 1993 - 30 Jul 1993, E. G. Riley, 1 male (UCR_ENT 00094271), 1 female (UCR_ENT 00094272) (TAMU); 18 Jul 1994 - 19 Jul 1994, J. Cook & E. Riley, 1 male (UCR_ENT 00094275) (TAMU). Estacion Biol. Los Cedros, Gomez Farias, 22.88621°N 99.0255°W, 18 Jul 1994 - 22 Jul 1994, Cook, Ganaway & Riley, 1 female (UCR_ENT 00094276) (TAMU).

Diagnosis. Distinguished among species of *Glyptocombus* by dark brown coloration, elytriform forewings in both sexes, forewing veins wider than cells, absence of areoles in

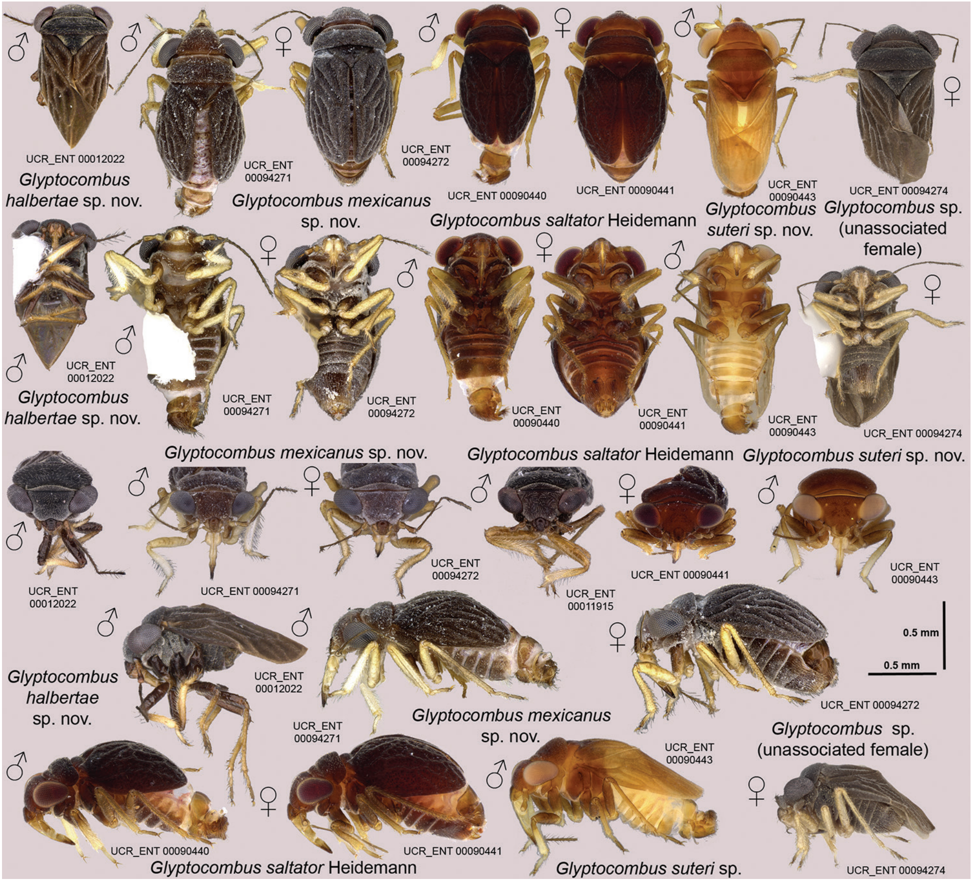

Figure 1 Habitus images of *Glyptocombus* spp. in dorsal, ventral, frontal and lateral views.

forewing cells, and all legs with tibia and femora pale (Figure 1). Most similar to *G. saltator* based on wingtype in both males and females, but differentiated by much wider veins.

Description. Male (Figure 1): with elytriform forewing, length: 1.18–1.74 mm; body ovoid. **Coloration:** head and body dark brown to black, coxae light brown, rest of legs pale to yellow, genital capsule and genitalia light to dark brown. **Surface and Vestiture:** in frontal orientation forefemur without anterior stout seta, hind tibia with-twoerect medium-length setae ventrally on distal half, second tarsomere of hind leg with stout seta anteroventrally (Figure 1). **Structure. Head:** disc declivous. **Thorax:** ratio of pronotal collar length to pronotum length 0.30–0.32, pronotal collar slightly depressed below pronotum (Figure 1), posterior margin of postnotum curved, ratio of height of forefemur to length of forefemur 0.20–0.23, ratio of length of hind tibia to width of pronotum 1.00, wing venation as in Figure 2B, forewing elytriform, with veins wider than cells. **Abdomen and genitalia:** as in genus description (Figure 3A, B).

Female (Figure 1): with elytriform forewing, length: 1.51 mm; body ovoid. **Coloration:** similar to male. **Surface and vestiture:** forefemur with anterior stout seta, hind tibia

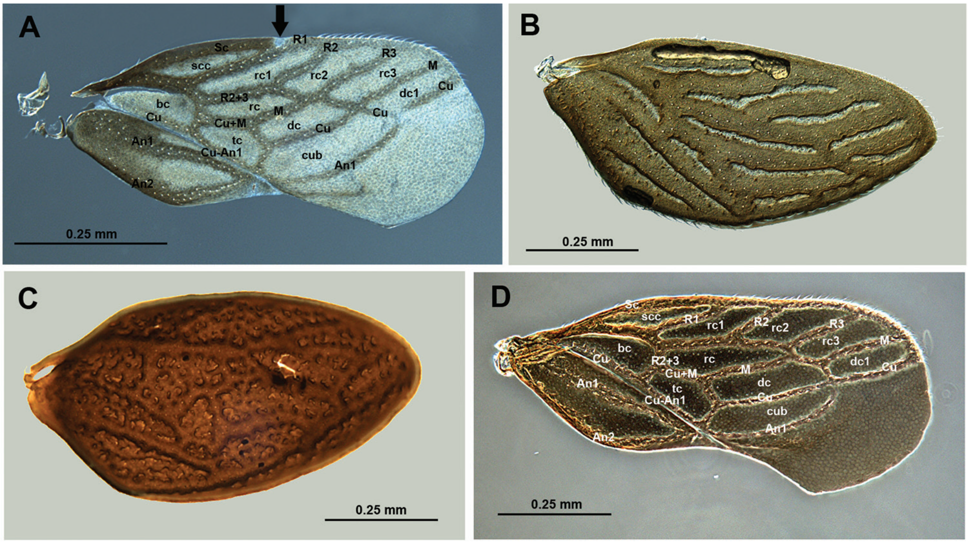

Figure 2. Forewings of males of *Glyptocombus* spp. **A** *Glyptocombus halbertae* (UCR_ENT 00012051) **B** *G. mexicanus* (UCR_ENT 00094271) **C** *G. saltator* (UCR_ENT 00090440) **D** *G. suteri* (UCR_ENT 00090443).

with four erect medium-length macrosetae ventrally on distal half, second hind tarsomere with two stout setae anteroventrally (Figure 1), entire surface of sternum 7 shiny with long setae (Figure 1). **Structure. Head:** disc decurrent anteriorly. **Thorax:** similar to male, but ratio of pronotal collar length to pronotum length 0.28, collar slightly depressed below pronotum (Figure 1), postnotum short and rectangular, ratio of height of forefemur to length of forefemur 0.26, ratio of length of hind tibia to width of pronotum 1.00, forewing similar to male. **Abdomen and Genitalia:** as in genus description (Figure 3C, D).

Etymology. Named for the country of origin.

Distribution. Specimens of this species have been collected in Quintana Roo and Tamaulipas in Mexico.

Glyptocombus saltator Heidemann, 1906

Figures 1–3, 10

Material. ***Type material*****. Holotype:** male: Maryland: Montgomery Co.: Plummers Island, 38.97049°N 77.1763°W, 4.10.05, DH Clemons (UCR_ENT 00028583) (USNM). Paratypes: USA: Maryland: Montgomery Co.: Plummers Island, 38.97049°N 77.1763°W, 29 Sep 1905, DH Clemons, 1 female Paratype No 9785 U.S.N.M.(USNM).

Diagnosis. Recognized among species of *Glyptocombus* by reddish-brown coloration, elytriform forewings in both sexes, forewing veins narrower than cells, and areolate forewing cells (Figure 1). Most similar to *G. mexicanus* based on wingtype in both males and females, but differentiated by much narrower veins.

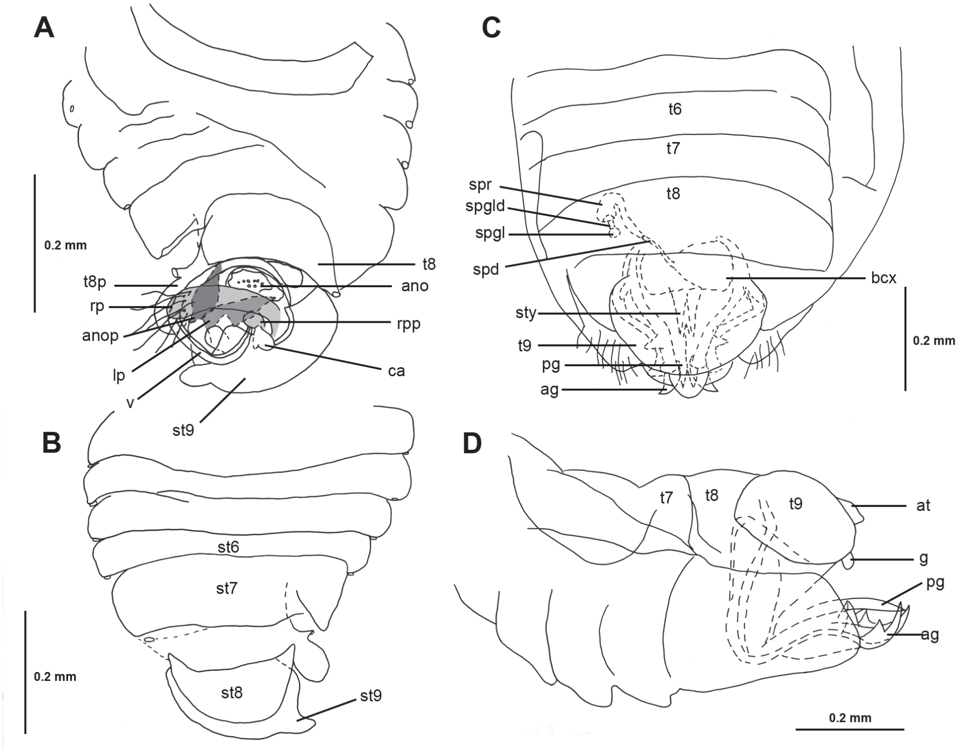

Figure 3. Male genitalia of *G. halbertae* (UCR_ENT 00012051) in **A** dorsal and **B** ventral view, and female genitalia of *G. saltator* (UCR_ENT 00090441) in **C** dorsal and **D** lateral view.

Revised description. Male (Figure 1): with elytriform forewing, length: 1.14–1.52 mm; body ovoid. **Coloration:** head and body reddish dark brown, legs light brown with apex of foretibiae light, genital capsule and genitalia light to dark brown. **Surface and vestiture:** in frontal orientation forefemur without anterior stout seta, hind tibia with four erect medium-length stout setae ventrally on distal half, second tarsomere of hind leg with stout seta anteroventrally. **Structure. Head:** disc decurrent anteriorly. **Thorax:** ratio of pronotal collar length to pronotum length 0.25–0.35, collar slightly depressed below pronotum (Figure 1), posterior margin of postnotum curved in medially around contour of scutellum, ratio of height of forefemur to length of forefemur 0.20–0.23, ratio of length of hind tibia to width of pronotum 0.94–1.16, venation of elytriform forewing as in Figure 2A, veins narrower than cells, cells areolate. **Abdomen and genitalia:** as in genus description (Figure 3A, B).

Female (Figure 1): elytrous, length: 1.46–1.49 mm; body ovoid. **Coloration:** similar to male. **Surface and vestiture:** in frontal orientation forefemur without anterior stout seta, hind tibia with four erect medium-length stout setae ventrally on distal half, second hind tarsomere with stout seta anteroventrally, sternum 7 with posteriad-pointing medial U-shaped shiny area with long setae. **Structure. Head:** disc steeply declivous anteriorly. **Thorax:** similar to male, ratio of pronotal collar length to pronotum length 0.26–0.29, collar slightly depressed below pronotum (Figure 1), posterior margin of postnotum curved posteriorly, ratio of height of forefemur to length of forefemur 0.14–0.24, ratio of length of hind tibia to width of pronotum 0.88–1.09, elytriform forewing as in male. **Abdomen and genitalia:** as in genus description (Figure 3C, D).

Notes. A redescription of this species is included to achieve more consistent treatments for species of Old World (Hill 1984, 1987, 1991, 2013) and New World Hypselosomatinae (Carpintero and Dellapé 2006, Hoey-Chamberlain and Weirauch 2016).

Distribution. Specimens of this species have been collected in Maryland, Georgia, Oklahoma, Texas, and Mississippi (USA).

Other material examined. Georgia: Clarke Co.: Whitehall Forest, 33.90694°N 83.35722°W, 07 May 1977 - 12 May 1977, R. Turnbow, 1 male (AMNH_IZC 00150699) (AMNH); 09 Jul 1977 - 15 Jul 1977, R. Turnbow, 1 male (UCR_ENT 00011913) (FSCA); 24 Jul 1977 - 31 Jul 1977, R. Turnbow, 1 adult sex unknown (UCR_ENT 00011914) (FSCA). Glynn Co.: Jekyll Island, 31.06833°N 81.41361°W, 18 Aug 1965, W. R. Suter, 2 females (UCR_ENT 00090439 and UCR_ENT 00090441), 1 male (UCR_ENT 00090440) (FMNH). Mississippi: Pontotoc Co.: Ecru, 34.35316°N 89.02311°W, 07 May 1980, W. H. Cross, 2 adults sex unknown (UCR_ENT 00028695, UCR_ENT 00028697) (USNM); 08 May 1980, W. H. Cross, 1 adult sex unknown (UCR_ENT 00028696) (USNM). Oklahoma: Latimer Co.: Latimer County, no specific locality, 34.83503°N 95.31025°W, May 1991, Karl Stephan, 1 male (UCR_ENT 00011915) (FSCA); May 2002, K. Stephan, 1 male (UCR_ENT 00094270) (TAMU). Texas: Wood Co.: 3 miles WSW Hainsville, 32.70833°N 95.41°W, 28 Apr 2000 - 30 Apr 2000, M. Yoder, 1 male (UCR_ENT 00094273) (TAMU).

Specimens from literature. USA: Arkansas: Chicot Co.: 0.2 mile east of Lake Chicot State Park, 33.37194°N 91.19578°W, 22 Jan 1977, R. G. Chenowith, 1 male (AMNH). Cross Co.: Village Creek State Park, cabin area, 35.16824°N 90.72144°W, 07 Feb 1987, C. E. Carlton, 1 male (AMNH). District of Columbia: no specific locality, 38.90719°N 77.03687°W, Jan or Jun 1879, Theo. Pergande, 1 adult sex unknown (USNM). Maryland: Montgomery Co.: Plummers Island, 38.97049°N 77.1763°W, 08 Oct 1905, Schwarz, Heidemann, 1 adult sex unknown (USNM); 14 Oct 1906, C. H. T. Townsend, 1 adult sex unknown (USNM). Virginia: Northampton Co.: Savage neck dunes natural area preserve, ca 6 km SW of East6lle, 37.32694°N 76.00774°W, 24 Jun 1999 - 28 Jul 1999, Virginia Division of Natural Heritage personnel, 1 male (VMNH); 27 Aug 1999 - 23 Sep 1999, Virginia Division of Natural Heritage personnel, 1 male (VMNH); 23 Sep 1999 - 28 Oct 1999, Virginia Division of Natural Heritage personnel, 2 males (VMNH). Virginia Beach Co.: Oceana Naval Air Station, City of Virginia Beach, ca. 1 mi/1.6 km SSE jct. U.S. Route 58 and Great Neck Road, 37.32694°N 76.00774°W, 14 Jun 1989 - 28 Jun 1989, K. A. Buhlmann, 2 males (VMNH).

Glyptocombus suteri sp. n.

http://zoobank.org/EA79FC9B-4E23-4CCF-BF13-D39FC5713734

Figures 1–3, 10

Material. ***Type material.*** **Holotype:** male: USA: Florida: Dade Co.: Everglades National Park, on side of road from Fla. 27, 25.28662°N 80.89865°W, 18 Jun 1965, W. R. Suter, ED_5198 (UCR_ENT 00090443) (FMNH).

Diagnosis. Recognized among *Glyptocombus* species by males macropterous, general coloration light brown (Figure 1, *G. suteri*), C+Sc not desclerotized basal to junction with R1, Cu separated from M by m-cu cross vein, Cu distal to tc straight, R2 straight, rc and dc longer than bc (Figure 2D). Most similar to *G. halbertae* based on wing type in males, but differentiated by details of wing venation.

Description. Male (Figure 1): macropterous, length: 1.47 mm; body ovoid. **Coloration:** head and body tan, legs from middle of tibiae to pretarsus pale. **Surface and Vestiture:** in frontal orientation forefemur without anterior stout, long seta, hind tibia with 5 erect medium-length stout setae ventrally on distal half, second tarsomere of hind leg with stout seta anteroventrally (Figure 1). **Structure. Head:** disc declivous. **Thorax:** ratio of pronotal collar length to pronotum length 0.26, collar at same level as pronotum (Figure 1), postnotum trapezoidal, ratio of height of forefemur to length of forefemur 0.26, ratio of length of hind tibia to width of pronotum 0.94, venation of forewing as in Figure 2D, veins wider than cells. **Genitalia:** as in genus description (Figure 3A, B).

Female. Unknown.

Etymology. Named for the collector of the single known specimen of this species.

Distribution. Known from the Everglades National Park in Dade County, Florida (USA).

Glyptocombus sp. (unassociated female)

Figures 1, 10

Material. MEXICO: Chiapas: Ocozocoautla de Espinosa Municipality Co.: Reserva El Ocote, Campo El Ocote, 17.04278°N 93.80778°W, 274 m, 26 Jul 1997 - 29 Jul 1997, Gonzalez, Woolley, & Galdamez, 1 female (UCR_ENT 00094274) (TAMU).

Notes. We have examined one undescribed female specimen of *Glyptocombus* from Chiapas in Mexico that has remained unassociated with male specimens (Figure 1; UCR_ENT 00094274). This specimen differs from females of *Glyptocombus mexicanus* sp. n. in being macropterous (elytriform forewings in males and females of *Glyptocombus mexicanus* sp. n.). Although wing polymorphism is common in Hypselosomatinae, species with elytriform forewings in males have not been documented to contain macropterous females (Hill 1984, Hoey-Chamberlain and Weirauch 2016).

Schizopterinae Reuter, 1891

Corixidea major McAtee & Malloch, 1925

Figures 4, 5, 10

Material. ***Type material.*** **Holotype:** male: USA: Tennessee: Montgomery Co.: Clarksville, 36.52972°N 87.35944°W, Aug 1915, G. A. Runner (UCR_ENT 00028582) (USNM).

Diagnosis. Recognized among species of *Corixidea* by the uniformly dark coloration, macropterous forewing without pale band, presence of laterally directed tergum 8 process, and very small and rounded anophoric process.

Revised Description. Male (Figure 4): macropterous, body length 1.36–1.58 mm; body elongate-oval. **Coloration:** general coloration dark brown to black, head, thorax, and costal area of the forewing dark brown to black, remainder of wing brown to dark brown, antenna and legs uniformly brown, abdomen dark brown to black. **Surface and vestiture:** head, pronotum and wing veins with short to medium-length light brown setae, abdomen densely covered with elongate, light brown setae, wing cells with distinct cell-like sculpture. **Structure: Head:** rounded in ventral view, width of eye ~1/3 width of synthlipsis, ocellus roughly equal in size to one ommatidium, positioned close to margin of compound eye. **Thorax:** pronotum trapezoidal, with posterior margin slightly curved posteriorly, scutellum triangular, with rounded tip, metepisternum with posterior margin rounded, blunt metasternal process widened apically, hind coxa with well-developed adhesive pad, tarsal formula 3-3-3, pretarsus with setiform parempodia, arolia present on fore- and midleg. **Abdomen:** with 5–6 visible sterna corresponding to segments 2+3 (if visible), 4, 5, 6, 7, and 9 (pygophore), sternum 2 longer than preceding sterna, weakly asymmetrical, terga of pregenital abdomen moderately sclerotized, tergum 7 rectangular or weakly trapezoidal, tergum 8 roughly rectangular with process and serrated patch on left side, process of tergum 8 with narrow base and widened apex, aligned with serrated patch on tergum, bearing spinous process. **Genitalia:** pygophore weakly asymmetrical, dorsoventrally flattened, with rounded apex, plane of parameres rotated at 90 degrees with respect to longitudinal body axis, right paramere straight, with robust base and elongate stem, left paramere much smaller than right, roughly as long as wide, aedeagus devoid of large conjunctival appendages, vesica forming 1¼ coils, with long slender process at midpoint of vesica, anophore well sclerotized and with small rounded process.

Female (Figure 4): macropterous, body length 1.42 mm, elongate-oval. **Coloration, surface and vestiture:** as in male. **Structure:** as in male but tarsal formula 2-2-3, arolia absent. **Abdomen:** with 4–5 visible sterna corresponding to segments 2+3 (if visible), 4, 5, 6, and 7; sternum 7 much longer than preceding sterna, symmetrical. **Genitalia:** ovipositor vestigial, spermathecal reservoir comma-shaped, spermathecal duct slightly longer than width of tergum 7, connected to left side of bursa copulatrix.

Notes. Distinguished from other US Schizopteridae by a combination of relatively large size, blunt 3-segmented labium, absence of pronotal collar, presence of two trian-

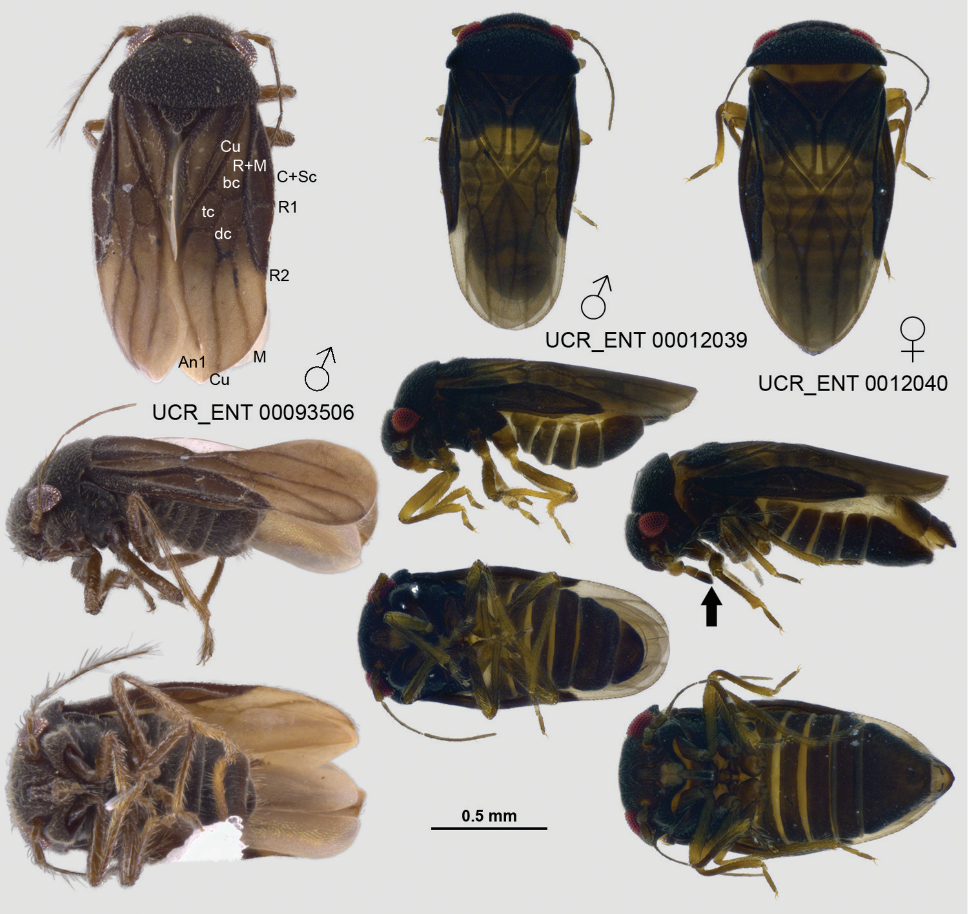

Figure 4. Habitus images of male and female *Corixidea major* in dorsal, lateral, and ventral view. UCR_ENT 00093506 shows a dry, point-mounted specimen; the other two specimens are ethanol-preserved.

gular cells on costal margin of forewing (bordered by C+Sc, R+M, and R1, and C+Sc, R1, and R2), dorso-ventrally flattened pygophore with rounded apex, very long right paramere, and vesica with long subapical process. The genus *Corixidea* is a part of the *Corixidea* genus group, informally created by Emsley (1969), which also includes *Hoplonannus* McAtee & Malloch, 1925, *Membracioides* McAtee & Malloch, 1925, *Oncerodes* Uhler, 1894, *Voccoroda* Wygodzinsky, 1950, and *Voragocoris* Weirauch, 2012. Monophyly of the group is supported by the blunt labium, absence of a pronotal collar, venational similarities, and by limited molecular data when representatives of three genera were analyzed (Knyshov et al. 2016). However, generic limits that were proposed based on morphological features are unclear when undescribed diversity of the group and the poorly described original species are considered. We are currently working on a revision of the *Corixidea* genus group (Knyshov et al. unpublished), which will contain a comprehensive diagnosis of *C. major* in view of potential taxonomic changes within the group.

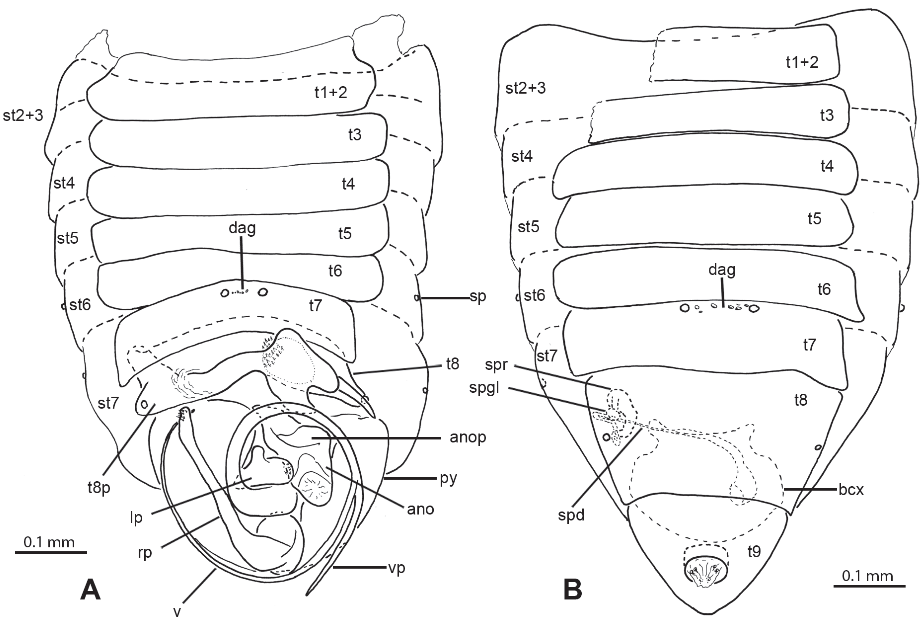

Figure 5. Male and female genitalic features of *Corixidea major*. A. Male abdomen (UCR_ENT 00012039) in dorsal view; B. Female abdomen (UCR_ENT 00012040) in dorsal view.

Other specimens examined. USA: Florida: Alachua Co.: Gainesville, 29.63527°N 82.37111°W, 24 m, 12 Jun 1966 - 15 Jun 1966, Ladonia O'Berry, 1 female (UCR_ENT 00011922) (FSCA). Broward Co.: Everglades National Park, 25.4775°N 80.96085°W, 24 Aug 1949 - 25 Aug 1949, H. S. Dybas, 1 male (UCR_ENT 00090856) (FMNH). Collier Co.: Florida: Collier Co. Immokalee, 26.41853°N 81.41741°W, 24/IV/2014-1/IV/2014, Susan Halbert, 4 males (UCR_ENT 00012031, UCR_ENT 00012032) (FSCA); 07 Jun 2007 - 14 Jun 2007, Selina Estrada, 1 female (UCR_ENT 00011920) (FSCA); 15 Mar 2012 - 22 Mar 2012, Scott Croxton, 1 female (UCR_ENT 00011918) (FSCA); 08 Nov 2012 - 15 Nov 2012, Scott Croxton, 1 female (UCR_ENT 00011919) (FSCA); 21 Feb 2013 - 28 Feb 2013, Scott Croxton, 1 male (UCR_ENT 00011921) (FSCA); 02 Jan 2014 - 09 Jan 2014, Susan Halbert, 1 male (UCR_ENT 00011867) (FSCA). Immokalee, 26.40611°N 81.41389°W, 13 Jul 2013 - 20 Jul 2013, Susan Halbert, 1 male (UCR_ENT 00011912) (FSCA); 20 Jul 2013 - 27 Jul 2013, Susan Halbert, 2 males (UCR_ENT 00011910, UCR_ENT 00011911) (FSCA); 14 Oct 2013 - 21 Nov 2013, Susan Halbert, 1 female (UCR_ENT 00011868) (FSCA); 07 Nov 2013 - 14 Nov 2013, Susan Halbert, 2 males (UCR_ENT 00011857), 1 female (UCR_ENT 00011858) (FSCA); 05 Dec 2013 - 12 Dec 2013, Susan Halbert, 1 female (UCR_ENT 00011866) (FSCA); 16 Jan 2014 - 23 Jan 2014, Susan Halbert, 1 male (UCR_ENT 00011864) (FSCA); 30 Jan 2014 - 06 Feb 2014, Susan Halbert, 1 male (UCR_ENT 00011865) (FSCA); 13 Mar 2014 - 20 Mar 2014, Susan Halbert, 1 female (UCR_ENT 00012026) (FSCA); 20 Mar 2014 - 22 Mar 2014, Susan Halbert, 2 males (UCR_ENT 00012027, UCR_ENT 00012028) (FSCA); 03 Apr 2014 - 10 Apr 2014, Susan Halbert, 1 male (UCR_ENT 00012029), 1 female (UCR_ENT 00012030) (FSCA); 01 May 2014 - 08 May 2014, Susan Halbert, 5 males (UCR_ENT 00012033-UCR_ENT 00012037) (FSCA); 22 May 2014 - 29 May 2014, Susan Halbert, 1 male (UCR_ENT 00012038) (FSCA); 29 May 2014 - 05 Jun 2014, Susan Halbert, 1 female (UCR_ENT 00012041), 1 male (UCR_ENT 00012042) (FSCA); 05 Jun 2014 - 12 Jun 2014, Susan Halbert, 1 male (UCR_ENT 00012039), 1 female (UCR_ENT 00012040) (FSCA); 03 Jul 2014 - 10 Jul 2014, Susan Halbert, 2 females (UCR_ENT 00012043, UCR_ENT 00012044) (FSCA); 10 Jul 2014 - 17 Jul 2014, Susan Halbert, 4 males (UCR_ENT 00012045-UCR_ENT 00012047, UCR_ENT 00012049), 1 female (UCR_ENT 00012048) (FSCA). Highlands Co.: Parker Islands 7 mi. S.E. of Lake Placid, 27.24476°N 81.29812°W, 13 Jun 1955, H. S. Dybas, 1 female (UCR_ENT 00090857) (FMNH). Hillsborough Co.: Hillsborough River State Park, 28.10735°N 82.27178°W, 07 Feb 1958, F. W. Mead, 1 female (UCR_ENT 00011923) (FSCA). Louisiana: Vermilion Co.: Gueydan, 30.03059°N 92.50833°W, 01 Jul 1925, E. R. Kalmbach, 1 male (UCR_ENT 00026654) (USNM). Oklahoma: Latimer Co.: Latimer County, no specific locality, 34.83503°N 95.31025°W, Jul 1989, Karl Stephan, 2 females (UCR_ENT 00011924, UCR_ENT 00011925), 1 male (UCR_ENT 00011926) (FSCA); Jun 2002, K. Stephan, 2 males (UCR_ENT 00093519, UCR_ENT 00093517) (TAMU); Jul 2002, K. Stephan, 3 females (UCR_ENT 00093528, UCR_ENT 00093527, UCR_ENT 00093510), 4 male (UCR_ENT 00093512, UCR_ENT 00093511, UCR_ENT 00093508, UCR_ENT 00093509) (TAMU); Aug 2002, K. Stephan, 1 female (UCR_ENT 00093516), 4 males (UCR_ENT 00093518, UCR_ENT 00093505-UCR_ENT 00093507) (TAMU). Texas: Brazos Co.: College Station, 30.62778°N 96.33417°W, 03 May 1978 - 09 May 1978, J. A. Jackman, Light Trap, 1 male (UCR_ENT 00094213) (TAMU). College Station, Lick Creek Park, 30.57755°N 96.29052°W, 04 Oct 1987 - 18 Oct 1987, R. Wharton, 1 female (UCR_ENT 00094184) (TAMU). Cameron Co.: Sabal Palm Grove Sanctuary, 25.85016°N 97.4244°W, 16 Oct 1993, Backmon, Quinn & Riley, 1 male (UCR_ENT 00094182), 1 female (UCR_ENT 00094183) (TAMU). Wood Co.: Little Sandy National Wildlife Refuge, 32.57611°N 95.24722°W, 19 Sep 1998, J.D. Oswald, 10 males (UCR_ENT 00094214, UCR_ENT 00094215, UCR_ENT 00093514, UCR_ENT 00093520-UCR_ENT 00093526), 3 females (UCR_ENT 00094216, UCR_ENT 00093513, UCR_ENT 00093515) (TAMU).

Nannocoris Reuter, 1891

Nannocoris tuberculiferus Reuter, 1891

Notes. Nomenclature. Reuter (1891) described the subgenus *Schizoptera* (*Nannocoris*) to accommodate two new species with distinctly elongated heads, *Schizoptera* (*Nanno-*

coris) *nebulifera* Reuter, 1891 and *Schizoptera* (*Nannocoris*) *tuberculifera* Reuter, 1891. Whereas *Schizoptera* is feminine, *Nannocoris* is masculine, because "coris" is Greek for "bug" and a noun with masculine gender. When McAtee and Malloch (1925) elevated *Nannocoris* to genus level, they failed to adjust the gender of previously described species from feminine to masculine and also treated their newly described species as feminine. Nevertheless, subsequent authors continued to treat *Nannocoris* as feminine. *Nannocoris arenaria* Blatchley, 1926 was corrected to *Nannocoris arenarius* Blatchley, 1926 by Henry (1988) without comment. We here adjust the genders to masculine for all remaining names that were originally treated as feminine and are not patronyms: *N. nebuliferus* Reuter, 1891; *N. tuberculiferus* Reuter, 1891; *N. capitatus* (Uhler, 1894); *N. nasus* McAtee & Malloch, 1925; *N. flavomarginatus* McAtee & Malloch, 1925.

Phylogeny and classification. A recent molecular phylogenetic analysis of *Nannocoris* (Frankenberg et al. 2018) included one North American specimen (UCR_ENT 00094252), a female from Texas that we have assigned to the new species *N. brevipilus* below. This taxon was recovered as part of the *pricei* species group that is diagnosed by the opening of the male-specific vertex gland being located in a posterior position, i.e. posteriorly on the vertex or on the pronotal collar. The opening is more anterior on the head in males of all other *Nannocoris* species we have examined (data not shown; see Figure 1 in Frankenberg et al. [2018] for selected species) and it is absent in some species. Males of *N. arenarius* and the second newly described species, *N. anophorus*, share the pronotal position of the opening of the vertex gland. We therefore tentatively assign all three Nearctic species to the *pricei* species group.

Nannocoris anophorus **sp. n.**

http://zoobank.org/4AFF2372-4A4E-4608-8806-0956F2F747FB
Figures 6, 7, 10

Material. ***Type material.*** **Holotype:** male: USA: Texas: Hays Co.: 6 mi. NW Dripping Springs, 30.22648°N 98.18493°W, 408 m, 03 Jun 2006 - 30 Jun 2006, E. G. Riley, et al. (UCR_ENT 00094264) (TAMU).

Diagnosis. Recognized among species of *Nannocoris* by relatively short head, ovoid body and forewing shape, yellow costal and posterior claval margins, long setae on forewing veins, vertex gland opening on depression of pronotal collar, short, smoothly rounded vesica with less than one coil, apically bifurcating right paramere, and long and sigmoid anophoric process that reaches anteriorly to terga 5 or 6.

Description. Male (Figure 6): macropterous, length: 1.16 mm; body ovoid. **Coloration:** general coloration light brown, with head yellowish brown, lighter colored anteriorly, scutellum and costal and posterior claval margins yellow, legs pale yellow (Figure 6). **Surface and vestiture:** forewing veins with long white setae, pronotum and head with dense, short, recumbent white setae. **Structure: Head:** moderately elongate, ca. as high as long, labium very slender, barely surpassing posterior margin of pronotal collar, eye small, ~1/6 of greatest head width. **Thorax:** opening of vertex gland medially on pronotal

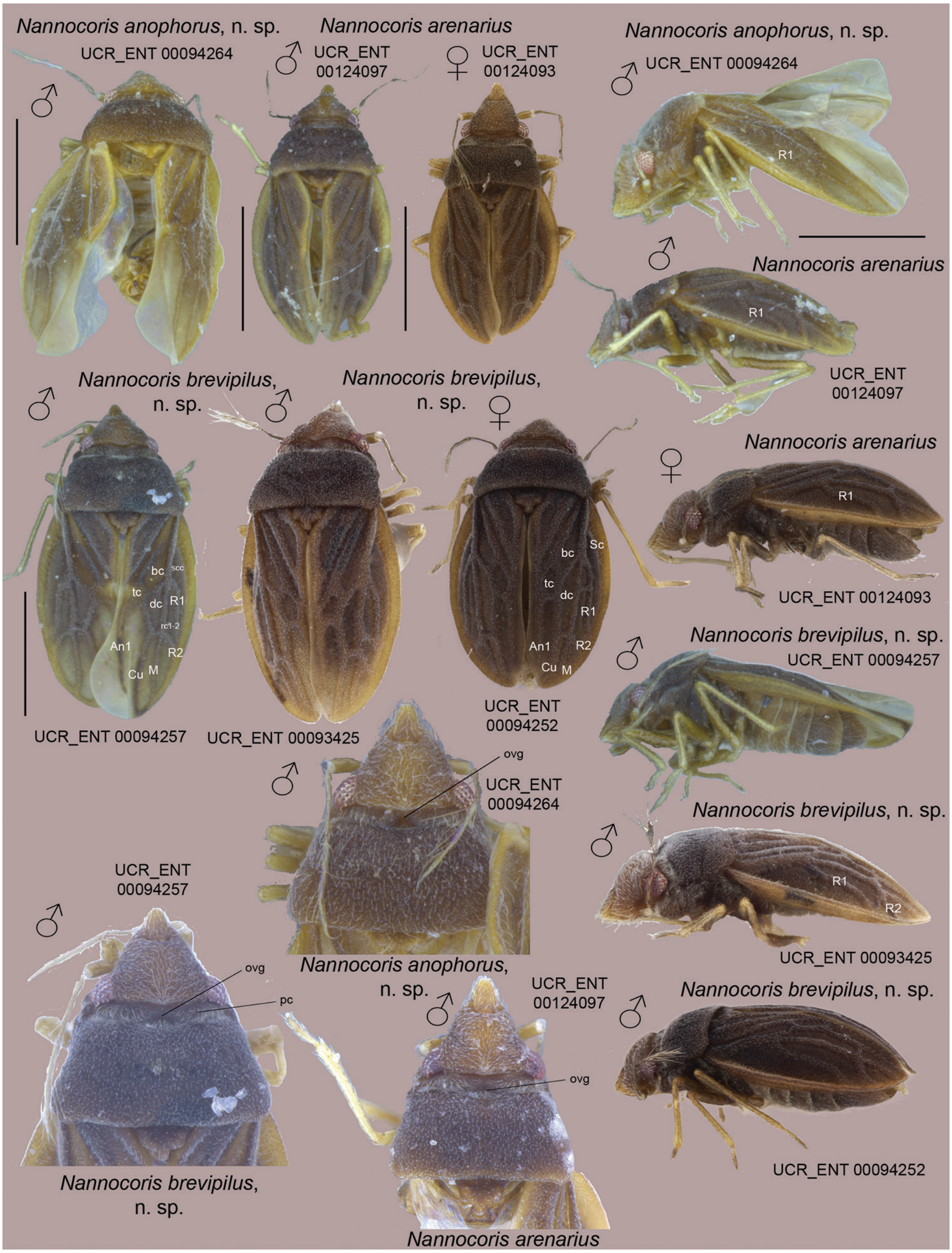

Figure 6. Habitus images of *Nannocoris* spp. in dorsal and lateral views and close-ups of head and pronotum of males to document the unusual position of the vertex gland opening on the pronotal collar.

collar, opening large (Figure 6), forewing macropterous (Figure 6), costal margin slightly explanate, R1 straight, obliquely traversing cells scc and rc1-2, merging with Sc close to where R2 reaches wing margin, An1 almost reaching Cu. **Abdomen:** tergum 8 slightly

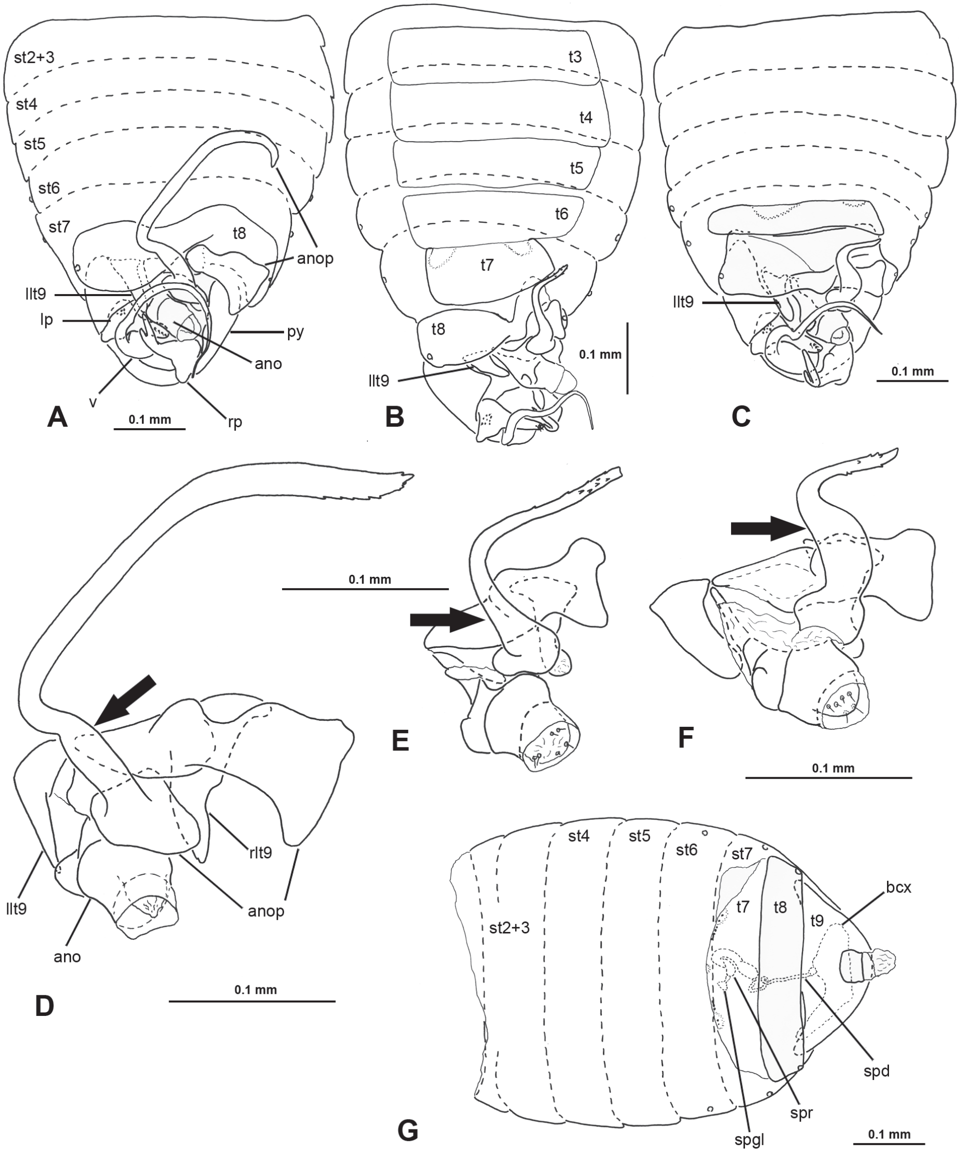

Figure 7. Male and female genitalic features of *Nannocoris* spp. **A–C** Male abdomen: **A** *N. anophorus* (UCR_ENT 00094264) **B** *N. arenarius* (UCR_ENT 00124097) **C** *N. brevipilus* (UCR_ENT 00093425) **D–F** Male anophore with associated sclerites: **D** *N. anophorus* (UCR_ENT 00094264) **E** *N. arenarius* (UCR_ENT 00124097) **F** *N. brevipilus* (UCR_ENT 00094257) **G** *N. arenarius*, female abdomen (UCR_ENT 00124095).

asymmetrical, transverse, right half slightly curved anteriad. **Genitalia** (Figure 7A, D): left laterotergite 9 long and slender, posteriad-oriented spine, right paramere with broad base and narrow, bifurcating apex, left paramere triangular, vesica forming smoothly rounded ¾ loop, anophoric process with anterior broad portion adjacent to tergum 8 and long, sigmoid process reaching anteriorly to approx. level of tergum 5 or 6.

Female: Unknown.

Etymology. Named for the long anophoric process that is unusually prominent among species of *Nannocoris*, especially in other species of the *pricei* species group.

Notes. The holotype was collected using a flight intercept trap.

Distribution. Known only from Hays County in Texas.

Nannocoris arenarius Blatchley

Figures 6, 7, 10

Material. ***Type material.*** **Holotype:** male: USA: Florida: Pinellas Co.: Dunedin, 28.027°N 82.77126°W, Jan 4- Feb 16, W.S. Blatchley (PURC). **Paratypes:** same data as holotype, 11 specimens.

Revised diagnosis. Recognized among species of *Nannocoris* by relatively short head, ovoid body and forewing shape, yellow costal and posterior claval margins, short setae on forewing veins, vertex gland opening on depression of pronotal collar, short and thin, slightly sigmoid vesica, apically bifurcating right paramere, and relatively short s-shaped anophoric process with slender base that reaches anteriorly to tergum 7. Similar to *N. brevipilus*, but distinguished by slender base of anophoric process.

Revised description. Male (Figure 6): submacropterous, length: 1.04–1.09 mm, body broadly ovate. **Coloration:** general coloration light brown, with head somewhat lighter, scutellum and costal and posterior claval margins yellow, legs pale yellow with basal ¾ of femora light brown (Figure 6). **Surface and vestiture:** head, pronotum and forewing veins with dense, short, recumbent white setae. **Structure: Head:** moderately elongate, slightly longer than high, labium very slender, reaching to approx. mid coxa, eye small, ~1/6 of greatest head width. **Thorax:** opening of vertex gland medially on pronotal collar, opening large (Figure 6); forewing submacropterous (Figure 6), costal margin slightly explanate, R1 sinuously traversing cells scc and rc1-2, merging with Sc proximal to R2 reaching wing margin. **Abdomen:** tergum 8 strongly asymmetrical, much wider in left half, right half narrow and curved anteriad. **Genitalia** (Figure 7B, E): left laterotergite 9 relatively short, laterad-oriented spine, right paramere with narrow, bifurcating apex, left paramere elongate-triangular, vesica sinuous, not forming loop, anophoric process with anterior broad portion adjacent to tergum 8 and s-shaped process reaching anteriorly to posterior margin of tergum 7, base of s-shaped process slender.

Female (Figure 6): similar to male, length: 1.00–1.02 mm. **Genitalia:** as in Figure 7G.

Notes. Specimens have been collected from leaf litter associated with *Quercus myrtifolia* Wild, *Quercus chapmanii* Sarg, and *Panicum* grass; berleseate of dried cattle manure; and flight intercept traps.

Distribution. Specimens examined by us are from Highlands, Pinellas, and Polk Counties in Florida, including specimens collected at the type locality. Specimens from Georgia, North Carolina, and Virginia deposited at NCSU and VMNH were identified as *N. arenarius* by Robert L. Blinn, Richard L. Hoffman, and Steven L. Roble. *Nannocoris anophorus* and *Nannocoris brevipilus* are currently known only from Texas; the male illustrated by Hoffman et al. (2006) is submacropterous. We therefore assume that the specimens from Georgia, North Carolina, and Virginia are *N. arenarius*, but male genitalic structures should be examined to confirm this hypothesis.

Other material examined. USA: Florida: Highlands Co.: Lake Placid, Archbold Biological Station, 27.188°N 81.337°W, 03 Feb 1984, M. Deyrup, 2 females (UCR_ENT 00124094, UCR_ENT 00124095), 1 male (UCR_ENT 00124097) (ABS); 01 Feb 1986, M. Deyrup, 1 female (UCR_ENT 00124096) (ABS). Pinellas Co.: Dunedin, 28°N 82°W, Dec 1929 - Apr 1930, W. S. Blatchley, 1 male (UCR_ENT 00120010) (NHMUK). Polk Co.: Lake Wales Ridge Forest, 27.66388°N 81.39455°W, 16 Jul 2009, H. Otte, M. Deyrup, N. Deyrup, 1 female (UCR_ENT 00124093) (ABS). Georgia: Bryan Co.: no specific locality, 32.16562°N 82.90008°W, 17 Sep 1974, R. Beshear, 1 female (USNM).

Specimens databased from other collections (not examined by us). North Carolina: Davidson Co.: Davidson, 35.77224°N 80.1878°W, 11 Jul 1976, T. Daggy, 75 males (NCSU_ENT 00216994-NCSU_ENT 00216998) (NCSU). Mecklenburg Co.: Davidson College, Davidson, 35.50173°N 80.84678°W, 839 m, 11 Nov 1955, T. Daggy, 5 males (NCSU). Virginia: Suffolk Co.: South Quay pine barrens, "100 m north of the canal", ca. 13 km S of Franklin, 36.55843°N 76.90858°W, 02 Jul 2003 - 06 Aug 2003, S.M. Roble, 2 males, 1 female (VMNH); 06 Aug 2003 - 13 Sep 2003, S.M. Roble, 2 males (VMNH).

Nannocoris brevipilus sp. n.

http://zoobank.org/D041EB3E-C766-4297-AEBF-9853DFF975A2

Figures 6, 7, 10

Material. ***Type material.*** **Holotype:** male: USA: Texas: Sabine Co.: Beech Bottom, 9 mi E Hemphill, 31.38226°N 93.70455°W, 05 Jun 1989 - 17 Jun 1989, R. Anderson & E. Morris (UCR_ENT 00094257) (TAMU). Paratype: USA: Texas: Angelina Co.: Angelina Nat'l. Forest ca. 3 mi. NE Rockland, 31.05528°N 94.36833°W, 02 May 1996 – 16 May 1996, Clarke, Menard, & Riley, 1 male (UCR_ENT 00093425) (TAMU).

Diagnosis. Recognized among species of *Nannocoris* by relatively short head, ovoid body and forewing shape, yellow costal and posterior claval margins, short setae on forewing veins, vertex gland opening on depression of pronotal collar, short and thin, slightly sigmoid vesica, apically bifurcating right paramere, and relatively short s-shaped anophoric process with slender base that reaches anteriorly to tergum 7. Similar to *N. brevipilus*, but distinguished by slender base of anophoric process.

Description. Male (Figure 6): submacropterous, length: 1.04–1.09 mm, body broadly ovate. **Coloration:** general coloration light brown, head somewhat lighter, scutellum and costal and posterior claval margins yellow, legs pale yellow with basal ¾ of femora light brown (Figure 6). **Surface and vestiture:** head, pronotum and forewing veins with dense, short, recumbent white setae. **Structure: Head:** moderately elongate, slightly longer than high, labium very slender, reaching to ca. midcoxa, eye small, ~1/6 of greatest head width. **Thorax:** opening of vertex gland medially on pronotal collar, opening large (Figure 6), forewing submacropterous (Figure 6), costal margin slightly explanate, R1 sinuously traversing cells scc and rc1-2, merging with Sc proximal to R2 reaching wing margin. **Abdomen:** tergum 8 strongly asymmetrical, much wider in left half, right half narrow and curved anteriad. **Genitalia** (Figure 7B, E): left laterotergite 9 relatively short, laterad-oriented spine, right paramere with narrow, bifurcating apex, left paramere elongate triangular, vesica sinuous, not forming loop, anophoric process with anterior broad portion adjacent to tergum 8 and s-shaped process reaching anteriorly to posterior margin of tergum 7, base of s-shaped process slender.

Female (Figure 6): similar to male, length: 1.11–1.23 mm, shorter and more ovoid than male, yellow borders of costal and claval margin less pronounced, forewings shorter.

Etymology. Named for the short vestiture on the wings that distinguishes this species from the second species occurring in Texas, *N. anophorus*; a combination of the Latin *brevis* (short) and *pilus* (hair).

Notes. We treat a series of female specimens collected in Bastrop County as conspecific with *N. brevipilus*. We refrain from treating these specimens as paratypes, because no syntopic males are available and females of *N. anophorus* are unknown. We argue that these specimens are unlikely to be conspecific with *N. anophorus* because of the short vestiture, but we cannot exclude the possibility that they are females of a yet undiscovered species of *Nannocoris*.

Males were collected using pitfall and flight intercept traps, females with Berlese extraction.

Distribution. Known from Angelina, Bastrop, and Sabine Counties in Texas.

Other material examined. USA: Texas: Bastrop Co.: Bastrop State Park, 30.11222°N 97.26056°W, 11 Mar 1995, R. Wharton, 6 females (UCR_ENT 00094250-UCR_ENT 00094255), 1 female (UCR_ENT 00094256) (TAMU).

Schizoptera Fieber, 1860

Subgenus *Schizoptera* (*Cantharocoris*) McAtee & Malloch, 1925

Schizoptera bispina McAtee & Malloch, 1925

Material. ***Type material.*** **Holotype:** male: GUATEMALA: Alta Verapaz: Cacao Trece Aguas, 15.4°N 89.75°W, 1906, Schwarz & Barber (UCR_ENT 00028598) (USNM).

Revised diagnosis. Recognized among species of *Schizoptera* (*Cantharocoris*) by fairly uniformly light brown coloration and whitish membrane, broad and shallow posterior process on sternum 6, weakly asymmetrical subgenital plate with two small laterad-projecting slender and acute processes (Figure 9A), spine-like right conjunctival appendage and small left conjunctival appendage with three lobes (Figure 9C), long and curved right paramere with abruptly narrowed apex, roughly quadrate left paramere (Figure 9B), and looping vesica moderately slender with 2–3 coils (Figure 9B).

Revised description. Male (Figure 8): macropterous, length: ~1.3 mm; body broadly ovate. **Coloration** (Figure 8): uniformly light brown except humeral angles

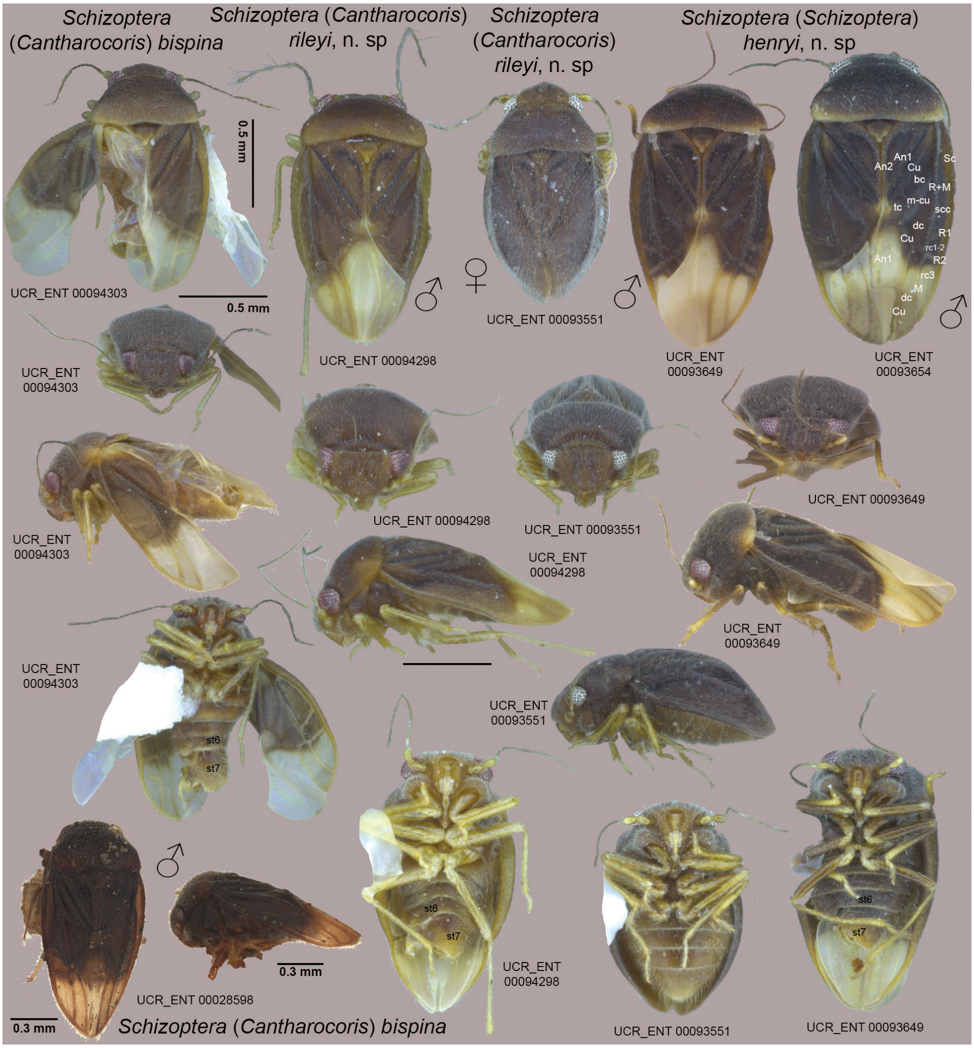

Figure 8. Habitus images of *Schizoptera* spp. in dorsal, frontal, lateral, and ventral views. UCR_ENT 00028598 (lower left corner) is the male holotype of *S.* (*C.*) *bispina*. Scale bar: 0.5 mm, except where indicated otherwise.

and posterior margin of pronotum, costal margin, and scutellum laterally yellow, membrane largely white with narrow proximal boarder dark, vein only slightly darker, legs pale yellow (Figure 8). **Surface and vestiture:** relatively short and dense on head and pronotum, forewing veins with sparse, short setae. **Structure: Head:** triangular in frontal view, slightly wider than high (Figure 8), synthlipsis ~3 times width of eye. **Thorax:** posterior pronotal margin slightly sinuate, R1 distinct, dc1 very slender, especially basally. **Abdomen:** sternum 6 with broad and shallow posterior process, subgenital plate weakly asymmetrical withtwosmall laterad projecting slender and acute processes (Figure 9A). **Genitalia** (Figure 9A–C): right conjunctival appendage spine-

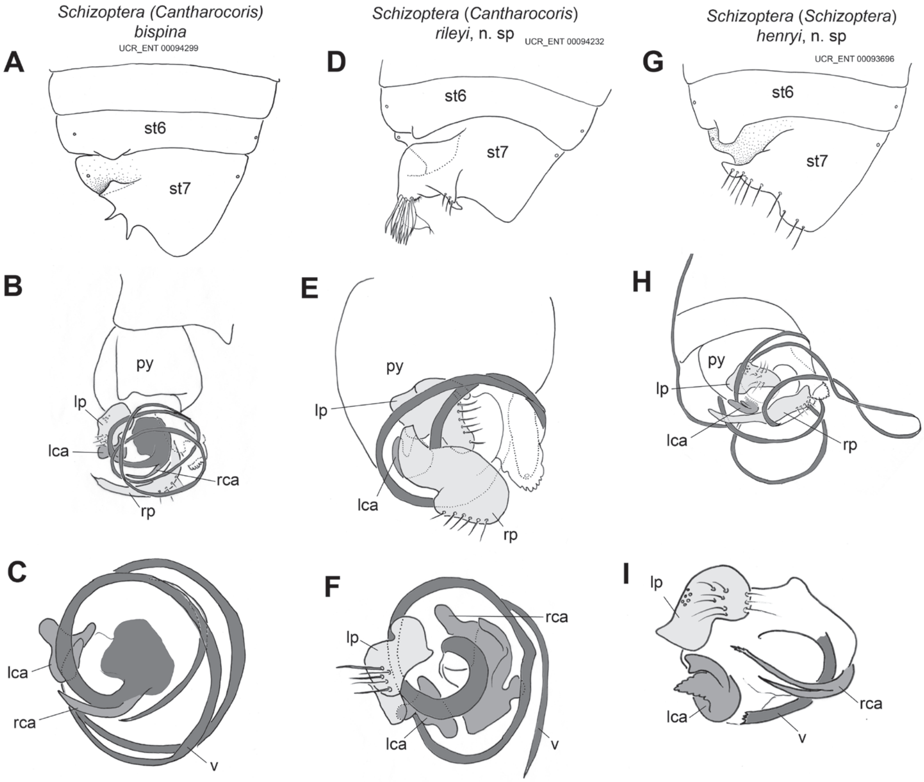

Figure 9. Male genitalic features of *Schizoptera* spp. Top row illustrating ventral view abdominal apex and diagnostic features of sternum 6 and the subgenital plate (sternum 7); middle row showing the pygophore and associated structures in dorsal or dorsolateral view; and bottom row depicting vesica or base of vesica with conjunctival appendages and left parameres after removal of right paramere for *S.* (*C.*) *rileyi* and *S.* (*S.*) *henryi*, and removal of both parameres in *S.* (*C.*) *bispina*.

like, left conjunctival appendage small, with 3 lobes (Figure 9C), right paramere long and curved, with abruptly narrowed apex, left paramere roughly quadrate (Figure 9B), vesica looping, moderately slender, with 2–3 coils (Figure 9B).

Female. One female specimen reported (but not illustrated) by Blatchley (1926) and not examined in our study.

Notes. McAtee and Malloch (1925) described this species from Guatemala based on a single male specimen. They mentioned the slightly yellowish humeral angle, dark color proximally across the membrane, and only slightly notched scutellar apex as characters distinguishing this species from *Schizoptera* (*Cantharocoris*) *sulcata* McAtee & Malloch, 1925, while emphasizing the importance of the shape of the subgenital plate. The characteristic lateral spines on the subgenital plate are shorter in the specimen from Mexico that McAtee and Malloch (1925) considered conspecific with *S.* (*C.*) *bispina*. Blatchley (1926) reported *S.* (*C.*) *bispina* from Florida and

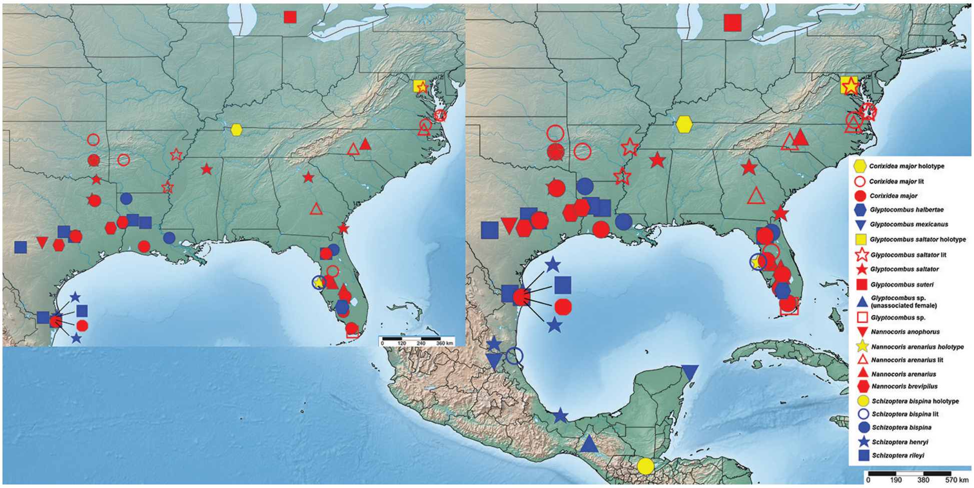

Figure 10. Distribution records of Schizopteridae in the United States and records of selected species from Mexico and Guatemala. Holotype localities of previously described species are indicated in yellow, records from the literature indicate as unfilled symbols, and records reported for the first time in this publication as filled blue or red symbols.

provided a redescription. The specimens examined by us are clearly conspecific with those examined and illustrated by Blatchley (1926) based on his fairly detailed description of coloration and drawing of the subgenital plate. No other described species of *Schizoptera* (*Cantharocoris*) has a subgenital plate that even remotely resembles the one in *S.* (*C.*) *bispina*. Nevertheless, the distribution range of *S.* (*C.*) *bispina* is much larger than the ranges typically seen in schizopterids. A comprehensive revision of *Schizoptera* (*Cantharocoris*) across the Nearctic and Neotropical regions is therefore not unlikely to reveal that the current concept of *S.* (*C.*) *bispina* is a complex of several closely related species.

Blatchley (1926) reported the three specimens he examined as "beaten from Spanish moss," "sifted from vegetable debris," and "beaten from sugar cane." New records indicate that specimens were collected by UV lighting and Malaise trapping.

Distribution. Guatemala, Mexico, and Florida, Louisiana, and Texas in the United States.

Other specimens examined. MEXICO: Tamaulipas: or Unknown Co.: Tampico, 22.2331°N 97.86105°W, December 15, E. A. Schwarz, 1 male (USNM). USA: Florida: Clay Co.: Gold Head Branch St. Park, 29.84638°N 81.96171°W, 07 May 1985, R.W. Jones, 1 male (UCR_ENT 00094299) (TAMU). Pinellas Co.: Dunedin, 28.027°N 82.77126°W, Jan. 19-April 15, Blatchley, 2 male, 1 female (AMNH). Louisiana: Bossier Co.: Bodcau Wdlf. Mgt. Ar., 32.7°N 93.5°W, 22 May 1996, E.G. Riley, 1 male (UCR_ENT 00094303) (TAMU). Texas: Sabine Co.: 9 mi. E. Hemphill, "Beech Bottom," 31.34135°N 93.6974°W, 22 May 1989 - 04 Jun 1989, R. Anderson & E. Morris, 1 male (UCR_ENT 00093577) (TAMU).

Schizoptera rileyi sp. n.

http://zoobank.org/1146075C-514D-401C-892D-0BEE52A6D4DC

Material. ***Type material.*** **Holotype:** male: USA: Louisiana: Natchitoches Par Kisatchie Natl. For. Red Dirt W.M.A., 31.35549°N 92.43442°W, 12 Jul 1985, E.G. Riley, 1 male (UCR_ENT 00094298) (TAMU). **Paratypes:** USA: Louisiana: Natchitoches Par Kisatchie Natl. For. Red Dirt W.M.A., 31.35549°N 92.43442°W, 12 Jul 1985, E.G. Riley, 5 males (UCR_ENT 00094301, UCR_ENT 00094308-UCR_ENT 00094311) (TAMU). Natchitoches Park, Kisatchie National Forest, Red Bluff Camp, 31.498°N 93.144°W, 01 Apr 1989, E. Riley & L. Prochaska, 1 female (UCR_ENT 00094315) (TAMU). Texas: Brazos Co.: Koppe's Bridge, 5 mi SW College Station, 30.58227°N 96.39809°W, 06 Mar 1988, R. Anderson, 1 female (UCR_ENT 00094314) (TAMU); 20 Nov 1993, E. Riley, 1 female (UCR_ENT 00094316), 3 females (UCR_ENT 00094317, UCR_ENT 00094312, UCR_ENT 00094313) (TAMU). Cameron Co.: 10.7 mi. N jct. 106 on FM 2925, 30.85325°N 96.97693°W, 02 Sep 1995 - 03 Sep 1995, E.G. Riley, 1 male (UCR_ENT 00094307) (TAMU). Sabal Palm Grove Ref. (site 1), 25.84851°N 97.41794°W, 03 Sep 2008 - 16 Sep 2008, E.G. Riley & J. King, 1 male (UCR_ENT 00093726) (TAMU). Sabal Palm Grove Ref. (site 2), 25.84851°N 97.41794°W, 03 Oct 2008 - 16 Oct 2008, E. Riley, 1 male (UCR_ENT 00093727) (TAMU); 17 Oct 2008 - 30 Oct 2008, E. Riley, 2 males (UCR_ENT 00093721, UCR_ENT 00093724) (TAMU); 31 Oct 2008 - 02 Jun 2009, E.G. Riley, 1 female (UCR_ENT 00093550) (TAMU). Sabal Palm Grove Sanctuary, 25.85016°N 97.4244°W, 16 Oct 1993 - 17 Oct 1993, H. Blackmon & M. Quinn & E. Riley, 1 female (UCR_ENT 00094306) (TAMU); 02 Sep 1995, E.G. Riley, 1 male (UCR_ENT 00094300) (TAMU). Hidalgo Co.: Santa Ana NWR (site 3) Wildlife Drive, 26.07526°N 98.1388°W, 03 May 2008 - 17 May 2008, E. Riley, 1 female (UCR_ENT 00093549) (TAMU). Kerr Co.: 6.5 mi. SW Hunt, 29.99015°N 99.3874°W, 1960 m, 12 Nov 2005 - 15 Dec 2005, E.G. Riley, 1 female (UCR_ENT 00093551) (TAMU); 24 Feb 2006 - 30 Mar 2006, E.G. Riley, 1 female (UCR_ENT 00094320) (TAMU); 31 Mar 2006 - 27 Apr 2006, E.G. Riley, 2 females (UCR_ENT 00094318, UCR_ENT 00094319) (TAMU); 28 Apr 2006 - 02 Jun 2006, E.G. Riley, 1 female (UCR_ENT 00093548) (TAMU); 01 Jul 2006 - 27 Jul 2006, E.G. Riley, 1 male (UCR_ENT 00093718) (TAMU); 01 Jul 2006 - 27 Jul 2006, E.G. Riley, 4 males (UCR_ENT 00093728, UCR_ENT 00093730, UCR_ENT 00093719, UCR_ENT 00093720), 4 males (UCR_ENT 00094232, UCR_ENT 00093552-UCR_ENT 00093554) (TAMU); 28 Jul 2006 - 01 Sep 2006, E.G. Riley, 1 male (UCR_ENT 00093725) (TAMU); 28 Jul 2006 - 01 Sep 2006, E.G. Riley, 1 male (UCR_ENT 00093729) (TAMU).

Diagnosis. Recognized among species of *Schizoptera* (*Cantharocoris*) by uniformly light to yellowish brown coloration, medium-sized posterior process on sternum 6, and subgenital plate with large lateral process posteriorly beset with tuft of flattened and long setae and smaller acute posteriad-oriented process (Figure 9D).

Description. Male (Figure 8): macropterous, length: 1.42–1.48 mm; body ovate. **Coloration:** (Figure 8): generally light and yellowish brown, posterior margin of pronotum, costal margin, and scutellum yellow, Cu proximally, An1 on cuneus and An2 lined anteriorly with contrasting dark coloration, membrane white except rc3 and dc1 yellowish and apical 1/3 slightly suffused, legs pale yellow (Figure 8). **Surface and vestiture:** long and moderately dense on head, pronotum, and forewing veins. **Structure: Head:** triangular in frontal view, wider than high (Figure 8), synthlipsis slightly less than three times width of eye. **Thorax:** with posterior pronotal margin medially slightly concave, posterior margin of clavus broadly elevated, R1 obsolete, dc1 very slender, width similar throughout. **Abdomen:** sternum 6 with medium-sized posterior process, with large lateral process beset posteriorly with tuft of flattened and long setae and smaller acute posteriad- oriented process (Figure 9D). **Genitalia** (Figure 9D–F): right conjunctival irregularly shaped with two lobes and several ridges, left conjunctival appendage smaller, with three lobes (Figure 9F), right paramere large, broad, with broad, curved apex (Figure 9E), left paramere roughly quadrate with thumb-like process (Figure 9E), vesica looping, fairly stout, with slightly fewer than two coils (Figure 9B).

Female (Figure 8): coleopteroid with very narrow membranous border, length: 1.22–1.29 mm; body ovate. **Coloration:** (Figure 8): more uniformly brown compared to male, head slightly paler, legs pale yellow, An2 anteriorly and claval furrow lined with contrasting dark coloration, similar to pattern in male. **Surface and vestiture:** similar to male. **Structure: Head:** triangular in frontal view, approx. as wide as high (Figure 8), synthlipsis slightly more than 3 times width of eye. **Thorax:** pronotum narrower than in male, posterior pronotal margin medially slightly concave, forewing veins obsolete, claval furrow distinct, posterior margin of clavus broadly elevated. **Genitalia:** not examined.

Etymology. Named in honor of Dr. Ed Riley, who collected most of the specimens examined for this study. A noun in genitive case.

Notes. Coleopteroid females evolved several times independently in the Schizoptera genus group (Leon and Weirauch 2017), but female coleopteroidy appears to be especially prevalent in the subgenus *Schizoptera* (*Cantharocoris*). Associating conspecific macropterous males and coleopteroid females is often a challenge in *Schizoptera*. Species diagnoses heavily rely on male genitalic features, long series of males and females from a small collection event are rare, and molecular matching of males and females has been done only for a few minute litter bugs (Knyshov et al. 2016). Matching male and female *Schizoptera rileyi* was comparatively straightforward because of the long series of specimens of both sexes from across the known distribution range, but also because of the distinctive dark lines on the forewings.

Although the collection method is unknown for the majority of specimens examined, both sexes have been collected using flight intercept traps and some males have been taken at UV light traps.

Distribution. Known only from the U.S., where it has been collected in Natchitoches Parish in Louisiana and Brazos, Cameron, and Hidalgo Counties in Texas.

Subgenus *Schizoptera* (*Schizoptera*) McAtee & Malloch

Schizoptera henryi sp. n.

http://zoobank.org/1FE7CD11-1F9D-4DA6-A909-29235C12FB03

Material. ***Type material.*** **Holotype:** male: USA: Texas: Cameron Co.: 1.5 mi. E. jct. FM, 1419 on Hwy 4, E of Brownville, 25.88758°N 97.43592°W, 19 Oct 2002, B. Raber & E. Riley, 1 male (UCR_ENT 00093649) (TAMU). **Paratypes:** MEXICO: Tamaulipas: Estacion Biol. Los Cedros, Gomez Farias, 22.88621°N 99.0255°W, 28 Jul 1993 - 29 Jul 1993, E. Riley & M. Quinn, 1 male (UCR_ENT 00093696) (TAMU). Veracruz: San Andres Tuxtla Co.: Est. Biol. Los Tuxtlas, Vigia Trail, 18.5849°N 95.07393°W, 450 m, 18 Jun 1997, Wilson & Woolley, 1 male (UCR_ENT 00093704) (TAMU). USA: Texas: Cameron Co.: 1.5 mi. E. jct. FM, 1419 on Hwy 4, E of Brownville, 25.88758°N 97.43592°W, 19 Oct 2002, B. Raber & E. Riley, 1 male (UCR_ENT 00093656) (TAMU). Laguna Atascosa NMR (site 1), 26.22375°N 97.35454°W, 06 Feb 2009 - 26 Feb 2009, E.G. Riley & J. King, 1 immature (UCR_ENT 00093555) (TAMU); 23 Apr 2009 - 05 May 2009, E.G. Riley & J. King, 1 male (UCR_ENT 00093664) (TAMU). Sabal Palm Grove, 25.8525°N 97.4175°W, 24 Oct 1992, E. G. Riley, 1 male (UCR_ENT 00093654) (TAMU).

Diagnosis. Recognized among species of *Schizoptera* (*Schizoptera*) by fairly uniformly dark brown coloration with contrasting yellow posterior pronotal margin and humeral angle, whitish membrane with apical ½ suffused, and contrasting yellow and brown legs, large posterior process on sternum 6, and subgenital plate with medium-sized finger-shaped lateral process pointing laterad and with distinctive border of stout setae along right margin of subgenital plate (Figure 9G).

Description. Male (Figure 8): macropterous, length: 1.51–1.67 mm; body ovate. **Coloration** (Figure 8): general coloration dark brown, posterior margin of pronotum, humeral angles, scutellar margin, and marking distal to apex of clavus yellow, costal and posterior claval margins yellowish brown, membrane white with apical 1/2 slightly suffused, legs with coxae and femora brown, trochanters yellow, tibiae brown proximally and yellow distally, (Figure 8). **Surface and vestiture:** long and moderately dense on head, pronotum, and forewing veins. **Structure: Head:** triangular in frontal view, distinctly wider than high (Figure 8), synthlipsis slightly more than twice width of eye. **Thorax:** posterior pronotal margin almost straight, very weakly concave medially, dc1 of similar width throughout, almost as wide as rc3. **Abdomen:** sternum 6 with large posterior process, subgenital plate with medium-sized finger-shaped lateral process pointing laterad and with distinctive border of stout setae along right margin of subgenital plate (Figure 9G). **Genitalia** (Figure 9G–I): right conjunctival appendage with two spines, longer apically, beset with small tubercles, left conjunctival with two lobes (Figure 9I), right paramere long and slender, with gently curving apex (Figure 9H), left paramere roughly triangular with broad apex (Figure 9I,H), vesica looping, very slender, with more than four coils (Figure 9H).

Female: Unknown.

Etymology. Named in honor of Dr. Thomas Henry on the occasion of his 70th birthday and in recognition of his outstanding contributions to heteropterology. We also thank Tom for advancing our understanding of the little-studied Schizopteridae in the United States by keeping his dedicated eye open for these tiny bugs and publishing updated distribution records. A noun in genitive case.

Distribution. Known from Tamaulipas and Veracruz in Mexico and Cameron County in Texas in the U.S.

Notes. This species is unique among *Schizoptera* in the U.S. in having brown and yellow contrasting legs, in addition to the distinctive features of the male abdomen and genitalia.

Acknowledgements

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RESEARCH ARTICLE

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Miscellanea Miridologica V. Taxonomy and chorology of new or little known taxa of Continental New Guinea and neighboring islands (Insecta, Heteroptera, Miridae)

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Abstract

Gressitocoris henryi (Deraeocorinae, Deraeocorini) is described as a new species on the basis of the female holotype from Syoubri vill(age), Arfak Mounts, Doberai Peninsula, Papua Barat, Indonesia. Additional data on distribution are provided for 17 species of Cylapinae, Deraeocorinae, Mirinae, Orthotylinae and Phylinae. *Trigonotylus tenuis* is cited for the first time from Papua New Guinea.

Keywords

Gressitocoris henryi, new species, Miridae, New Guinea, chorology, host-plants

Introduction

The recent study of several public and private collections of Miridae (Insecta, Heteroptera) from Iran Jaya or Papua Barat, Papua New Guinea and the Moluccas islands provided several interesting taxonomic and chorological (distributional) data on new or poorly known taxa. When available, data on habitat or assumed host-plants are also given.

Material and methods

The material used in this work comes mostly from four public and two private collections: the Institut Royal des Sciences Naturelles de Belgique, Brussels (**ISNB**); the Museum National d'Histoire Naturelle, Paris (**MNHN**); the Natural History Museum, London (**NHMUK**); the National Museum of Natural History, Praha (**NMPC**); the collection of D. Telnov in the Erfurt Museum of Natural History, Erfurt (ex **DTPC**, **NME**); and the private collection of J. Gorczyca (**JGKP**).

In the descriptions, measurements are given in millimeters (mm). The photos showing morphological details were taken with a Nikon DXM1200 digital camera.

Results

Cylapinae Kirkaldy, 1903
Fulviini Uhler, 1886

Cylapofulvius punctatus Poppius, 1909

Material examined. Indonesia: 1♂, Papua Barat, Doberai Peninsula, Arfak Mounts, Syoubri vill(age) (coordinates provided on the label: 1°07'16"S, 133°54'34"E), 1570–2100 m, primary lower mountain rainforest, 11–12.ix.2015, Telnov D. leg. (FC n° 7580) (ex DTPC, NME).

Distribution. Described from Papua New Guinea and also known from Papua Barat and Solomon Islands (Chérot et al. 2017).

Fulvius subnitens Poppius, 1909

Material examined. Papua New Guinea: 2♀♀, Madang Province, Nagada Binatang Research Center (coordinates provided on the label: 05°09'23"S, 145°47'41"E), 20 m, 20.v.2011, Votýpka J. & Lukeš J. leg. (FC n° 6420) (NMPC).

Distribution. Described at least in part from Papua New Guinea. Widely distributed from Africa (Tanzania, Togo) and the Seychelles to Taiwan and Pacific Islands and from Malaysia to Papua New Guinea (Chérot et al. 2017); recently introduced but not established in several European countries.

Fulvius variegatus Poppius, 1909

Material examined. Papua New Guinea: 1?, Madang Province, Baitbag (coordinates provided on the label: 05°08'46"S, 145°46'36"E), 40 m, 17.v.2011, dissected for parasites, dissection number 716, negative, Votýpka J. & Lukeš J. leg. (FC n° 6437) (NMPC).

Distribution. Described from Papua New Guinea and widely distributed in Pacific Islands (Chérot et al. 2017).

Deraeocorinae Douglas & Scott, 1865
Deraeocorini Douglas & Scott, 1865

Deraeocoris finisterrensis Carvalho, 1985

Material examined. Indonesia: 1♀, Papua Barat, Doberai Peninsula, Arfak Mounts, Syoubri vill(age) (coordinates provided on the label: 1°06'40"S, 133°54'36"E), 1510 m, edge of secondary lower mountain rainforest, at white light, 11–12.ix.2015, Telnov D. leg. (FC n° 7565) (ex DTPC, NME); 8♀♀, Papua Barat, Doberai Peninsula, Arfak Mounts, Anggi Gigi Lake S(outh), upper vill(age) (coordinates provided on the label: 1°18'0.5"S, 133°54'24"E), 2200 m, edge of primary mid mountain rainforest, 09–11.ix.2015, Telnov D. leg. (FC n°s 7560–7564, 7567, 7569, 7571) (ex DTPC, NME); 1♀, 1?, Papua Barat, Doberai Peninsula, Arfak Mounts, Anggi Gigi Lake S(outh), upper vill(age) and surroundings (coordinates provided on the label: 1°18'10"S, 133°54'0.3"E), 1985 m, primary mid montain rainforest, at white light, 08–09.xi.2015, Telnov D. leg. (FC n°s 7562, 7562bis) (ex DTPC, NME).

Distribution. Endemic to New Guinea (Schuh 2002–2013).

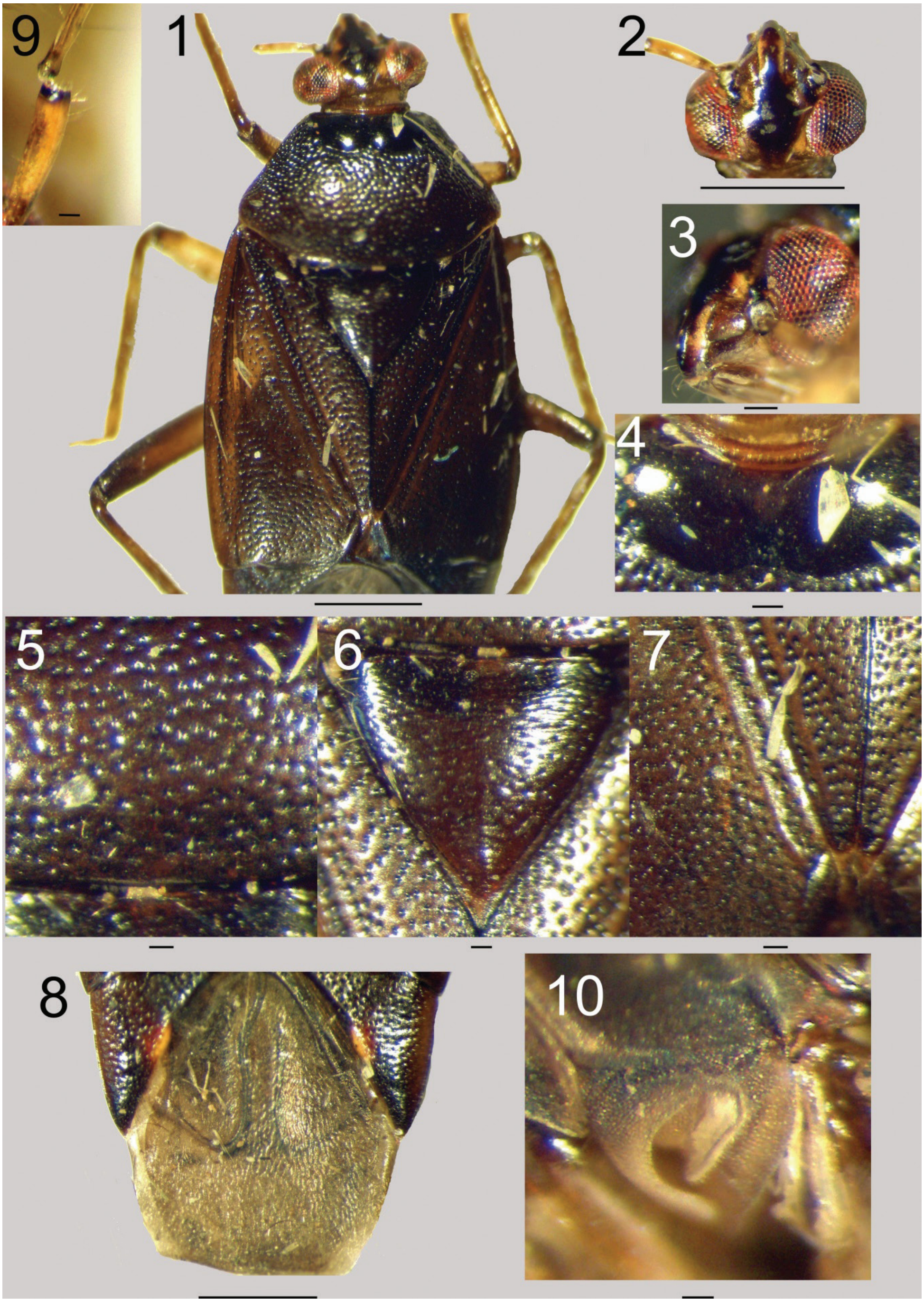
Gressitocoris henryi sp. n.

http://zoobank.org/2FFAE8FA-E8C0-448D-9BCA-5142027591A5

Material examined. Indonesia: Holotype ♀, Papua Barat, Doberai Peninsula, Arfak Mounts, Syoubri vill(age) (coordinates provided on the label: 1°06'40"S, 133°54'36"E), 1510 m, edge of secondary lower mountain rainforest, at white light, 12–13.ix.2015, Telnov D. leg. (FC n° 7565). Holotype deposited in DTPC, NME.

Description. Female: *Measurements (mm)*: Total length (dorsal view): 7.00, maximal width of hemelytra: 2.95, width of head across eyes ("diatone"): 1.25, width of vertex: 0.45, length of antennal segments: I: 0.70, II: 1.68, III: 1.10, IV: 0.75, medial pronotal length (pronotal collar included): 1.45, posterior pronotal width (between humeral angles): 2.40, lateral length of pronotum (between anterior and humeral angles): 1.25, length of scutellum: 1.20, width of scutellum: 1.30, length of cuneus: 1.08, width of cuneus: 0.60 (0.75 with paracuneus).

External morphology and coloration. Dorsally glabrous on pronotum, scutellum and hemelytra. Head (Figs 1–3): Elongate, smooth, slightly declivous in dorsal view. Clypeus medially black, laterally yellowish (Figure 2). Mandibulary and maxillary plates dark brown to black (Figure 3). Frons smooth, shining black. Vertex slightly carinate, carina brown, surface of vertex narrowly and shallowly punctate posteriorly, smooth anteriorly, dark brown to shining black medially, with two small yellowish



Figures 1–10. *Gressitocoris henryi* sp. n. female holotype. **1** Habitus in dorsal view **2** Head in dorsal view **3** Head in lateral view **4** Pronotal callosities **5** Pronotal disk in dorsal view **6** Scutellum in dorsal view **7** Endocorium and apex of clavi in dorsal view **8** Membrane and cunei in dorsal view **9** Left antenna: first antennal segment and base of the second **10** Evaporative area. Scale bar = 0.1 mm (except in Figs 1, 2 and 8, scale = 1.0 mm).

areas near inner margins of eyes, prolonged on frons. Eyes reddish with several black patches medially (Figure 2), occupying head height in lateral view (Figure 3). First antennal segment thickened sub-basally, after small concavity, slightly longer than vertex width, yellowish brown, with apical black ring (Figure 9), apparently devoid of erect setae. Second segment narrower, significantly longer, yellowish brown, darker apically, with several erect setae obviously longer than width of segment. Third and fourth segments dark brown to black, with same erect pilosity. Labium reaching metacoxae, yellowish brown. Pronotum (Figs 1, 4–5): Pronotal collar (Figure 4) very short, brown, almost smooth, with very narrow and shallow punctation. Pronotal callosities (Figure 4) rounded, medially separated and separated from pronotal lateral margins, shining black, smooth. Pronotal lateral margins slightly concave to sigmoid medially, carinate, carina yellowish, easily visible in lateral view. Pronotal posterior margin (Figure 1) convex but medially almost straight and laterally, near humeral angles, slightly concave. Humeral angles rounded. Pronotal disk widely and deeply punctate (Figure 5), punctation dense, black, surface of disk dark brown. Mesoscutum covered (Figure 6). Scutellum (Figure 6) slightly swollen, reddish brown to dark brown, more narrowly punctate. Clavus and corium (Figure 7), including embolium, widely and deeply punctate, punctation black, surface of hemelytra evenly dark brown. Cuneus (Figure 8) dark brown bearing inner reddish sub-basal spot with wide whitish inner margin. Membrane (Figure 8) slightly declivous, greyish, veins thick, blackish to greenish, larger cell curved inward submedially. Coxae yellow. Pro- and mesofemora yellowish, darker apically. Metafemora dark brown to black. Metatibiae yellowish brown, as tarsi. Claws reddish. Pilosity of legs elongate, stiff, about as long as tibial spine. Propleura almost black, narrowly and shallowly punctate. Meso- and metapleura dull, blackish with yellowish areas. Abdomen dark brown, with elongate white setae.

Genital structures. Not dissected to preserve the holotype.

Male unknown.

Etymology. I am pleased to dedicate this new species to Dr T. J. Henry (United States National Museum of Natural History, Washington D.C, United States of America) in recognition of his major contributions to Heteroptera taxonomy, particularly to the classification and phylogeny of Berytidae and Lygaeoidea, but also to the study of several difficult plant bug genera such *Ceratocapsus* Reuter, 1876, *Hyalochloria* Reuter, 1907, *Neurocolpus* Reuter, 1876 and *Ranzovius* Distant, 1893.

Discussion. Through the courtesy of Dr T. J. Henry, I was able to compare the new species to the dorsal and lateral views of a paratype of *G. sedlaceki* Carvalho, 1985, the type species of *Gressitocoris* and, until now the only species of the genus. The female holotype of the new species concords with Carvalho's (1985) original description of *Gressitocoris* in a majority of character states. The antennal segments are covered by dense pilosity with some sparse, erect setae longer than width of the segment, the second antennal segment is slightly thickened apically, the posterior margin of pronotal disk is rounded but slightly concave laterally near humeral angles, the lateral margins are carinate, the pronotal disk and hemelytra (including wide embolium) are widely and deeply punctate, the scutellum is more narrowly punctate, the vein of larger areolar cell of the membrane is thick, expanded posteriorly, curved inward submedially and a reddish sub-basal spot with wide whitish inner margin is present on inner part of cuneus.

A very narrow and shallow punctation is apparently present on the pronotal collar of both species (contra Carvalho 1985).

Gressitocoris henryi sp. n. differs from *G. sedlaceki* Carvalho, 1985 by the length of the third antennal segment shorter than the length of the second antennal segment (versus slightly longer in *G. sedlaceki*), the eyes less wide, the covered mesoscutum and the darker dorsal coloration, particularly the medial black stripe of clypeus, the medial black patch of frons and vertex (both absent in *G. sedlaceki*), the almost even dark brown to black pronotum (yellowish brown lateral areas and posterior margin absent), the reddish brown scutellum (yellowish lateral stripes absent), the almost even dark brown hemelytra, and absence of an elongate yellowish stripe lining the clavo-corial suture.

As pointed out by T. Yasunaga (in litt. 2017-08-22), the validity of the genus *Gressitocoris* Carvalho, 1985 should be analyzed and compared with the large genus *Deraeocoris* Kirschbaum, 1856, whose monophyly remains to be established. However, *Gressitocoris henryi* sp. n. differs in habitus from all Papuan species of *Deraeocoris* described or redescribed by Carvalho (1985).

Distribution. Indonesia, Papua Barat, Doberai Peninsula. Type locality: Syoubri vill(age) (1°06'40"S, 133°54'36"E).

Saturniomirini Carvalho, 1952

Imogen bicolor (Poppius, 1912a)

Material examined. Indonesia: 1♂, North Moluccas, Central Halmahera, creek N(orth)-E(ast) of Kobe vill(age), creek side (coordinates provided on the label: 0°28'41"N, 127°53'53"E), 10 m, 07.vii.2013, Telnov D. leg. (FC n° 7559) (ex DTPC, NME).

Distribution. According to Chérot et al. (2017), this species was described from a small series of males from Ighibirei, Central Province, Papua New Guinea and is known from continental Papua Barat, Indonesia, and from Papua New Guinea. This is apparently the first citation from the North Moluccas.

Mirinae Hahn, 1833
Mirini Hahn, 1833

Moroca giluwensis Carvalho, 1986

Material examined. Papua New Guinea: 1♀, Eastern Highlands, Goroka (coordinates provided on the label: 6°4'44"S, 145°22'56"E), 1600 m, 13.v.2011, dissected for parasites, dissection number 627, negative, Votýpka J. & Lukeš J. leg. (FC n° 6420) (NMPC); 1?, M(oun)t Gahavisuka Provincial Park (coordinates provided on the label:

6°2'2"S, 145°25'28"E), 2000 m, 11.v.2011, dissected for parasites, dissection number 597, negative, Votýpka J. & Lukeš J. leg. (FC n° 6421) (NMPC).

Distribution. Endemic to New Guinea (Schuh 2002–2013).

Moroca lineaticolle Poppius, 1912b

Material examined. Indonesia: 1♀, Papua Barat, Doberai Peninsula, Arfak Mounts, Anggi Gigi Lake S(outh), upper vill(age) (coordinates provided on the label: 1°18'0.5"S, 133°54'24"E), 2200 m, edge of primary mid mountain rainforest, 09–11.ix.2015, Telnov D. leg. (FC n° 7574) (ex DTPC, NME); 1♀, Papua Barat, Doberai Peninsula, Arfak Mounts, Syoubri vill(age) (coordinates provided on the label: 1°06'40"S, 133°54'36"E), 1510 m, edge of secondary lower mountain rainforest, at white light, 12–13.ix.2015, Telnov D. leg. (FC n° 7575) (ex DTPC, NME).

Distribution. Endemic to New Guinea (Schuh 2002–2013).

Moroca verticillata Carvalho, 1986

Material examined. Indonesia: 1♂, 1♀, Papua Barat, Doberai Peninsula, Arfak Mounts, Syoubri vill(age) (coordinates provided on the label: 1°06'40"S, 133°54'36"E), 1510 m, edge of secondary lower mountain rainforest, at MV light, 12–13.ix.2015, Telnov D. leg. (FC n°s 7572–7573) (ex DTPC, NME).

Distribution. Endemic to New Guinea (Schuh 2002–2013).

Peltidopeplus annulipes Poppius, 1912b

Material examined. Indonesia: 1♀, Papua Barat, Doberai Peninsula, Arfak Mounts, Anggi Gigi Lake S(outh), upper vill(age) and surroundings (coordinates provided on the label: 1°18'0.5"S, 133°54'24"E), 2200 m, primary mid mountain rainforest, at white light, 10–11.ix.2015, Telnov D. leg. (FC n° 7551) (ex DTPC, NME); 1♀, Papua Barat, Doberai Peninsula, Arfak Mounts, Anggi Gigi Lake S(outh), upper vill(age) and surroundings (coordinates provided on the label: 1°18'10"S, 133°54'0,3"E), 1985 m, primary mid mountain rainforest, at white light, 08–09.xi.2015, Telnov D. leg. (FC n° 7552) (ex DTPC, NME).

Distribution. Endemic to New Guinea (Chérot and Pauwels 2000; Schuh 2002–2013).

Prolygus alboscutellata Carvalho, 1987a

Material examined. Papua New Guinea: 1♂, 1♀, 1?, Eastern Highlands, Kegsugl, under M(oun)t Wilhelm (coordinates provided on the label: 05°49'52"S, 145°05'10"E), 2780 m, 13.v.2012, dissected for parasites, dissection numbers 623–625, negative, Votýpka J. & Lukeš J. leg. (FC n° 6420) (NMPC).

Distribution. Endemic to New Guinea (Schuh 2002–2013).

Prolygus papuanus (Poppius, 1914)

Material examined. Indonesia: 11♂♂, 13♀♀, 2??, Papua Barat, Doberai Peninsula, Arfak Mounts, Anggi Gigi Lake S(outh), upper vill(age) (coordinates provided on the label: 1°18'0.5"S, 133°54'24"E), 2200 m, edge of primary mid mountain rainforest, at white light, 09–11.ix.2015, Telnov D. leg. (FC n°s 7595–7621) (ex DTPC, NME); 34♂♂, 20♀♀, 5??, Papua Barat, Doberai Peninsula, Arfak Mounts, Syoubri vill(age) (coordinates provided on the label: 1°06'40"S, 133°54'36"E), 1610 m, edge of secondary lower mountain rainforest, 12–13.ix.2015, Telnov D. leg. (FC n° 7622–7681) (ex DTPC, NME).

Distribution. Endemic to New Guinea (Schuh 2002–2013).

Remark. The genital structures of the male FC n° 7771 conform to Carvalho's (1987a: 148, figs 44–46) drawings.

Tinginotum knolwesi (Kirkaldy, 1908)

Material examined. Indonesia: 2♂♂, 2♀♀, Papua Barat, Paniai (? Regency), Sinak (no coordinates on the label, approximate coordinates available via Google Earth for Paniai Regency: 3°47'S, 136°21'E), 14–17.xii.1995, Riedel A. leg. (FC n°s 7335–7338) (JGKP).

Distribution. Widely distributed in New Guinea and Pacific Islands (Schuh 2002–2013, Chérot et al. 2017).

Tinginotum rubrovenosus Carvalho, 1987b

Material examined. Indonesia: 1♂, Papua Barat, Doberai Peninsula, Arfak Mounts, Anggi Gigi Lake S(outh), upper vill(age) (coordinates provided on the label: 1°18'0.5"S, 133°54'24"E), 2200 m, edge of primary mid mountain rainforest, at white light, 09–11.ix.2015, Telnov D. leg. (FC n° 7576) (ex DTPC, NME); 2♂♂, 1♀(?), Papua Barat, Doberai Peninsula, Arfak Mounts, Syoubri vill(age) (coordinates provided on the label: 1°06'40"S, 133°54'36"E), 1510 m, edge of secondary lower mountain rainforest, 12–13.ix.2015, Telnov D. leg. (FC n° 7577–7579) (ex DTPC, NME).

Distribution. Endemic to New Guinea (Schuh 2002–2013).

Warrissia huonensis (Poppius, 1914a)

Material examined. Indonesia: 1?, Papua Barat, Doberai Peninsula, Arfak Mounts, Syoubri vill(age) (coordinates provided on the label: 1°07'16"S, 133°54'34"E), 1570–2100 m, primary lower mountain rainforest, 11–12.ix.2015, Telnov D. leg. (FC n° 7558) (ex DTPC, NME); 2♀♀, 3??: Papua Barat, Doberai Peninsula, Arfak Mounts, Syoubri vill(age) (coordinates provided on the label: 1°06'40"S, 133°54'36"E), 1510 m, edge of secondary lower mountain rainforest, MV light, 12–13.ix.2015, Telnov D. leg. (FC n°s 7553–7557) (ex DTPC, NME); Papua New Guinea: 1♂, Madang Province, Nagada Harbour (no coordinates on the label, approximate coordinates available via Google Earth: Latitude: -5.16667 Longitude: 145.81667), 18.iii.1990, Lansbury I. leg. (FC n° 7333) (JGKP); 1♀, Madang Province, Nagada Harbour (no coordinate on the label, approximate coordinates available via Google Earth: Latitude: -5.16667 Longitude: 145.81667), 16.v.1992, Lansbury I. leg. (FC n° 7334) (JGKP).

Distribution. Widespread in Southeast Asia and New Guinea (Yasunaga et al. 2002, Schuh 2002–2013, Chérot et al. 2017).

Stenodemini China, 1943

Trigonotylus tenuis Reuter, 1893

Material examined. Papua New Guinea: 2♂♂, Madang Province, Nagada Harbour (no coordinates on the label, approximate coordinates available via Google Earth: Latitude: -5.16667 Longitude: 145.81667), 18.iii.1990, Lansbury I. leg. (FC n°s 7340, 7342) (JGKP); 1♂, 1♀, Madang Province, Nagada Harbour (no coordinates on the label, approximate coordinates available via Google Earth: Latitude: -5.16667 Longitude: 145.81667), 16.v.1992, Lansbury I. leg. (FC n°s 7339, 7341) (JGKP).

Distribution. World distribution widespread (Schuh 2002–2013), but apparently not previously recorded from Papua New Guinea.

Orthotylinae Van Duzee, 1916

Austromirini Carvalho, 1976

Irianocoris italae Carvalho, 1971

Material examined. Papua New Guinea: 1♂, Madang Province, Baiteta Forest (no coordinates provided on label; according to Chérot et al. 2017, Baiteta lies at the following coordinates: 05°01'S, 145°45'E), 11.v.1995, O. Missa leg., host unknown, fogging (FC n°4083) (ISNB); 2♂♂, 4♀♀, same locality, 25.v.1995, O. Missa leg., *Planchonella thysoidis* or *Dysoxylum arnoldicum* (Sapotaceae + Melicaceae), fogging (FC n°s 4084–4089) (ISNB); 3♀♀, same locality, 08.vi.1995, O. Missa leg., *Hapholobus sp.* (Burseraceae), fogging (FC n°s 4090–4092) (ISNB); 2♂♂, same locality, 09.vi.1995, O. Missa leg., *Sarcocephalus sp.* (Rubiaceae), fogging (FC n°s 4093–4094) (ISNB); 1♂, 2♀♀, 1?, same locality, 14.vi.1995, O. Missa leg., *Chisocheton ceramicus* (Melicaceae), fogging (FC n°s 4095–4097, 4173) (ISNB); 6♂♂, 2??, same locality, 14.vii.1995, O. Missa leg., *Neonauclea sp.* (Rubiaceae), fogging (FC n°s 4098–4103, 4105, 4109) (ISNB); 3♂♂, same locality, 17.vii.1995, O. Missa leg., *Chisocheton wenlandia* (Melicaceae), fogging (FC n°s 4106–4108) (ISNB); 3♂♂, 5♀♀, 3?, same locality, 1995, O. Missa leg., *Celtis latifolia* (Ulmaceae) or *Planchonella* sp. (Sapotaceae), fogging (FC n°s 4110–4120) (ISNB); 6♀♀, 1?, same locality, 1995, O. Missa leg., *Chisocheton ceramicus* (Melicaceae), fogging (FC n°s 4121–4127) (ISNB); 1♂, same locality, 10.iv.1996, O. Missa leg., *Litesia irianensis* (Liliaceae), light trap (FC n°4128) (ISNB); 1♂, 2♀♀, same locality, 17.iv.1996, O. Missa leg., host unknown, fogging (FC n°s 4129–4131) (ISNB); 1♂, same locality, ?.iv.1996, O. Missa leg., host unknown, light trap (FC n°4102b) (ISNB); 2♀♀, same locality, 01.v.1996, O. Missa leg., host unknown, fogging (FC n°s 4132–4133) (ISNB); 2♂♂, 2♀♀, same locality, 07.vi.1996, O. Missa leg., host unknown, fogging (FC n°s 4134–4137) (ISNB); 1?, same locality, 04.vii.1996, O. Missa leg., on *Sloanea sogeriensis* (Elaeocarpaceae), fogging (FC n° 4138) (ISNB); 1♂, same locality, 10.vii.1996, O. Missa leg., *Celtis philippinensis* (Ulmaceae) or *Polyorthia* sp. (Annonaceae), light trap (FC n°4139) (ISNB); 1♂, 1♀, 1?, same locality, 25.vii.1996, O. Missa leg., host unknown, fogging (FC n°s 4140–4142) (ISNB).

Distribution. Endemic to New Guinea. Described by Carvalho (1971) from Maffin Bay, Dutch New Guinea, the species was recently cited for the first time from Papua New Guinea (Cassis et al. 2012).

Remark. The genus *Irianocoris* was transferred from Orthotylini to Austromirini by Cassis, Cheng and Tatarnic (2012).

Phylinae Douglas & Scott, 1865
Hallodapini Van Duzee, 1916 sensu Schuh & Menard 2013

Linacoris viridescens Carvalho, 1983

Material examined. Papua New Guinea: 4♂♂, 2♀♀, 2??, Madang Province, Nagada Binatang Research Center (coordinates provided on the label: 05°09'23"S, 145°47'41"E), 20 m, 20.v.2011, two specimens dissected for parasites, dissection numbers 892–893, negative, Votýpka J. & Lukeš J. leg. (FC n°s 6450–6453, 6455–6458) (NMPC); 2♂♂, 1♀, Madang Province, Ohu (coordinates provided on the label: 05°08'46"S, 145°46'36"E), 06.v.2011, dissected for parasites, dissection numbers 205–207, negative, Votýpka J. & Lukeš J. leg. (FC n°s 6454, 6459–6460) (NMPC).

Distribution. Described by Carvalho (1983) from Papua New Guinea and Iran Jaya. Additional species of the genus *Linacoris* Carvalho, 1983 remain to be described in Southeast Asia (Schuh and Menard 2013).

Remark. The genus *Linacoris* was recently transferred from Orthotylinae, Orthotylini to Phylinae, Hallodapini by Schuh and Menard (2013) on the basis of phylogenetic analyses by Menard et al. (2013).

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A new species and new records of *Engytatus* from the Hawaiian Islands (Heteroptera, Miridae)

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Abstract

Engytatus henryi **sp. n.** is described from the Waianae Mountains of Oahu. This new species feeds on *Abutilon sandwicense* (Malvaceae), an endangered understory plant in mesic forests. A dorsal habitus photograph and line drawings of key male genitalic structures are provided for *E. henryi*, accompanied by a photograph of the host plant. *Cyrtopeltis kahakai* Asquith is given a new generic assignment as *Engytatus kahakai* (Asquith) new combination, and additional locality and host-plant records are provided for four other Hawaiian endemic *Engytatus* species.

Keywords

Engytatus, Hawaii, new species, new records

Introduction

The genus *Engytatus* is represented by 28 species worldwide, and has undergone a modest insular radiation in the Hawaiian Islands, where 9 endemic species have been previously known to occur, most of them single-island endemics (Perkins 1912, Carvalho and Usinger 1960, Gagné 1968, Asquith 1992). These species occur on host-plant species in the genus *Cyrtandra* in the Gesneriaceae; *Dubautia* in the Asteraceae; *Lysmachia* in the Primulaceae; *Phyllostegia* in the Labiatae; *Scaevola* in the Goodeniaceae; and *Sida* in the Malvaceae. In the course of general Heteroptera surveys in the Waianae

Mountains of Oahu, the author discovered yet another new species in this insular assemblage, present on *Abutilon sandwicense*, another host plant in the Malvaceae. This new species is described below, and additional geographic and host-plant records are provided for four other native Hawaiian *Engytatus* species. In particular, it is shown that individual *Engytatus* species utilize multiple host species in the genus *Cyrtandra* on Oahu, and multiple species of *Dubautia* on Maui, indicating that species isolating mechanisms operate primarily at the host-plant genus level in Hawaiian *Engytatus*.

Methods

All measurements in the descriptions below are given in millimeters, and were made using a Wild M3Z dissecting microscope equipped with an ocular micrometer. High resolution dorsal habitus photographs were taken using an AutoMontage digital imaging system linked to a Leica M165-C dissecting stereomicroscope, with post-processing using Photoshop software. Line drawings of male genitalic structures were made using a camera lucida attached to a Wild M3Z dissecting microscope.

Synonymies provided under species are nomenclatural only, rather than comprehensive for all previous citations in the literature. For material collected by the author, CL numbers following localities refer to a collection locality-numbering scheme used to cross-reference photographs and other metadata to specific collecting localities.

Nomenclature for host plants follows Wagner et al. (1999). Host plant determinations were verified by consultation with botanists at the Bishop Museum, and checked against voucher specimens in the Herbarium Pacificum at that institution. In cases where the botanical names provided on original host-plant labels for the *Engytatus* specimens examined have now been superseded due to more refined taxonomic interpretations, the currently accepted host-plant name is provided in brackets following the name originally used on the label. Collection locality elevations originally taken with an altimeter reading in feet have also been converted to metric values in brackets.

The following abbreviations are used for specimen depositories:

BPBM	Bernice P. Bishop Museum, Honolulu, Hawaii, USA.
USNM	United States National Museum of Natural History, Smithsonian Institution, Washington, DC, USA.

Taxonomy

Genus *Engytatus* Reuter, 1876

Discussion. The Hawaiian species currently held in *Engytatus* were all originally described in the genus *Cyrtopeltis* (Perkins 1912, Carvalho and Usinger 1960, Gagné 1968), within which *Engytatus* was considered a subgenus by most authors, although

Zimmerman (1948) treated it as a full genus and placed the Hawaiian species described at that time within it. Cassis (1986), in his doctoral dissertation, subsequently elevated all subgenera of *Cyrtopeltis*, including *Engytatus*, to full genus status, a taxonomic arrangement subsequently followed in the catalog of Schuh (1995), thus validating Zimmerman's previous interpretation. Asquith (1992) described yet another Hawaiian *Cyrtopeltis* species, but gave no subgeneric assignment, and made no comment regarding his decision to use this genus name in preference to *Engytatus*. In the current work, all Hawaiian species formerly assigned to *Cyrtopeltis* are considered to fall within the generic limits of *Engytatus* as it is currently interpreted. In addition to the endemic Hawaiian species, another widespread *Engytatus* species, *E. modestus* (Distant), has also been introduced to the Hawaiian Islands, where it is a pest of tomato and other agricultural crops (Tanada and Holdaway 1954).

Following a modest amount of targeted collecting and taxonomic scrutiny from 1930–1968, Hawaiian *Engytatus* species have been infrequently collected or discussed in the scientific literature over the past 45 years. However, more recent records for previously described species, listed below, as well as the discovery of a new species, as reported herein, indicate that these insects are still present, even on the heavily developed island of Oahu, in areas of native forest. Overall, *Engytatus* species seem to be generally overlooked due to their inconspicuous habits and specialized associations with increasingly rare host plants.

Engytatus henryi sp. n.

http://zoobank.org/4046845E-2F99-4EE4-A86B-041E2FE1303C

Description. *Male* with general form slender, elongate, parallel-sided (Fig. 1); overall length 3.90–4.10, length from tip of tylus to cuneal fracture 2.60–2.80, maximum width (across base of cuneus) 1.00–1.05. General coloration pale yellowish green, with base of head, anterior margin of pronotum, and entire abdomen bearing more saturated green to bluish-green coloration.

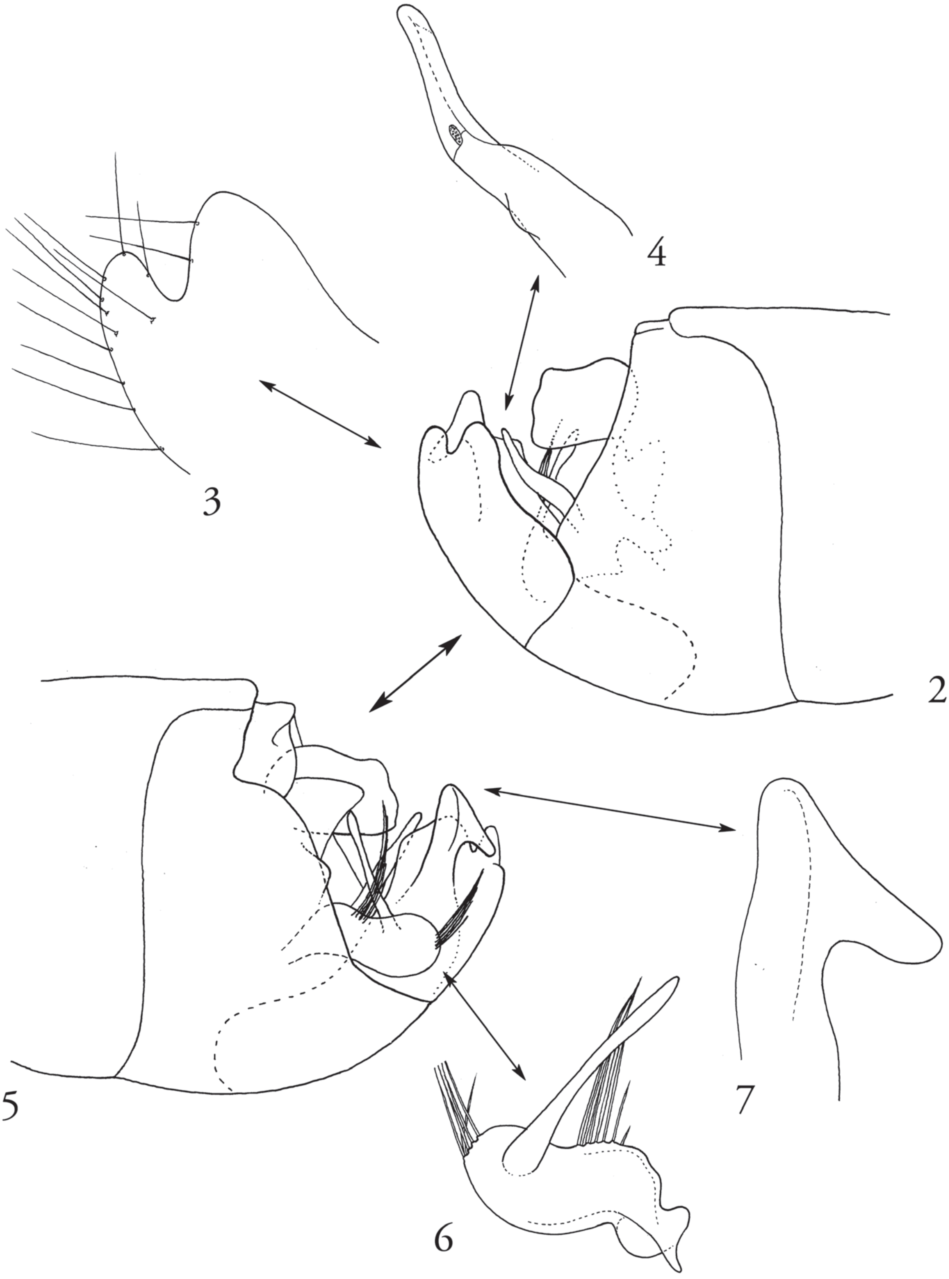
Head length 0.30, width across eyes 0.52, pale yellowish green with more saturated bluish-green coloration at posterolateral margins; eyes relatively small, dark reddish-black, length 0.15, width 0.10; vertex width 0.32, bearing scattered moderately long, semi-erect, pale setae. Antennae long, slender, all segments very pale yellowish, segment I bearing 3 erect, golden, spinose setae, all segments thickly covered with short, semi-erect pale setae, lengths of segments I–IV = 0.40, 1.10, 1.15, 0.50. Rostrum length 1.25, reaching apices of middle coxae, pale golden yellow, extreme tip dark.

Pronotum length 0.60, width 0.80, pale yellowish green, bearing scattered semi-erect pale setae. *Scutellum* length 0.40, width 0.35, pale yellowish-green, bearing scattered semi-erect pale setae.

Hemelytra translucent, uniformly pale yellowish green except extreme posterior apex of cuneus brown (Fig. 1); entire hemelytral surface set with simple, semi-recumbent pale setae; wing membrane very pale grey, veins yellowish green.

Figure 1. *Engytatus henryi* sp. n., male, dorsal habitus photograph. Specimen from Kaluaa Gulch, Waianae Mountains, Oahu.

Legs slender, elongate (Fig. 1), very pale yellow, tarsi pale golden brown; all leg segments clothed with very short, pale, recumbent setae; anterior margins of all femora bearing ~10 evenly spaced, slender, erect, spine-like setae; posterior margin of fore femur with numerous slender, erect, pale setae; posterior margins of middle and hind femora each with 3–4 very long, slender, erect pale setae, lengths of setae subequal to greatest width of corresponding femur on which they occur; anterior margin of hind tibia with scattered long, erect, spine-like setae, lengths of setae ~2× the tibial width.



Figures 2–7. *Engytatus henryi* sp. n., male genitalic structures. Specimen from Kaluaa Gulch, Waianae Mountains, Oahu. **2** Male terminal abdomen, right lateral view **3** Terminal processes on right side of male pygophore, right lateral view **4** Male right paramere, right lateral (outer) view **5** Male terminal abdomen, left lateral view **6** Male left paramere, right lateral (inner) view **7** Terminal process on left side of male pygophore, left lateral view.

Figure 8. *Abutilon sandwicense*, host plant for *Engytatus henryi* sp. n.; photograph taken at type-locality in middle Kaluaa Gulch, Waianae Mountains, Oahu.

Ventral surface predominantly pale green, clothed with short, recumbent pale setae, these setae becoming longer and more numerous adjacent to genital cavity.

Male genitalia with right paramere slender and finger-like (Fig. 4); left paramere stout and bilobate basally, basal lobe bearing acuminate tuft of long, dark setae, distal lobe with slender, elongate, darkly sclerotized process, apex of distal lobe with acuminate tuft of long setae (Fig. 6); proctiger with two small apical lobes on right side when viewed laterally (Figs 2, 3), left side with larger, hook-like process (Figs 5, 7).

Female length overall length 4.20–4.30, length from tip of tylus to cuneal fracture 2.90–3.00, maximum width (across base of cuneus) 1.05–1.10; similar to male in general structure and coloration, but slightly more yellowish.

Host plant. *Abutilon sandwicense* (O. Degener) Christophersen (Malvaceae).

Types. Holotype, male, HAWAIIAN ISLANDS, Oahu, Waianae Mountains, middle section of Kaluaa Gulch, W. of Schofield Barracks, 1600 ft. [485 m.], 21°27'49"N, 158°06'34"W, 26 April 2017, CL 8527, D. A. Polhemus (BPBM). Paratypes: HAWAIIAN ISLANDS, Oahu: 10 males, 16 females, same data as holotype (BPBM, USNM).

Etymology. The name "henryi" is a patronym honoring Dr. Thomas J. Henry for his many years of scientific effort devoted to the study of Heteroptera, particularly Miridae.

Discussion. *Engytatus henryi* runs to *E. cyrtandrae* in the key of Gagné (1968), by virtue of its parallel-sided form, pale dorsal pubescence, elongation of the head behind the eyes, uniformly pale antennae, and pale-colored body and wings with only a small dark mark at the extreme apex of the cuneus (Fig. 1). It differs from *E. cyrtandrae* in its larger size, with the overall length across both sexes being 3.90–4.10 mm, versus 3.13–3.28 mm in *E. cyrtandrae*; by having a much different set of structures at the apex of the pygophore, consisting of two small, rounded lobes on the right side (Figs 2, 3) and a large, hooked lobe on the left (Figs 5, 7), rather than a pair of more developed processes on the right side, one acuminate and the other bulb-like, as in *E. cyrtandrae* (see figs 5a–b in Gagné 1968); and by the shapes of the male parameres (Figs 4, 6).

Ecological notes. The type series of *E. henryi* was taken from a stand of *Abutilon sandwicense* (Fig. 8) in a fenced enclosure along the middle reach of Kaluaa Gulch, on the windward side of the Waianae Mountains in western Oahu. *Abutilon sandwicense* is a sprawling to arborescent, large-leaved shrub that was formerly common in the understory of Hawaiian mesic forests, but has been badly reduced in extent by wildland fire and the depredations of feral pigs, such that it is now listed as Endangered under the federal Endangered Species Act.

Engytatus kahakai **(Asquith), comb. n.**

Cyrtopeltis kahakai Asquith, 1993: 17.

Discussion. In his description of *C. kahakai*, Asquith (1993) did not provide a subgeneric placement within *Cyrtopeltis* or otherwise discuss his generic assignment. In the assessment of the author, *C. kahakai* is clearly congeneric with the remainder of the endemic Hawaiian dicyphine radiation, all other members of which were assigned to the genus *Engytatus* when the latter group was elevated from subgeneric to generic status by Cassis (1986). The current nomenclatural adjustment thus aligns the species binomial with current taxonomy.

Engytatus terminalis **(Gagné)**

Cyrtopeltis terminalis Gagné 1968: 42.
Engytatus terminalis: Schuh 1995: 497.

Material examined. HAWAIIAN ISLANDS, Oahu: 2 males, 2 females, Koolau Mountains, Mt. Tantalus area, gulch crossing on Kaluawahine Trail, 1500 ft [455 m], 21°20'13"N, 157°48'55"W, 23 May 2017, on *Cyrtandra* cf. *sandwicensis*, CL 8528, D. A. Polhemus (BPBM); 3 males, 3 females, Waianae Mountains, Honouliuli Forest Reserve, South Fork of Kaluaa Gulch, 26 April 1970, on *Cyrtandra christophersenii* [= *C. waianaeensis* x *C. garnotiana*], W. C. Gagné (BPBM); 1 male, 1 female, Koolau Mountains, Honolulu Watershed Forest Reserve, Kului Gulch, 400 m, 31 January 1971, on *Cyrtandra cordifolia* W. C. Gagné (BPBM).

Ecological notes. Three species of Hawaiian *Engytatus*, all of them endemic to Oahu, appear to be exclusively associated with the host-plant genus *Cyrtandra* in the

Gesneriaceae, which contains 58 endemic Hawaiian species, all apparently derived from a single colonizing ancestor (Wagner et al. 1999, Cronk et al. 2005). Previously, Gagné (1968) speculated that specialization on individual species within this diverse local plant radiation could be a significant species isolating mechanism within Hawaiian *Engytatus*.

In regard to *E. terminalis*, Gagné (1968) noted its association with *Cyrtandra*, but did not specify which species was involved. Bishop Museum specimens collected subsequent to his study bear host-plant labels indicating that they were taken on *C. cordifolia* Gaudichard. More recently, specimens have been taken on the slopes of Mt. Tantalus, in the Koolau Mountains behind Honolulu, from *Cyrtandra* cf. *sandwicensis*. The host-plant determination for these latter specimens is provisional because hybrids between *C. sandwicensis* (H. Léveillé) H. St. John & Storey and *C. grandiflora* Gaudichard are known to occur in the Mt. Tantalus area, based on Bishop Museum herbarium specimens, but the large, pubescent leaves of the plants in question are most similar to those of *C. sandwicensis*. It therefore appears that *E. terminalis* occurs on at least two *Cyrtandra* species in the Koolau Mountains. Other Gagné specimens in the Bishop Museum from Kaluaa Gulch, in the Waianae Mountains, are recorded as having been taken on *C. christophersenii* H. St. John & Storey, which is now considered a hybrid of *C. waianaeensis* H. St. John & Storey and *C. garnotiana* Gaudichard (Wagner et al. 1999). *Engytatus terminalis* thus utilizes a minimum of three species of *Cyrtandra* across Oahu as a whole, to some extent invalidating the hypothesis of Gagné (1968) that individual host-plant association would prove to be a species isolating mechanism in the genus.

***Engytatus confusus* (Perkins)**

Cyrtopeltis confusa Perkins, 1911: 729.
Engytatus confusus: Zimmerman 1948: 189.
Cyrtopeltis (Engytatus) confusa: Carvalho 1958: 185.

Material examined. HAWAIIAN ISLANDS, Oahu: 6 males, 9 females, Waianae Mountains, Mt. Palikea, gulch head NE of summit, 915 m, 21°24'52"N, 158°05'59"W, 28 August 2013, on *Cyrtandra waianaeensis*, CL 8518, D. A. Polhemus (BPBM); 2 females, Waianae Mountains, Mt. Palikea, head of Palawai Gulch, 845 m, 21°24'46"N, 158°05'59"W, 28 August 2013, on *Cyrtandra waianaeensis*, CL 8518, D. A. Polhemus (BPBM); 4 males, 4 females, Koolau Mountains, Punaluu Valley, 1000 ft, 28 September 1968, on *Cyrtandra propinqua*, W. C. Gagné (BPBM); 2 males, Waianae Mountains, Kawaihapoi Gulch, 548 m, 29 September 1971, on *Cyrtandra* sp., W. C. Gagné (BPBM).

Ecological notes. The association of this species with the host-plant *Cyrtandra cordifolia* was previously reported by Gagné (1968). Further specimens have been subsequently collected on *C. propinqua* C. N. Forbes and *C. waianaeensis* H. St. John & Storey. *Engytatus confusus* therefore seems to occur on at least three species of *Cyrtandra* on Oahu, one of which is also utilized by *E. terminalis*. This once again indicates that individual host-plant association is not a strong isolating mechanism for the Oahu *Engytatus* species feeding on *Cyrtandra*.

Engytatus hawaiiensis **(Kirkaldy)**

Cyrtopeltis hawaiiensis Kirkaldy, 1092: 138.
Engytatus hawaiiensis Zimmerman, 1948: 1988.
Cyrtopeltis (*Engytatus*) *hawaiiensis*: China and Carvalho 1952: 160.

Material examined. HAWAIIAN ISLANDS, Maui: 1 male, 1 female, East Maui, Koolau Forest Reserve, 2042 m, 8 August 1973, on *Dubautia* cf. *coriacea [=D. thyrisiflora*], W. C. Gagné (BPBM); 6 males, 7 females, Haleakala National Park, West Rim, 9600 ft, 12 August 1975, on *Railliardia* [= *Dubautia* sp.], J. W. Beardsley (BPBM).

Ecological notes. This species has been previously recorded as occurring on several species of *Railliardia* (Gagné 1968), a host-plant genus subsequently synonymized within *Dubautia*, in the Asteraceae. Based on these records and examination of other Bishop Museum specimens, *E. hawaiiensis* occurs on *Dubautia menziesii* (A. Gray) D. D. Keck, *D. platyphylla* (A. Gray) D. D. Keck, and *D. thyrisiflora* (Sherff) D. D. Keck, and thus is not strictly confined to a single host-plant species within this genus.

Engytatus sidae **(Gagné)**

Cyrtopeltis sidae Gagné, 1968: 40.
Engytatus sidae: Schuh, 1995: 497.

Material examined. HAWAIIAN ISLANDS, Lanai: 15 males, 8 females, Kaumolu Bay heiau, 7 February 1971, on *Sida* sp., J. W. Beardsley (BPBM).

Ecological notes. This species was originally described from Maui, and the record above demonstrates its occurrence on Lanai as well.

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This paper represents contribution 2017-005 to the Hawaii Biological Survey.

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Appendix 1

Checklist of Hawaiian *Engytatus* species with known host plants and distributions within the Hawaiian Islands.

Species	Host plant(s)	Distribution
Engytatus confusus (Perkins)	*Cyrtandra waianaeensis* (Gesneriaceae) *Cyrtandra propinqua* (Gesneriaceae)	Oahu
Engytatus cyrtandrae (Gagné)	*Cyrtandra* sp. (Gesneriaceae)	Oahu
Engytatus hawaiiensis (Kirkaldy)	*Dubautia menziesii* (Asteraceae) *Dubautia platyphylla* (Asteraceae) *Dubautia thyrisiflora* (Asteraceae)	Maui
Engytatus henryi sp. n.	*Abutilon sandwicense* (Malvaceae)	Oahu
Engytatus kahakai (Asquith)	*Scaevola sericea* (Goodeniaceae)	Kauai, Molokai
Engytatus lysimachiae (Carvalho & Usinger)	*Lysimachia* sp. (Primulaceae)	Kauai
Engytatus perplexa (Gagné)	*Dubautia* sp. (Asteraceae)	Maui
Engytatus phyllostegiae (Carvalho & Usinger)	*Phyllostegia* sp. (Labiatae)	Oahu
Engytatus terminalis (Gagné)	*Cyrtandra* cf. *sandwicensis* (Gesneriaceae) *Cyrtandra cordifolia* (Gesneriaceae) *Cyrtandra christophersenii* (Gesneriaceae)	Oahu
Engytatus sidae (Gagné)	*Sida* sp. (Malvaceae)	Maui, Lanai

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Taxonomic review of the *bifenestratus* species group of the genus *Fulvius* Stål with descriptions of two new species (Hemiptera, Heteroptera, Miridae, Cylapinae)

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Abstract

Two new species of the genus *Fulvius* Stål are described from the Philippines and Papua New Guinea. A taxonomic review of representatives of the *F. bifenestratus* species group, illustrations of the male genitalia, a color habitus image of each species, and a key to species of the group are provided.

Keywords

Australian Region, diagnosis, *Fulvius*, key, new species, Oriental Region, taxonomy

Introduction

Fulvius Stål, 1862 is a morphologically diverse, speciose genus, with more than 80 valid species worldwide; most are found in the tropical and subtropical regions (Gorczyca 2006; Schuh 2002–2013). This genus is assumed to be paraphyletic and to lack consistent diagnostic characters. A combination of characters presented by previous authors (e.g., Carvalho and Costa 1994, Gorczyca 2000, Yasunaga 2000) in diagnosing *Fulvius* (e.g., elongate, parallel-sided, rather small body; porrect head; acarinate vertex; trapezoidal pronotum; two-segmented tarsus) is also shared by many other fulviine genera. Gorczyca (2002) suggested that the Old World members of the genus *Fulvius* exhibit some interspecific variation and can be divided into the *anthocoroides* and *bifenestratus* species groups. Based on an analysis of morphological characters, Sadowska-Woda (2005) and Gorczyca (2006) proposed three species groups for a more adequate classification of the genus *Fulvius*. The *anthocoroides*, *bifenestratus*, and *bisbistillatus* (occurring in the New World) groups were supported by preliminary DNA sequencing data from only a few congeners (Sadowska-Woda et al. 2008).

Our paper provides a taxonomic review of the species belonging to the *bifenestratus* group, including diagnoses and color habitus images for all species treated. Two new species, *F. henryi* and *F. tumidipennis*, are described. Scanning electron micrographs showing selected structures of *F. bifenestratus* Poppius, *F. subnitens* Poppius, and *F. tumidipennis* sp. n. and a key to species of the *bifenestratus* group are provided.

Materials and methods

Observations were made using an Olympus SZX12 stereomicroscope and an Olympus BX50 optical microscope. Digital images of live individuals were taken by TY using a Canon EOS Kiss digital camera body + Olympus OM-System. Scanning electron micrographs were taken using Hitachi S-3400N and Hitachi S3000N scanning electron microscopes. Measurements were taken using an eyepiece (ocular) micrometer; all measurements are given in millimeters. The structures measured were defined by Wolski (2015). Dissections of male genitalia were performed using the technique of Kerzhner and Konstantinov (1999). Terminology of the male genitalic structures follows Konstantinov (2003) for elements of the genital capsule and parameres, and Cassis (2008) in using the term "endosoma" for the male intromittent organ. The specimens examined are deposited in the institutions or personal collections listed below, with the following abbreviations:

NHMUK	Natural History Museum, London, England
BPBM	Department of Natural Sciences Collection, Bernice P. Bishop Museum, Honolulu, Hawaii, USA
ISNB	Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium
MCSN	Museo Civico di Storia Naturale, Genova, Italy
NHMW	Naturhistorisches Museum Wien, Vienna, Austria
NMPC	National Museum, Prague, Czech Republic
TYCN	T. Yasunaga Collection; Nagasaki, Japan
TLI	Tiroler Landesmuseum, Innsbruck, Austria
US	Department of Zoology, University of Silesia, Katowice, Poland
ZJPC	Zdeněk Jindra collection, Praha, Czech Republic
ZMUC	Zoological Institute, University Copenhagen, Denmark

Taxonomy

Fulvius bifenestratus group

Diagnosis. Dorsum shiny, covered with irregular, simple setae (Figs 1–12, 27–30, 37, 38); second tarsomere typically subdivided medially, without subapical claw (Figs 32, 33); aperture of pygophore subapical, oriented laterally, dorsal wall short (Figure 34); parameres strongly asymmetrical, right paramere vestigial and left paramere variable in shape (Figs 14, 15, 17, 18, 20, 22, 23, 25); endosoma membranous, without sclerites (Figs 16, 19, 21, 24, 26).

Discussion. Each species of the *bifenestratus* group can be distinguished from other Old World species of *Fulvius,* members of the *anthocoroides* group, by several characters. In the *bifenestratus* group, the dorsum is shiny and covered with irregularly distributed, simple setae (Figs 1–9, 12, 29, 27, 30, 37, 38), whereas in the *anthocoroides* group the dorsum is matte, and covered with uniformly distributed, scale-like vestiture (Figs 41–44). The second tarsomere in species of the *bifenestratus* group typically is subdivided medially and the pretarsal claw lacks the subapical tooth (Figs 32, 33; Sadowska-Woda et al. 2008). In most representatives of the *anthocoroides* group the second tarsomere is not subdivided medially and the subapical tooth is present (Figs 45, 46; Sadowska-Woda et al. 2008). The aperture of the pygophore in the *bifenestratus* group is subapical and oriented laterally, with the dorsal wall relatively short (Figure 34; Sadowska-Woda et al. 2008), whereas in representatives of the *anthocoroides* group the aperture of the pygophore is oriented posteriorly and the dorsal wall is long (Figs 47, 48; Sadowska-Woda et al. 2008). The parameres in species of the *bifenestratus* group are strongly asymmetrical, with the right paramere vestigial and the left paramere quite variable in shape (Figs 14, 15, 17, 18, 20, 22, 23, 25). In contrast, members of the *anthocoroides* group have the parameres similar in size. The shape of both parameres is rather symmetrical, with the right paramere bearing a short and sharply pointed apical process and the apex of the inner surface of the paramere body possessing a short spine, whereas the left paramere is long and thin, with an incision subapically (Carvalho and Lorenzato 1978: figs 56, 57, 68, 69; Gorczyca 2002: figs 1–4; Pluot-Sigwalt and Chérot 2013: 4B, C; Yasunaga 2000: 23, 24, 28, 29; Sadowska-Woda and Gorczyca 2005: 2, 3; Yasunaga and Wolski 2017: 3A, B). The endosoma in the *bifenestratus* group is always broadly membranous and the sclerotized portion of the seminal duct is short and variable in shape (Figs 16, 19, 21, 24, 26; Sadowska-Woda et al. 2008). In species of the *anthocoroides* group, by contrast, the endosoma has sclerites or sclerotized appendages, and the sclerotized portion of the seminal duct is well developed, long and tubular (Carvalho and Lorenzato 1978: fig. 55; Pluot-Sigwalt and Chérot 2013: fig. 4A; Yasunaga 2000: 30; Yasunaga and Wolski 2017: fig. 3C; Sadowska-Woda et al. 2008). The membranous structure between the second valvulae is always absent in the *bifenestratus* group, and always present in species of the *anthocoroides* group (Sadowska-Woda et al. 2008).

Members of the *bifenestratus* group are most similar to species of the New World *bisbistillatus* group in sharing characters such as the shiny dorsum, covered with simple setae (Figs 1–9, 12, 27, 30, 37, 38, 50); the divided second tarsomere; the pretarsal claw without subapical tooth (Figs 32, 33, 52, 53); the male pygophore with aperture subapical, oriented laterally and with dorsal wall relatively short (Figs 34, 54); the parameres strongly asymmetrical with the right paramere vestigial (Figs 14, 15, 17, 18, 20, 22, 23, 25; Carvalho and Costa 1994: figs 4–6, 12–14, 19–21, 33–35, 40–42); and the membranous structure between the second valvulae absent (Sadowska-Woda et al. 2008). Representatives of the *bifenestratus* group can be distinguished from members of the *bisbistillatus* group by having the cuneus uniformly brown to dark brown (Figs 1–9), whereas in *bisbistillatus* the cuneus always possesses a pale, whitish or yellow patch at the base (Carvalho and Costa 1994: figs 1, 8, 16, 30, 37, 44). The apex of the first and second valvulae is slightly rounded or straight in the *bifenestratus* group, whereas in species of the *bisbistillatus* group the apices of the first and second valvulae are always triangular (Sadowska-Woda et al. 2008).

Key to species of the *bifenestratus* group

1 Eyes distinctly removed from pronotal collar (Figs 1–3, 10, 39); hemelytron without pale patch above cuneus (Figs 1–3, 39), covered with sparse, short setae; apical process of left paramere not elongated, distinctly broadened apically (Figs 15, 18; Carvalho and Lorenzato 1978: fig. 48) **2**

– Eyes only somewhat removed from pronotal collar (Figs 4–8, 27, 28, 40); hemelytron with pale patch above cuneus (Figs 4–8, 39), covered with relatively dense and long setae (Fig. 30); apical process of left paramere thin, elongated (Figs 20, 23, 25) **4**

2 Corium and membrane without pale patches (Fig. 3) .... ***F. henryi*, sp. n. (Australian)**

– Corium and membrane each with pale patches medially (Figs 1, 2) **3**

3 Antennal segment II uniformly dark brown; apical process of left paramere bifurcated (Carvalho and Lorenzato 1978: fig. 49).......................... ***F. bimaculatus* Poppius (Australian)**

– Antennal segment II with whitish annulation apically; apical process of left paramere not bifurcated (Fig. 15)......... ***F. bifenestratus* Poppius (Oriental)**

4 Hemelytron with pale patch basally (Figs 5–7, 40); pale patch above cuneus broad (Figs 5–7, 40) **5**

– Hemelytron without pale patch basally; pale patch above cuneus narrow (Figs 4, 8) **7**

5 Antennal segment II almost entirely pale yellow, narrowly darkened basally (Figs 5, 6) .... ***F. flavicornis* Poppius (Oriental)**

– Antennal segment II dark brown with more or less developed annulation apically (Figs 7, 8) **6**

6 Body length not more than 3.5 mm; apical portion of left paramere lacking subapical process ventrally (Fig. 22); endosoma not distinctly inflated (Fig. 24)............ ***F. subnitens* Poppius (Afrotropical, Australian, Oriental)**

– Body length more than 3. 5 mm; apical portion of left paramere with distinct subapical process ventrally (Fig. 25); endosoma distinctly inflated (Fig. 26) .... ***F. tumidipennis* sp. n. (Oriental)**

7 Clavus entirely dark brown (Fig. 8)..... ***F. thailandicus* Gorczyca (Oriental)**

– Clavus with thin, yellow stripe along outer margin (Fig. 4).......................... ....***F. constanti* Gorczyca (Australian)**

Fulvius bifenestratus Poppius, 1909

Figs 1, 10–13, 14–16, 39

Fulvius bifenestratus Poppius, 1909: 30, 35, 44; Bergroth 1920: 75; Carvalho 1957: 15, 1980: 643; Schuh 1995: 26; Gorczyca 2002: 18, Figs 9, 12; Sadowska-Woda and Gorczyca 2003: 336; Sadowska-Woda 2005: 20, 27, 55, 93, 105, 170, 171, 172, tab. 1, Fig. 6, tab. 15A, Figs 1–5, tab. 15B, Fig. 1, 2006a: 40; Sadowska-Woda et al. 2006: 618, 625, 632–633, Figs 6–8, 17.

Diagnosis. Eyes removed from pronotal collar (Figs 2, 10, 39); antennal segment I longer than width of head; segment II with yellow annulation apically (Figure 39); corium with distinct pale patch near base (Figs 1, 39); membrane with distinct pale patch basally (Figs 1, 39); body of left paramere thin, inner margin curved and outer margin weakly sinuate, apical process short and broadened, ventral part elongated (viewed laterally from left) (Figure 15); female genitalia as in Sadowska-Woda et al. (2006: figs 6–8, 17).

Remarks. *Fulvius bifenestratus* is most similar to *F. bimaculatus* in sharing the dark brown to black corium with a large yellow patch near the base and the membrane with a yellow patch basally (Figs 1, 2). It can be distinguished by its smaller size, the coloration of antennal segment II, and form of the male genitalia. With *F. bimaculatus* and *F. henryi* it also shares the eyes removed from the pronotal collar (Figs 1–3, 10, 39); corium covered with sparse, short setae, without any pale patch over cuneus (Figs 1–3, 39); and the short and broadened apical process of the left paramere (Figs 15, 18; Carvalho and Lorenzato 1978: fig. 49), but is distinguished by the shape of the male genitalia.

Biology. Unknown.

Distribution. Brunei (Temburong), Indonesia (Mentawei Isl., Sulawesi), Malaysia (Borneo: Sabah), Philippines (Mindanao: Misamis Oriental Province), Thailand (Nakhon Ratchasima).

Type material. Holotype ♀: INDONESIA: Mentawei, Sipora, Sereinu V-VI, 94 [1894], Modigliani; Museo Civ. Genova; *Fulvius bifenestratus* n. sp., B. Poppius det. (MCSN).

Additional material examined. 7 ♀♀ and 4 ♂♂: MALAYSIA: Sabah, British N. Borneo, Tawau, Quoin Hill, Cocoa Res. Sta., 5. IX. 1962; Y. Hirashima, Light Trap,

Figures 1–9. Dorsal habitus photographs of *bifenestratus* group of species of the genus *Fulvius*: **1** *F. bifenestratus* (♂) **2** *F. bimaculatus* (♀) **3** *F. constanti* (paratype) **4, 5** *F. flavicornis* (**4** ♂ **5** holotype); **6** *F. henryi* (paratype, ♀) **7** *F. subnitens* (♂) **8** *F. thailandicus* (holotype) **9** *F. tumidipennis* (paratype, ♂).

Bishop; 2 ♀♀: British N. Borneo, Tawau, Quoin Hill, 3–7. VII. 1962; H. Holtmann, Light Trap, Bishop; ♂: Same data, except collected in jungle, H. Holtmann, Light Trap, Bishop; ♂ and ♀: British N. Borneo, Tawau, Quoin Hill, 15–20. VII. 1962; H. Holtmann, Light Trap, Bishop; ♀: British N. Borneo, Tawau, Quoin Hill, 8–14. VII. 1962; H. Holtmann, Light Trap, Bishop; ♀: North Borneo (SE), Forest Camp, 19 km, N. of Kalabakan, 60 m, 18. X. 1962; K. J. Kuncheria Collector, Bishop; ♀: North Borneo (SE), Forest Camp, 19 km, N. of Kalabakan, 60 m, 18. X. 1962; Y. Hirashima Collector, Bishop; ♂: North Borneo (SE), Tawau, Quoin Hill, Cocoa Res. Sta., 13. IX. 1962; Y. Hirashima, Malaise Trap, Bishop; ♂: British N. Borneo, Tawau, Quoin 11;ill, Cocoa Res. Sta., 24. IX. 1962; Y. Hirashima, Light Trap, Bishop; ♂: British N. Borneo, Tawau, Quoin Hill, Cocoa Res. Sta., 4. IX. 1962; Y. Hirashima, Light Trap, Bishop; ♂: British N. Borneo, Tawau, Quoin Hill, Cocoa Res. Sta., 3. IX. 1962; Y. Hirashima, Light Trap, Bishop; ♀: P. I., Misamis OR., Mt. Balatukan, 10 km SW of Gingoog, 1000–2000m, 1–5. V. 1960; H. Torrevillas Collector. (3 ♂♂ and 4 ♀♀ in US, rest in BPBM); ♀: Light Trap; Sarawak: foot of Mt. Dulit, Junction of rivers, Trnjar & Lejok, 29. viii. 1932; Oxford Univ. Exp., B.M. Hobby, A.W. Moore, B. M. 1933-254; ♂: 125W. v. light; BRUNEI: Temburong District, ridge NE of Kuala Belalong, approx. 300 m alt., October 1992, J H Martin coll., B M 1992 – 172; Fulviini, det. G. Stonedahl, 19; ♀: Rothamsted light trap, site 1, 200m., H. Barlow; Indonesia: Sulawesi Utara, Dumoga-Bone N. P., February, 1985; ♀: at light; INDONESIA: SULAWESI UTARA Dumoga-Bone N. P., April, 1985; R. Ent. Soc. Lond, PROJECT WALLANCE, B. M., 1985 – 10, Clarck's Camp 1140 m; J.H. Martin Coll. (NHMUK); ♀: THAILAND: Nakhon Ratchasima Sakaerat Environmental Research Station, 14°30'N, 101°55'E, 400 m, light trap, 16 Sep 2008, T. Yasunaga; ♀: same data except for date 15 Sep 200; ♀: THAI: Nak. Ratchasima Sakaerat Forest R.S., 14°30'N, 101°55'E, 400 m, LT, 31 August 2008, T. Yasunaga; ♀: THAI: Nk. Ratchasima Sakaerat Environ. R. S., 14°30'N, 101°55'E, 400 m, LT 12–14.vi.2009, Yasunaga & Yamada (TYCN).

***Fulvius bimaculatus* Poppius, 1909**
Figure 2

Fulvius bimaculatus Poppius, 1909: 30, 36, 44; Bergroth 1920: 75; Carvalho 1957: 15, 1980: 643; Carvalho and Lorenzato 1978: 135, Figs 46–49, 51; Schuh 1995: 26; Gorczyca 2002: 18, 21, Fig. 10; Sadowska-Woda and Gorczyca 2003: 336; Sadowska-Woda 2005: 20, 25, 27, 55, 93, 106, 170, 171, 172, Tab. l, Fig. 3, Tab. 12, Fig. l, Tab. 16, Figs 1–5; Gorczyca 2006: 41.

Diagnosis. Eyes removed from pronotal collar (Figure 2); antennal segment II entirely dark brown; corium dark brown except for large, yellow patch near base (Figure 2);

membrane with large, yellow patch basally (Figure 2); apical process of left paramere short and broadened, bifurcated (Carvalho and Lorenzato 1978: Figure 49).

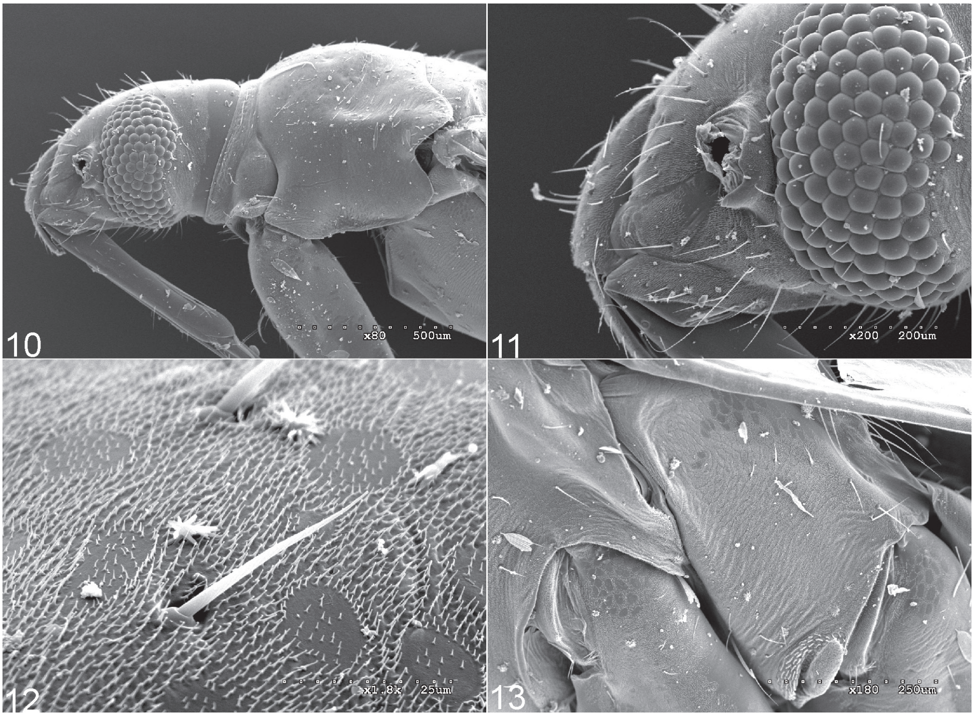
Remarks. *Fulvius bimaculatus* is most similar to *F. bifenestratus* (see diagnosis of *F. bifenestratus*), but it can be distinguished by the body size, the coloration of antennal segment II, and the male genitalia. With *F. bifenestratus* and *F. henryi* it also shares the similar head shape, corial coloration and vestiture, and a short and broadened left paramere apical process, but it can be distinguished by the overall structure of the male genitalia.

Biology. Unknown.

Distribution. Papua New Guinea.

Type material. Lectotype (♂, designated by Carvalho and Lorenzato 1978): PAPUA NEW GUINEA: N. Guinea S. E., Moroka, 1300 m, LORIA VII-30 93; Museo Civ. Genova; paralectotype ♂: N. Guinea S. E., Moroka, 1300 m, LORIA VII-30 93; Museo Civ. Genova (MCSN).

Additional material examined. 2 ♀♀ and ♂: PAPUA NEW GUINEA: Kokoda, 1200ft., ix 1933, L. E. Cheesman, B. M. 1934-321; ♀: Papua: Kokoda, 1200ft., viii-ix 1933, L. E. Cheesman, B. M. 1933-427; ♂: Papua: Kokoda, 1200 ft., viii 1933, L. E. Cheesman, B. M. 1933-427; ♀: Sten. No. 137; New Guinea: Morbe Dist., Herzog Mts., Vagau, C. 4 000 ft., 4–17. I. 1965; M. E. Bachus, B. M. 1965-120; ♂ and 2 ♀♀: W. New Guinea: Mt. Nomo. S. of Mt. Bougainville, 700 ft., ii. 1936; ♀: N. Dutch New Guinea: Waigeu. Camp 1., Mt. Nok., 2,500 ft., v. 1938, L. E. Cheesman., B. M. 1938-593; ♂: Fluorescent Mv Trap; Papua New Guinea: Morobe Prov. coast, Buso, 30. ix 1979, J. H. Martin coll.; Brit. Mus., 1980-150; ♀ and ♂: Dutch New Guinea: Humboldt Bay Dist., Bewani Mts., 400 metres, vii. 1937; W Stüber, B. M, 1938-177; 2 ♀♀: Dutch New Guinea: Cyclops Mts. Sabron. Camp: 2, 000 ft., vi. 1936, L. E. Cheesman, B. M. 1936-271; ♀: Dutch New Guinea, Mt. Cyclops, 4,000 ft. 12. iii. 1936, L. E. Cheesman, B. M., 1936-271; ♀: Dutch New Guinea, Cyclops Mts., Sabron, Camp I: 1,200 ft. 22. v. 1936, L. E. Cheesman, B. M., 1936-271; ♂: Dutch New Guinea, Cyclops Mts., Sabron, Camp I: 1,200 ft. 15. v. 1936, L. E. Cheesman, B. M., 1936-271; Dutch New Guinea, Cyclops Mts., Sabron, Camp 2: 2,000 ft.. v. 1936, L. E. Cheesman, B. M., 1936-271; ♀: Dutch New Guinea, Mt. Cyclops, Camp I: 3,500 ft. iii. 1936, L. E. Cheesman, B. M., 1936-271 (5 specimens in US, remainder in BMNH); ♂: PNG: New Guinea: NE, Morobe Prov.: Mt. Missim, S side, 2000 m, 15. VI. 1984; permethrin log of *Castanopsis acuminatissima*, mature canopy; W. C. Gagne & Urep session III, Colis sample #8, tree #330B; ♀: PNG: New Guinea: NE: Madang Prov.: Baku Forest Stn., 80 m, 4–12. II. 1978; At light; W. C. Gagne Coll, Bishop Museum, Acc. #1980, 4; 2 ♂♂: New Guinea: NE: Morobe Distr.: Kabwun to Ilaka, 4. VIII. 1966; G. A. Samuelson Collector, Bishop Museum; ♀: New Guinea: NE, Wau, 1200m, 30–31. x. 1964; M. V. Lamp, J. Sedlacek, Coll., Bishop Museum; ♂: New Guinea, Morobe Distr., Wau, 15. VIII. 1972, G. G. E. Scudder; MV Light Trap, G. G. E. Scudder; Bishop Museum Coll., Acc. 1981-522; ♀: New Guinea: NE, Wau, Morobe Distr., Mt. Missim, 1600 m, 1. V. 1974; Light Trap; Thane Pratt collector, Wau Ecology Inst. (Bishop); Bishop Museum, Accession 1980, 4; ♀: PNG: New Guinea: (NE), W. Sepik Prov., Feramin, 1500 m, 2. VII. 1976; collected at light; W. C. Gagne coll., Bishop Museum (two specimens in US, remainder in BPBM).



Figures 10–13. Scanning electron micrographs of *Fulvius bifenestratus*. **10** Head and thoracic pleura (left lateral view) **11** Head (left lateral view) **12** Texture and vestiture of pronotum **13** Thoracic pleura.

Fulvius constanti Gorczyca, 2004
Figure 3

Fulvius constanti Gorczyca, 2004: 154, figs 1–3; Gorczyca 2006: 41; Sadowska-Woda 2005: 21, 26, 27, 57, 93, 106, 170, 171, 172, tab. 19 figs 1–3; Sadowska-Woda et al. 2006: 619, 625, 633, 634, Figs 2, 21.

Fulvius nigricornis: Carvalho and Lorenzato 1978: 136, figs 50–53, 88, (nec Poppius 1909).

Diagnosis. Eyes contiguous with pronotal collar (Figure 3); antennal segment II dark brown with broad, yellow annulation apically (Figure 3); corium with pale patch over cuneus (Figure 3); clavus with pale, thin stripe along outer margin and small, yellow patch apically (Figure 3); male genitalia as in Gorczyca (2004: figs 1–3).

Remarks. *Fulvius constanti* is most similar to *F. flavicornis*, *F. subnitens*, *F. thailandicus*, and *F. tumidipennis* in having the eyes contiguous with the pronotal collar; the corium covered with dense setae, a pale patch over the cuneus; and the left paramere with an elongate apical process. It can be distinguished, however, by the absence of pale patches basally on the corium; the clavus with a thin, yellow stripe along its outer margin; and the shape of the male genitalia.

Biology. Unknown.

Distribution. Papua New Guinea.

Type material. Holotype ♂: Coll. I. R. Sc. N. B., Canopy Mission Papua New Guinea (Madang prov.): Batiteta, 08. VI. 1993, Light trap M1. Leg. Olivier Missa (ISNB); paratypes: ♀ and ♂: same data as holotype; ♀: Coll. I. R. Sc. N. B., Canopy Mission Papua New Guinea (Madang prov.): Batiteta, 03. VI. 1996, Light trap M7. Leg. Olivier Missa; ♂: Coll. I. R. Sc. N. B., Canopy Mission Papua New Guinea (Madang prov.): Batiteta, 13. IV. 1996, Light trap AR16. Leg. Olivier Missa (ISNB); ♂: Coll. I. R. Sc. N. B., Canopy Mission Papua New Guinea (Madang prov.): Batiteta,19. VI. 1996, Light trap AR22. Leg. Olivier Missa; ♂: Canopy Mission Papua New Guinea (Madang prov.): Batiteta, 02. VII. 1996, Light trap AR60. Leg. Olivier Missa, Coll. I. R. Sc. N. B (US).

Fulvius flavicornis Poppius, 1909

Figs 4, 5, 6, 20, 21

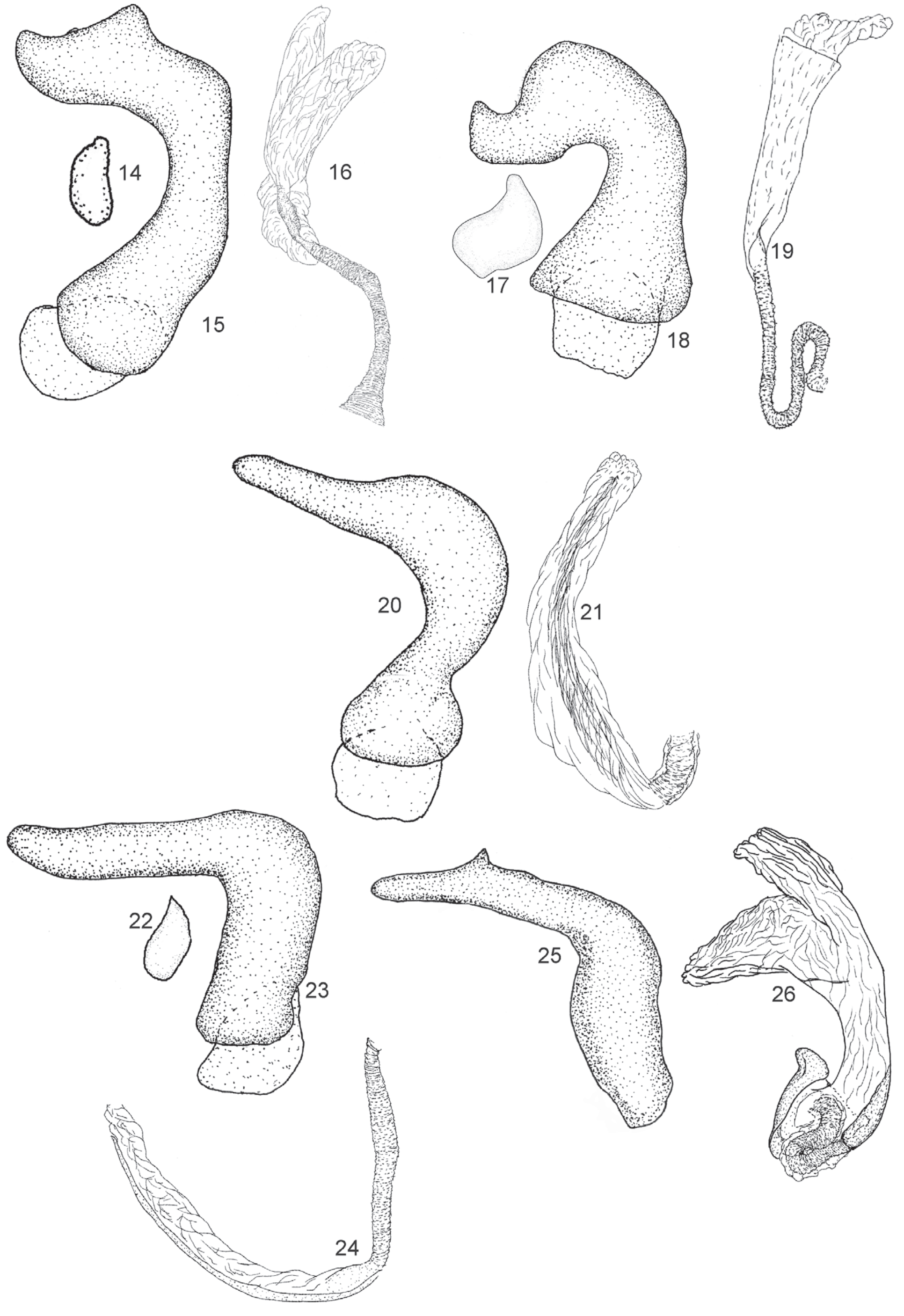
Fulvius flavicornis Poppius, 1909: 30, 34, 44; Bergroth 1920: 76; Carvalho 1957: 17, 1980: 644; Schuh 1995: 27; Sadowska-Woda 2005: 102; Gorczyca 2006: 35.

Diagnosis. Eyes contiguous with pronotal collar (Figs 4, 5); antennal segment II yellow, except basal one sixth brownish (Figs 4, 5); basal and apical portions of corium and apex of clavus yellow (Figs 4, 5); left paramere with apical process and paramere body forming obtuse angle, paramere body strongly narrowed medially, broadened apically, apical process elongated, broadened basally, weakly tapering toward apex (Figure 20).

Remarks. *Fulvius flavicornis* is most similar to *F. subnitens* and *F. tumidipennis* in sharing a yellow patch on the base and apex of the corium and apex of clavus, and the left paramere apical process elongate. *Fulvius flavicornis* can be distinguished by the coloration of antennal segment II and by the male genitalia.

Redescription. Female. **Coloration** (Figs 4, 5). Dorsum dark brown, with yellowish areas. ***Head***. Dark brown; antennal segment I brownish basally then dark yellowish; segment II yellow, with narrow, brown annulation basally; segments III and IV dark brown; rostrum yellow brown. ***Thorax***. *Pronotum*. Dark brown. *Thoracic pleura*. Dark gray brown. *Hemelytron*. Dark fuscous, embolium, corium, and clavus yellow basally and apically; cuneus dark brown; membrane dark gray. *Legs*. Forecoxae yellow at basal half, then brownish; remaining segments of each leg missing. ***Abdomen***. Brownish tinged with indistinct, yellow patches. **Structure and vestiture** (Figs 4, 5). Dorsal surface covered with relatively dense and long setae. ***Head***. Eyes contiguous with pronotal collar.

Male. Similar to ♀ in coloration, texture, and vestiture. ***Thorax***. *Legs*. Tibiae, femora and tarsi dark brown with dirty yellowish areas. **Male genitalia** (Figs 20, 21). *Left paramere* (Figure 20). Apical process broadened on basal one third, thin, tapering toward apex on apical two thirds; paramere body broadened basally and apically, narrowed medially. *Aedeagus* (Figure 21). Membranous, secondary gonopore undifferentiated.



Figures 14–26. Male genitalia of *F. bifenestratus* (**14–16**), *F. henryi* (**17–19**), *F. flavicornis* (**20, 21**), *F. subnitens* (**22–24**), and *F. tumidipennis* (**25, 26**) **14, 17, 22** right paramere (dorsal view) (**15, 18, 20, 23, 25**) Left paramere (left lateral view) (**16, 19, 21, 24, 26**). Endosoma (left lateral view).

Measurements. ♀/♂ (holotype measurements first). *Body*. Length 4.4/3.7, width 1.5/1.1. *Head*. Length of head 0.6/0.5, width 0.5/0.5, interocular distance 0.24. *Antenna*. Length of segment I 0.5/0.5, II 1.2/0.9, III 0.6 (♂, missing in ♀), IV 0.7 (♂, missing in ♀). *Labium* (♀, immeasurable in ♂). Length of segment I 0.7, II 0.9, III 1.1, IV 0.5. *Pronotum*. Length of pronotum 0.6/0.5, length of anterior margin 0.5/0.5, lateral margins 0.7/0.6, posterior margin 1.3/1.3.

Biology. Unknown.

Distribution. Indonesia (Sumatra: Sirambas).

Type material. Holotype ♀: INDONESIA: SUMATRA, SI-RAMBÉ, XII.90 – III.91, E. MODIGLIANI; Museo Civ. Genova; *Fulvius flavicornis* n. sp.; HOLOTYPUS, *Fulvius flavicornis* B. Poppius, 1909 (MCSN).

Additional examined material. ♂: MALAYSIA: W. Perak, 40 km SE of IPOH, 900 m, Banjaran Titi Wangsa, RINGLET, 29.iii.15.iv 2004, Čechowsky Petr lgt. (NHMW).

Fulvius henryi Wolski, Gorczyca & Yasunaga, sp. n.

http://zoobank.org/13E7A938-0685-427B-9F26-02CE8680CF3B
Figs 6, 17–19

Fulvius unicolor: Carvalho and Lorenzato 1978, nec Poppius 1909: 29, 36.

Diagnosis. Eyes removed from pronotal collar (Figure 6); corium entirely dark brown, without pale areas (Figure 6); left paramere stout, paramere body strongly curved, broadened basally and apically, apical process short, broadened apically (Figure 18).

Remarks. *Fulvius henryi* is most similar to *F. bifenestratus* and *F. bimaculatus* in having the corium with short and sparse setae, lacking a pale patch over the cuneus, and in having the apical process of the left paramere short and broadened (Figs 15, 18; Carvalho and Lorenzato 1978: fig. 49). It can be distinguished by lacking a large yellow patch near the base of the corium and the shape of the male genitalia.

Description. Female. **Coloration** (Figure 6). Dorsum uniformly dark brown. ***Head***. Dark brown; antenna dark brown; labium brown to dark brown. ***Thorax***. *Pronotum*. Dark brown. *Mesoscutum and scutellum*. Dark brown. *Thoracic pleura*. Proepimeron, mesepisternum and mesepimeron brown. *Hemelytron*. Dark brown; membrane brown to dark brown, venation brown. *Legs*. Coxae brown to dark brown; femora chestnut, sometimes slightly tinged with red apically; tibiae brown, slightly paler than femora; tarsi brown to pale brown, long. ***Abdomen.*** Chestnut to dark brown. **Structure, texture, and vestiture** (Figure 6). Dorsum covered with short, fine, pale setae. ***Head***. Antennal segment II almost cylindrical, covered with dense, short setae.

Male. Similar to female in structure, texture, and vestiture. **Male genitalia** (Figs 17–19). *Right paramere* (Figure 17). Irregularly shaped; apical process short and thin; paramere body ovoid. *Left paramere* (Figure 18). Apical process curved and broadened basally, thin, nearly cylindrical apically, convex on dorsal surface of extreme apex; paramere body broadened on basal half, thin on apical half. *Aedeagus* (Figure 19). Endosoma membranous, thin, broadened toward apex.

Measurements. ♀/♂ (* holotype measurements). Body length 4.2–4.50*/3.8, width 1.4–1.5*/1.2. *Head*. Length 0.6–0.7*/0.4, width 0.6/0.5, interocular distance 0.2/0.2. *Antenna*. Length of segment I 0.6/0.6, II 1.07/1.0, III 0.7. Labium. Length of segments I 0.6, II 0.7, III and IV together 1.4. *Pronotum*. Length 0.5/0.5, width of anterior margin 0.6, length of lateral margin 0.7–0.70*, width of posterior margin 1.2–1.2*/1.0.

Distribution. Papua New Guinea, including New Britain and New Ireland.

Etymology. It gives us great pleasure to dedicate this new species to Dr. Thomas J. Henry on the occasion of his 70th birthday and for his many outstanding contributions to the study of Heteroptera.

Type material. Holotype (♀): PAPUA NEW GUINEA: New Britain, Gazelle Pen., Mt. Sinewit, 5–9. XI. 1962; J. Sedlacek, Malaise Trap, Bishop (US); paratype (♀): New Britain, Gazelle Pen., Mt. Sinewit, 10. XI. 1962; Light Trap, J. Sedlacek, Bishop; *Fulvius unicolor* Popp. det. J.C.M. Carvalho 19; paratype (♀): New Britain, Gazelle Pen., Mt. Sinewit, 5- 10. XI. 1962; J. Sedlacek Collector, Bishop; *Fulvius unicolor* Popp. Det. J.C.M. Carvalho 19; paratype (♀): New Britain, Gazelle Pen., Mt. Sinewit, 900 m, 5–9. XI. 1962; J. Sedlacek, Malaise Trap, Bishop; *Fulvius unicolor* Popp. det. J.C.M. Carvalho 19 (US); paratype (♂): Papua New Guinea: New Britain, Gazelle Pen., Mt. Sinewit, 5–9. XI. 1962; J. Sedlacek, Malaise Trap, Bishop; Carvalho to Drake coll. 1993; paratype (♂): New Britain, Gazelle Pen., Upper Warangoi, Illugi, 25-26.XI.1962; J. Sedlacek, Malaise Trap, Bishop; Carvalho to Drake coll. 1993; paratype (♀): New Irland (SW), Ridge above "Camp Bishop" 15 km up Kait R. 250-500 m, VI.12.1956; E. J. Ford, Jr. Collector; Carvalho to Drake coll. 1993; paratype (♀): New Guinea: NE, Finisterre Range, Saidor, Kiambavi Vill., VII-22-29.1958; W. W. Brandt Collector Bishop; paratype (♀): NE New Guinea: Umboi I, c8km, WNW Lab Lab., 300 m, 8-19.II.1967; G.A. Samuelson Light trap, Bishop; Carvalho to Drake Coll. 1993 (USNM).

Fulvius subnitens Poppius, 1909

Figs 7, 27–34, 22–24, 40

Fulvius subnitens Poppius 1909: 30, 34, 44; Bergroth 1920: 77; Carvalho 1957: 19, 1980: 644, 1980: 652; Carvalho and Lorenzato 1978: 139, figs 58–61, 89; Schuh 1995: 29; Gorczyca 2000: 53, 65, 83, 2002: 21; 2006: 41; Sadowska-Woda and Gorczyca 2003: 336; Sadowska-Woda, 2005: 24, 29, 67, 93, 106, 170, 171, 172, tab. 3, Fig. 6, tab. 37, Figs 1–4A, B, tab. 44, Fig. 1A, B, tab. 48, Fig. 1A, B; Sadowska-Woda et al. 2008: 414, 415; Henry et al. 2011: 128, 129, 133, 134 (Figs 5, 6); Yasunaga 2017: 51 (Fig. 1).

Fulvius sauteri Poppius (synonymized by Gorczyca 2006: 41): Poppius 1915: 50; Bergroth 1920: 77; Carvalho 1957: 19, 1980: 652; Gaedike 1971: 151; Schuh 1995: 29; Kerzhner and Josifov 1999: 8; Kerzhner and Schuh 2001: 269.

Fulvius nakatai Yasunaga & Miyamoto (synonymized by Yasunaga and Wolski 2017): Yasunaga and Miyamoto 2006: 722, 731 (Fig. 5F–H); Yasunaga and Wolski 2017: 588–590 (Figs 1H, 2D).

Diagnosis. Eyes contiguous with pronotal collar (Figs 7, 28, 40); antennal segment II dark brown with large, yellow annulation apically Figs 7, 28, 40); corium covered with dense setae, with distinct pale patches basally and apically (Figs 7, 28, 40); left paramere with apical process and paramere body forming right angle, paramere body and apical process nearly cylindrical, apical process elongate and weakly narrowed apically (Figure 22).

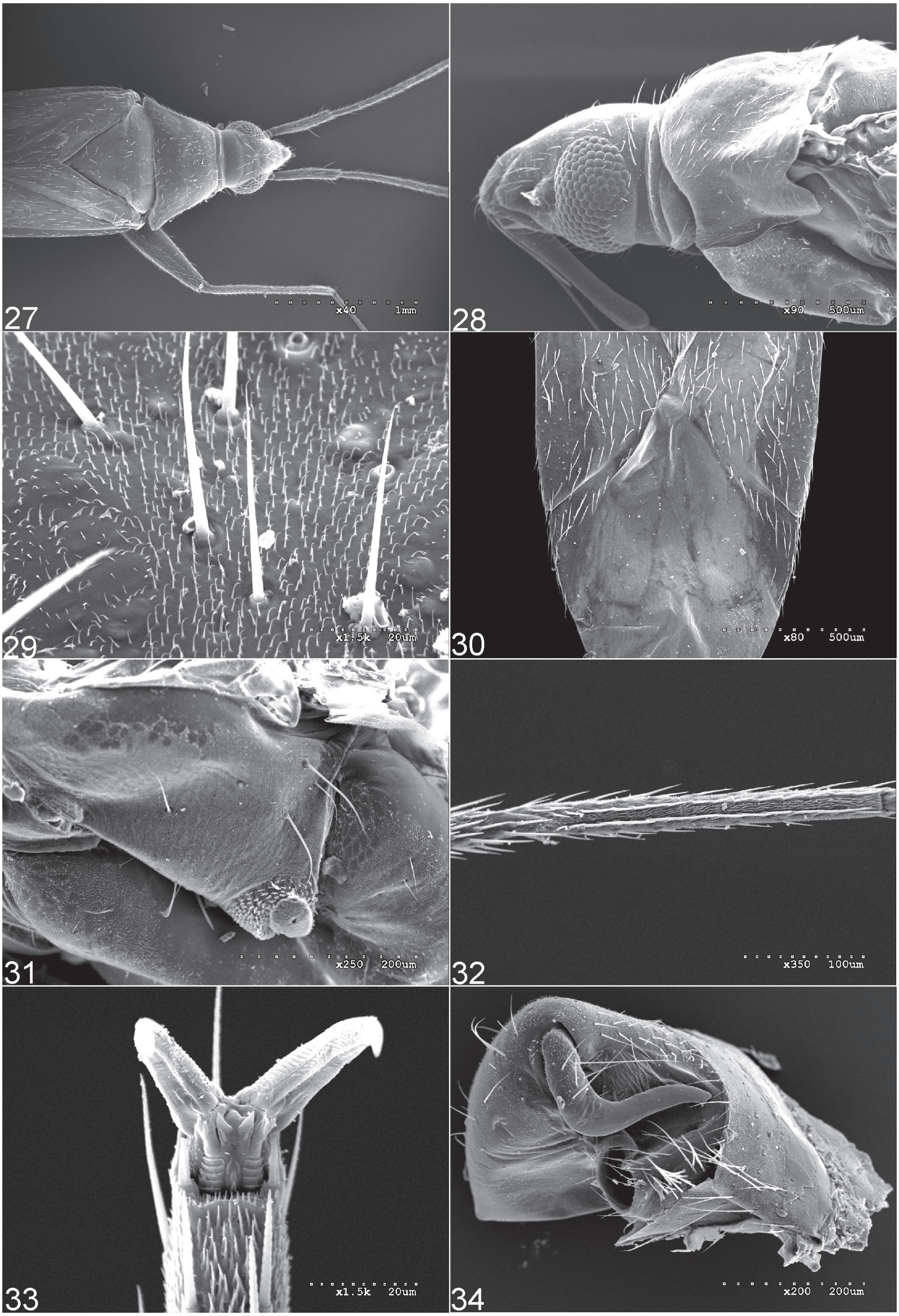
Remarks. *Fulvius subnitens* is most similar to *F. flavicornis* and *F. tumidipennis* in having the corium with a pale patch basally (Figs 5, 6, 9, 40), but it is distinguished by the structures of the male genitalia.

Biology. Unknown. Adults have been collected at light traps and from rotten logs.

Distribution. Brunei (Temburong), Fiji, Indonesia (S. Sulawesi: Bogani Nani Wartabone National Park; Bali: Ubud), Japan (Okinawa Island), E. & W. Malaysia, Papua New Guinea, Samoa, Seychelles (Mahe I), Solomon Islands, Taiwan, Thailand (Nakhon Ratchasima), Tanzania, USA (Virginia) (Gorczyca 2006; Henry et al. 2011; Yasunaga and Wolski 2017).

Type material. Lectotype ♂ (designated by Carvalho and Lorenzato 1978): PAPUA NEW GUINEA, Mer., Bujakori, 1890; *Fulvius subnitens* Poppius; Museum Zool. Helsingfors, type no. 9993, (ZMHU); paralectotype (?): N. Guinea, Biró; Stephansort, Astrolabe Bay; *Fulvius subnitens* n. sp., B. Poppius det; Typus (HNHM).

Additional material examined. ♀ and ♂: MALAYSIA: Sarawak, Skrang River, 30 km upstream, 15 VII 92, Heiss; ♂: MALAYSIA, Pengang on *Hevea* sp. XI 84, Heiss; 8 ♀♀ and ♂: 125W. v. light; BRUNEI: Temburong District, ridge NE of Kuala Belalong, approx. 300 m alt., October 1992, J H Martin coll., B M 1992 – 172; 2 ♂♂: MALAYSIA: Kedah, Pulau Langkawi NW, Datai Rainforest, 2–10 XI 2002, E.Heiss; Sammlung-Collection Ernst Heiss Innsbruck-Austria; sp. 3; ♀: INDONESIA, Central BALI, Ubud, Maya Hotel LF, 4 XI 2005, E. HEISS; Sammlung-Collection Ernst Heiss Innsbruck-Austria (TLI); ♂: 26 XII 1994, Malays, Pahang Rov. Kulala Lipis; Dr. Wolfgang G. Ullrich collection (US); 2 ♀♀: MALAYSIA: Sarawak, Mulu NP., 3.-5. 3., 1993; leg. H. Zettel (14); (d) Benarat Inn, am Licht, 3.-5. 3 (NHMW); 5 ♂♂: at light; INDONESIA: Sulawesi Utara [= South Sulawesi], Dumoga-Bone N. P., 13 February 1985; site 8, 540 m, Tompah Transect, J. D. Holloway; R. Ent. Soc. Lond, Project Wallace, B. M., 1985 - 10; ♂: same locality, 13 February 198:?; site 8, 540 m, Tompah Transect, J. D. Holloway; R. Ent. Soc. Lond, Project Wallace, B. M., 198510; ♂: Edw. Jacobson, Gun. Teleman, Sum. 1917 all housed in NHMUK; 3 ♀♀ and ♂: at light (1 ♀: under bark); Indonesia: Sulawesi Utara, Dumoga Bone N. P., February; Sites 10 + II. 1040 m., Tumpah Transect, J. D. Holloway; R. Ent. Soc London., Project Wallace, B. M. 1985-10 (NHMUK); 3 ♀♀ and 3 ♂♂: Sungai Segama, W. side suspension bridge, 150m, 30.XI.1989; BORNEO: Sabah, DANUM VALLEY, 70 km W Lahad Datu, M.J. & J.P. Duffels; sample Sab. 49, under storey secondary growth/canopy river-



Figures 27–34. Scanning electron micrographs of *Fulvius subnitens*: **27** Dorsal view **28** Head and thoracic pleura (left lateral view) **29** Texture and vestiture of frons **30** Structure, texture, and vestiture of hemelytron **31** Metepisternum **32**. Metatarsus **33** Pretarsal structure **34** Pygophore.

ine rainforest at light; ♀: Nature Trail 150 28.XI.1989; MALAYSIA: Sabah, DANUM VALLEY, 70 km W Lahad Datu, M.J. & J.P. Duffels; sample Sab. 44 open area in primary rainforest; understorey/canopy, at light; ♀: Sungai Segama, W. side suspension bridge, 150m, 10.XII.1989; MALAYSIA: Sabah, DANUM VALLEY, 70 km W Lahad Datu, M.J. & J.P. Duffels; sample Sab. 62, understorey secundary growth/canopy riverine rainforest at light; 5 ♀ and 2 ♂: MALAYSIA, Sarawak, 10–19 March 1994, Kapit. distr. Sebong env., Baleh riv., P. Bilek lgt.; EX COLLECTIO Z. JINDRA, PRAGUE (ZJPC); 1 ♀: INDONESIA, Irian Jaya, Kota Biak, 12.xii.2006, S. Bílý lgt.; COLLECTIO NATIONAL MUSEUM, Praha, Czech Republic (NMPC); ♀ and 2 ♂: 1 ♀♀: THAI: Nak. Ratchasima Sakaerat Forest R.S., 14°30'N, 101°55'E, 400 m, LT, 15 Sep 2008, T. Yasunaga; 3 ♀: THAILAND: Nakhon Ratchasima, Sakaerat Environ. R. S., 14°30'N, 101°55'E, 400 m, LT 12–14.vi.2009, Yasunaga & Yamada (TYCN).

Fulvius thailandicus Gorczyca in Sadowska-Woda & Gorczyca, 2003

Figure 8

Fulvius thailandicus Gorczyca in Sadowska-Woda and Gorczyca 2003: 336, figs l-5; Sadowska-Woda 2005: 24, 26, 93, 106, tab., 8, Fig. 5, tab. 9, Fig. 6, tab. 12, Fig. 3A, B, tab. 13, Fig. 3A, B, tab. 48, Fig. 2A, B; Gorczyca 2006: 42.

Diagnosis. Eyes contiguous with pronotal collar (Figure 8); antennal segment II dark brown with broad, yellow annulation apically (Figure 8); corium covered with dense setae, with yellow-orange patch above cuneus (Figure 8); male genitalia as in Sadowska-Woda and Gorczyca (2003: figs 2–4).

Remarks. *Fulvius thailandicus* is most similar to *F. constanti*, *F. flavicornis*, *F. subnitens*, and *F. tumidipennis* in having the eyes contiguous with the pronotal collar (Figs 5–7, 9), the corium covered with dense setae and a pale patch above the cuneus (Figs 5–7, 9), and the apical process of the left paramere elongate (Figs 20, 22, 25). *Fulvius thailandicus* can be distinguished by the orange patch above the cuneus and structures of the male genitalia.

Biology. Unknown.

Distribution. Thailand (Chiang Mai Province).

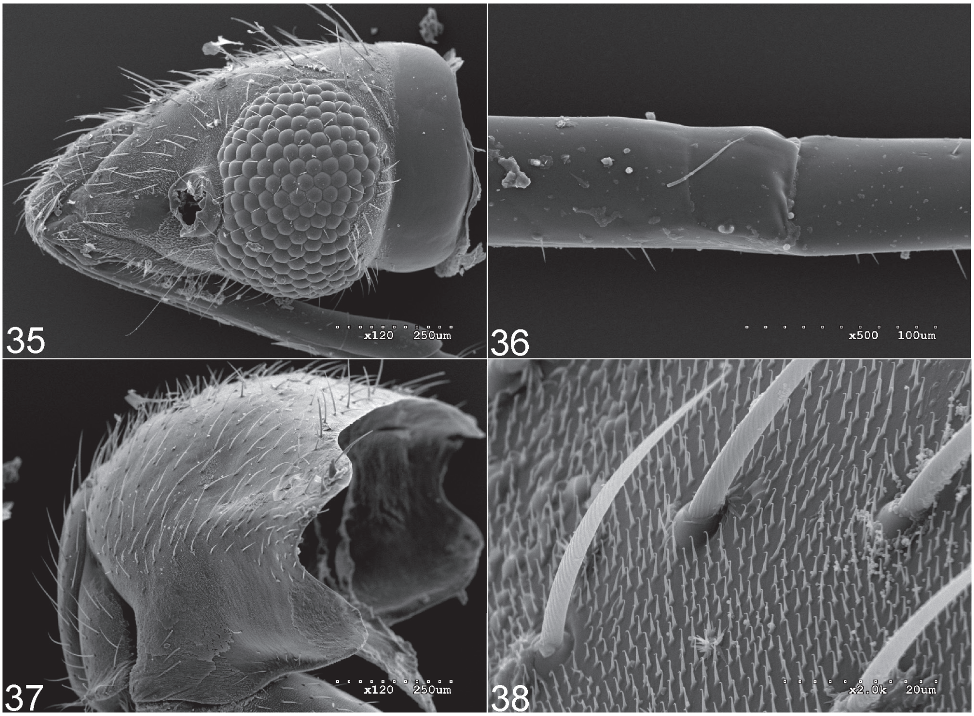
Type material. Holotype ♂: THAILAND, Doi Suthep – DoiPui natn. Park, Doi Pui road, 1000 m, 23–26. x. 1979, Zool. Mus. Copenhagen Exped.; **paratype** ♂: the same data as holotype (ZMUC).

Fulvius tumidipennis Wolski, Gorczyca & Yasunaga, sp. n.

http://zoobank.org/5F18A418-B185-4BF2-84FC-8BC75781B6F9

Figs 9, 25, 26, 35–38

Diagnosis. Eyes contiguous with pronotal collar (Figure 9); corium covered with dense setae, with yellow patches basally and apically (Figure 9). Male genitalia as in Figs 25, 26.



Figures 35–38. Scanning electron micrographs of *Fulvius tumidipennis*. **35** Head (left lateral view) **36** Subdivision of labial segment II **37** Pronotum **38** Texture and vestiture of pronotum.

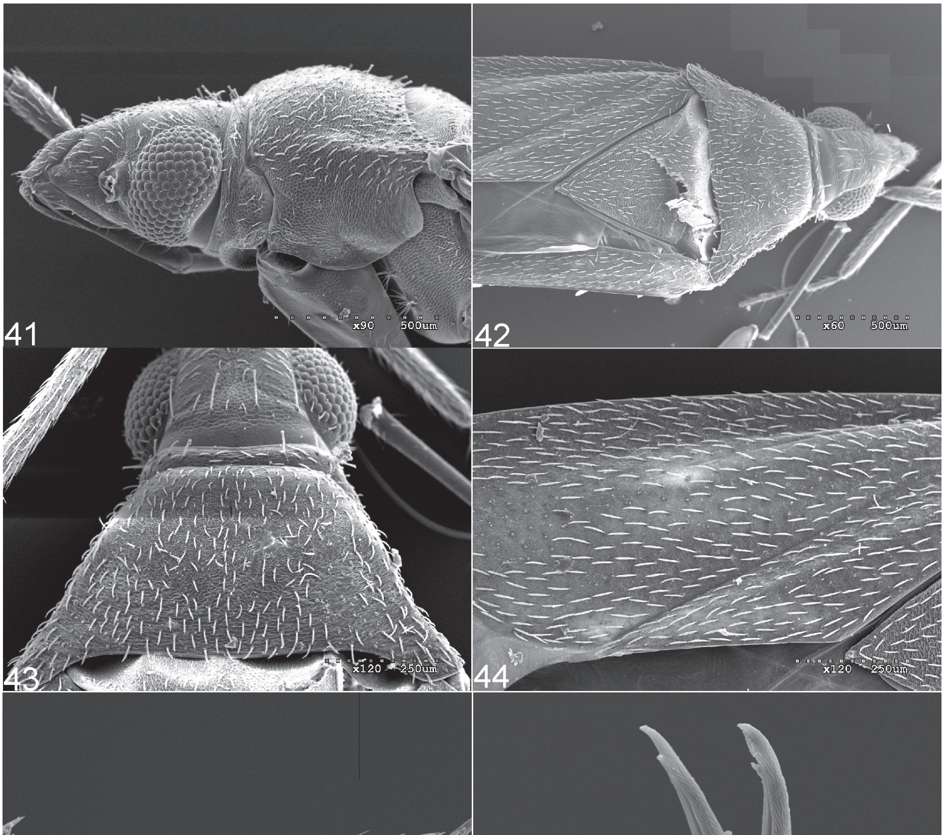
Remarks. *Fulvius tumidipennis* is most similar to *F. flavicornis* and *F. subnitens* in having a yellow patch basally and apically on the corium (Figs 5–7), but it can be distinguished by the structures of the male genitalia.

Description. Male. **Coloration** (Figure 9). Dorsal surface varying from brown to dark brown, with yellow and orange areas. ***Head***. Dark brown; maxillary and mandibular plates sometimes slightly tinged with red; antennal segment I varying from reddish to dark brown; segment II dark brown, weakly tinged with red at basal one third, apical two thirds yellow; segments III and IV dark brownish; IV sometimes slightly yellowish apically; rostrum ranging from dark yellow to dark brown. ***Thorax***. *Pronotum*. Ranging from brown to dark brown, almost black. *Mesoscutum and scutellum*. Varying from brown to dark brown. *Thoracic pleura*. Ranging from brown, sometimes slightly tinged with red to dark brown. *Hemelytra*. Clavus and corium with yellow patch basally and apically; corium with orange patch apically, contiguous with orange patch on apex of embolium; cuneus ranging from brown to dark brown; membrane brownish, sometimes tinged with gray. *Legs*. Mostly dull yellowish, often tinged with red; coxae usually paler than remainder of leg, yellow, slightly darkened apically; femora dull yellowish, often tinged with red; tibia and tarsus yellow, rarely darkened. ***Abdomen***. Dark brown, usually tinged with yellow, rarely with red. **Structure and vestiture** (Figs 9, 35–38). Dorsal surface covered with dense, relatively long, almost decumbent setae. *Head*. Posterior margin of vertex with row of long, erect setae, present also on posterior

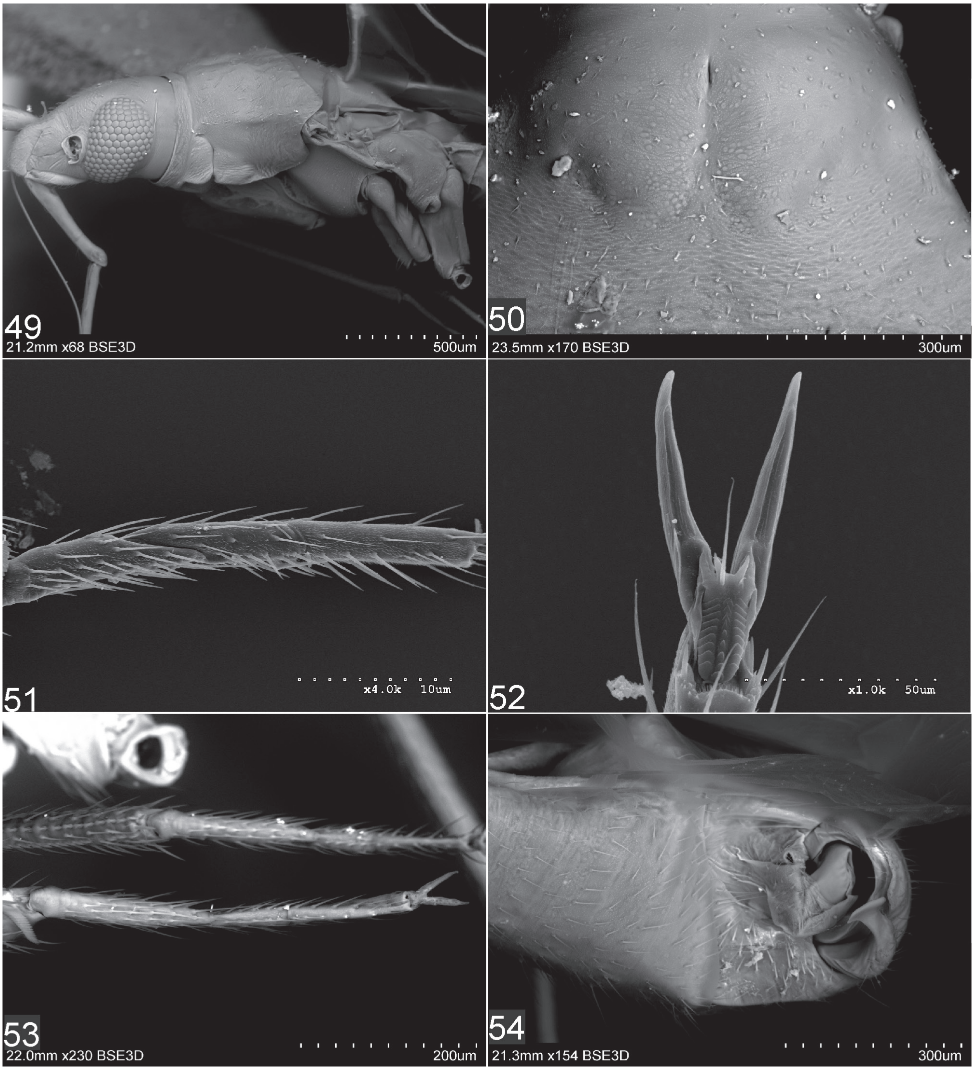
Figures 39–40. Live female adults of *Fulvius bifenestratus* (**39**) and *F. subnitens* (**40**) captured using UV light trap at Sakaerat Environmental Research Station, Thailand.

margin of each eye; eyes slightly removed from pronotal collar; antennae covered with dense, semidecumbent setae; rostrum distinctly surpassing half of abdominal length, sometimes reaching apex. ***Abdomen***. Apical portion of abdomen flattened ventrally. **Male genitalia** (Figs 25, 26). *Left paramere* (Figure 25). Apical process and paramere body forming obtuse angle; paramere body relatively thick, left margin convex in sinistrolateral view, arcuate, right margin weakly sinuate, concave; apical process when viewed sinistrolaterally with basal two thirds cylindrical and apical third weakly tapering toward apex, ventral margin with distinct subapical spine. *Aedeagus* (Figure 26). Endosoma tumid, membranous, divided into two, large lobes apically, sclerotized portion of *ductus seminis* inside endosoma relatively long, tapering toward apex.

Female. Similar to male in coloration, structure, texture, and vestiture.



Figures 41–48. Scanning electron micrographs of *anthocoroides* group of species of the genus *Fulvius*: *F. anthocoroides* Stål (**41, 45–47**), *F. pallens* Gorczyca (**42–44**), *F. urrlichi* Sadowska-Woda & Gorczyca: (**41**). Head and pronotum (left lateral view) **42** Head, pronotum, and hemelytron (dorsal view) **43** Head and pronotum (dorsal view) **44** Vestiture of hemelytron **45** Metatarsus **46** Pretarsal claw **47, 48** Male pygophore.



Figures 49–54. Scanning electron micrographs of *bisbistillatus* group of species of the genus *Fulvius*: *F. imbecilis* (**49–52**), *F. slateri* (**53**): **49** Head and pronotum (left lateral view) **50** Structure and vestiture of pronotum **51, 53** Metatarsus **52**. Pretarsal claw **54** Male pygophore.

Measurements. ♀/♂: body length 4.7–4.9/4.1–5.0, width 1.5–2.0/1.3–2.0. Head. Length 0.8–0.9/0.9, width 0.6–0.6/0.6, diameter of eye in dorsal view 0.2–0.2/0.2. Antenna. Length of segment I 0.6–0.6/0.74, II 1.2–1.3/1.4, III 0.9/0.8, IV (♀): 1.2. Labium. Length of segment I 0.8–0.9/0.8, II 1.12/1.0, III 1.1/1.2, IV 0.6/0.5. Pronotum. Length 0.6–0.7/0.56–0.6, width of anterior margin 0.5–0.5/0.3–0.5, length of lateral margin 0.8–0.8/0.7, width of posterior margin 1.2-1.2/1.1-1.2.

Etymology. The specific name is taken from the Latin *tumidus* (thickened) and is used to denote the distinctly thickened endosoma.

Biology. Unknown.

Distribution. Philippines (Mindanao).

Type material. Holotype ♀: P.I., PHILIPPINES: Mindanao, Davao, Genitalan, 8km NW OF Mt. Apo, 690m, 17.VIII.1958; jungle clearing; light trap, H.E. Milliron; paratypes: 2 ♀♀: P.I., MINDANAO, Agusan, Los Arcos, 19–23-XI-1959; Light Trap, L. Quate & C. Yoshimoto; ♂: P.I., MINDANAO, Mis. Or., Mt. Pomalihi, 21 km W. Gingoog City, 800–1000m, 11.x.1965; H.M. Torrevillas Collector BISHOP MUSEUM; ♀: P. I. Mindanao Z. DEL SUR, 11 km NW of Milbuk, 390m, 5.VIII.1958; Logging areas in jungle; H.E. Milliron Collector (BPBM).

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RESEARCH ARTICLE

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New genus and two new species of Hyaliodini from the Philippines (Miridae, Deraeocorinae)

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Abstract

Philicoris, a new genus of the mirid subfamily Deraeocorinae, tribe Hyaliodini, is described from the Philippines. New species *Philicoris mayon* **sp. n.** and *Philicoris palali* **sp. n.** from the island of Luzon are documented with photographic images of the dorsal habitus and male genital structures.

Keywords

Bicol Peninsula, biodiversity, Caraballo Mountain Range, Luzon Island, northern Philippines

Introduction

The island nation of the Philippines is home to a unique and highly endemic fauna, and as such is one of a small number of nations recognized globally as both a conservation biodiversity hotspot (Myers et al. 2000) and a megadiverse nation (Mittermeier et al. 1997). The capital city of Manila is on Luzon, a large island in the northern Philippines formed historically by the accretion of separate paleo-islands in the geological past (Adams and Pratt 1911; Rutland 1968; Hashimoto 1981a, b; Auffenberg 1988; Hall 1996; 1998; Yumul et al. 2009; Siler et al. 2011; Brown et al. 2013). It is assumed that the isolation and subsequent accretion of these precursor paleo-islands contributed to the evolutionary diversity found today (Brown et al. 1996, 2013; Brown and Diesmos 2009; Siler et al. 2011). However, our understanding of the impact Luzon's complex geography and distinct subfaunal regions had on the diversification of terrestrial species continues to be hampered by limited knowledge of distribution patterns of the islands vertebrate and invertebrate faunas (Siler et al. 2011; Brown et al. 2013). A resurgence in studies of Luzon's biodiversity, particularly for terrestrial vertebrates (reviewed by Brown and Diesmos 2009; Siler et al. 2011; Brown et al. 2013), has taken place over the last two decades. These studies have led to the discovery of several new species that appear restricted to volcanic peaks (i.e., Mts. Banahao, Isarog, Mayon; Heaney et al. 1999; Brown et al. 1995; Siler et al. 2017) or one of several distinct mountain ranges distributed across the island (i.e., Sierra Madres, Cordillera, and Caraballo Mountain ranges (Brown et al. 1996, 2012, 2013; Fuiten et al. 2011; Siler et al. 2009, 2013, 2014). Unfortunately, the diversity and distributions for members of many terrestrial organisms continue to be poorly understood throughout Luzon, including large gaps in our understanding of invertebrate diversity (Brown et al. 2013).

Diversity of Miridae in the Philippines remains unexplored for most of the major subfamilies and tribes. Within the eight currently recognized subfamilies and more than 11,130 species (Schuh 2013; Ferreira et al. 2015), only about 150 species are described from the Philippines (Schuh 2013). The island's known diversity, however, explodes with a focused descriptive effort. One of the first works on Miridae in the Indo-Pacific, which included the Philippines, was that of Poppius (1915), who described 20 species from the island. The next intensive work on Philippine mirids is Schuh's (1984) revision of the Indo-Pacific Phylinae, with 58 species recognized or described from the islands, including one endemic genus (*Abuyogocoris* Schuh). Almost all the material used in these descriptions was from general collecting expeditions in the Philippines in the 1960s; specimens are housed primarily in the Bishop Museum in Honolulu, Hawaii, and the American Museum of Natural History in New York (Schuh 1984). Since then, there has been little to no mirid-specific collecting on the islands, and few descriptions of new Philippine mirid taxa since the mid- to late 1980s (e.g., Schuh 1984; Stonedahl 1988).

During faunal surveys in 2016 and 2017, specimens of two unique taxa of Miridae in the subfamily Deraeocorinae were captured among low-lying scrubs adjacent to palm farms, one on the foothill of the Mt. Mayon volcano of the southern Bicol Peninsula of Luzon Island, and the other at mid-elevation on Mt. Palali in the Caraballo Mountain Range of central Luzon Island (Fig. 1). The two taxa represent new species and together with a new genus, possess a suite of diagnostic morphological features that readily differentiate them from other mirid diversity. Both species possess the pretarsus with the basal tooth on the claw, the smooth and punctate dorsal surface of the thorax and hemelytron that are consistent with the subfamily (Ferreira et al. 2015). The Deraeocorinae comprise the tribes Clivinemini, Deraeocorini, Hyaliodini, Saturniomirini, Surinamellini, and Termatophylini. Specimens of *Philicoris* have both the hyaline membrane and the wide emboliar margin of the corium (Ferreira et al. 2015), which is consistent with the Hyaliodini Carvalho and Drake. The genus

Figure 1. Topographic map of the Philippine archipelago, with island names provided for larger islands. Numeric labels for smaller islands correspond to inset key. Type localities on Luzon Island for *Philicoris mayon* sp. n. (Mt. Mayon) and *Philicoris palali* sp. n. (Mt. Palali) shown for reference.

Philicoris does not possess the elongate anal tube in both males and females (Ferreira et al. 2015), or the stridulatory structures on the embolium (Akingbohungbe 1979), but these characters are not consistent across all genera of the tribe (e.g., *Linnavuorista* Akingbohungbe). No genera of Hyaliodini are recorded from the Philippines (Schuh 2013), and we are unable to key the newly collected specimens to any known genera in Akingbohungbe's (1979) world key.

In this paper, external and internal genital features are used to demonstrate that both mirid populations on Luzon Island represent distinct evolutionary lineages (Wiley 1978; de Queiroz 1998, 1999) and are worthy of taxonomic recognition as members of a new genus in the tribe Hyaliodini. The recognition of these taxa represents the first records of the Hyaliodini in the Philippines. A new genus and two new species are described, technical images of key diagnostic traits provided, and its natural history, ecology, and geographic distribution are discussed. This manuscript was inspired by Dr. Thomas Henry, and this Festschrift article is dedicated to him. He never left a plant unsampled in fieldwork, and described hundreds of mirids across the world.

Materials and methods

All specimens were collected by KLM in 2016 and 2017 as part of Sam Noble Oklahoma Museum of Natural History expeditions to the Philippines in conjunction with the National Science Foundation Grant (NSF IOS 1353683) to CDS. As part of the Memorandum of Agreement with the Philippines, all specimens are temporarily deposited at the Sam Noble Oklahoma Museum of Natural History, Norman, Oklahoma, United States (OMNH).

Stacked habitus photos were taken at the Sam Noble Museum Invertebrate Paleontology Stacking Photography Lab. Color photos and illustrations were edited using Adobe Photoshop CS4 and numbered in Adobe Illustrator CS4. Helicon Focus v4.2.9 software was used for all image stacking.

Scanning Electron Micrographs (SEM) were taken at the Samuel Roberts Noble Microscopy Laboratory at the University of Oklahoma. Dried specimens attached to paper points were removed from the pins, and the points used as mounts to attach to aluminum stubs with carbon conductive tape. The stubs and specimens were then coated with gold/palladium and examined with a Zeiss NEON 40 EsB SEM or a LEO 1450VP SEM.

Terminology for male genitalia follows Cassis (2008). Genitalia were extracted by soaking the abdomen in 85% lactic acid solution for one to a few days at room temperature, and then washing with distilled water before being dissected in glycerol. Images of the male genitalia were taken using an Olympus CX31 compound microscope with an Olympus 5MP CCD Camera using Cellsens Software. Helicon Focus v4.2.9 software was used for all image stacking.

Measurements were taken using an eyepiece micrometer (10mm/100×) on an Olympus SZX2 stereomicroscope following the methodology of Schuh (1984). Measurements include the body length (clypeus to cuneus), pronotum length (anterior margin to posterior margin), second antennal segment length, head width (distance between lateral margins of the eyes), pronotum width (width at widest point along the posterior margin), width at the widest point of the hemelytra, and interocular distance. All measurements are in millimeters.

Taxonomy

Philicoris gen. n.

http://zoobank.org/FCC6FDF2-7C71-4F59-9C4E-9F78C26414CE

Figs 2–5

Type species. *Philicoris mayon* by original designation.

Included species. *Philicoris mayon* sp. n., *Philicoris palali* sp. n.

Diagnosis. Recognized by trapezoidal and convexly rounded pronotum, shiny dorsum with punctation on pronotum and distinct rows of punctures along clavus and corium of hemelytron, wide emboliar margins, and shape of male genitalia.

Description. *Male.* Coloration. *Head:* tan to light yellowish brown, clypeus and labrum dark brown; labium basally yellow and dark brown apically; first antennal segment dark brown, basally dark brown, transitioning to tan or orange to light brown distally with dark brown apices, second antennal segment contiguously tan or yellow transitioning to reddish brown then dark brown at distal apex, third antennal segment tan or white basally transitioning to dark brown distally, fourth antennal segment tan or dark brown. *Thorax:* collar tan or yellowish brown, pronotum tan or light yellowish brown, calli tan with posterior margin with lighter yellow macula or orange tinge along margin, mesoscutum brown with lateral yellow macula or light yellowish brown, scutellum dark brown medially and light whitish green along majority of lateral margins or light yellowish brown, lateral sclerites of thorax same coloration as pronotum or darker, scent gland and evaporative area same color as lateral sclerites or contrastingly whitish, procoxae light yellow or orange-brown, remaining coxae light brown apically and yellowish or orange-brown distally, femora tan or light yellowish brown with two orange-red stripes on preapical distal margins, and tibiae tan or orange and light yellowish brown basally, tarsomeres tan or light yellow. *Hemelytra:* embolium tan or light yellowish brown with orange tinge, cuneus tan or light yellowish brown with orange tinge, lateral margins of corium tan or light yellowish brown transitioning to light brown, clavus dark brown with light tan area along anterior one-third margin or with corium completely dark brown, membrane light brown to beige with orange-brown or beige veins. *Abdomen:* tan with dark brown anterior and posterior surfaces or completely-orange brown, gonopore tan or orange-brown. **Surface and vestiture:** *Head:* smooth and shiny, clothed with simple setae, antennal segments covered with dense simple setae of uniform length. *Thorax:* collar and calli smooth, remaining surface of pronotum punctate, covered with simple setae, scutellum and lateral sclerites of thorax with simple setae. *Hemelytra:* simple setae covering hemelytral surface, hemelytra surface shiny with dense punctuation in regular rows on clavus and corium, dorsal surface of emboliar margins and cuneus smooth. *Abdomen:* clothed with simple setae. **Structure:** *Head:* wider than high, clypeus not visible in dorsal view, frons convex, vertex flat, declining posteriorly towards anterior pronotal margin, eyes relatively large, taking up most of head in lateral view, dorsal surface confluent with vertex, posterior margin removed from anterior margin of pronotum, interocular width either greater than or less than width of single eye, first antennal segment length wider than interocular distance, less than half length of second segment, second antennal segment longest, apically narrower than first segment, distally widening to width equivalent to first, antennal segments three and four half width of antennal segment one, individually nearly equidistant in length to segment one; apex of labium extending to metacoxae. *Thorax:* pronotal collar narrow and rounded, dorsal surface of pronotum convexly rounded, anterior and posterior portions of pronotum not demarcated, pronotum trapezoidal with nearly straight lateral margins, calli fused into single weakly protruding plate surrounded by weakly defined rows of punctures, posterior margin of pronotum straight, mesoscutum mostly hidden or not visible, scutellum tumid, metathoracic scent gland relatively large, taking up greater than half area of metathoracic sclerite (Fig. 3A), femoral length equivalent and approximately four-fifth length of tibiae, metafemora greatest in width, medial width widest medially, tibial length nearly equivalent to emboliar length, third segment of pretarsus longest, pretarsal claws with basal tooth (Fig. 3B), parallel hair-like parempodia, lacking pulvilli. *Hemelytra*: weakly transversely rounded, lateral margins straight or weakly concave with wide embolium, cuneus longer than wide, bent ventrally at fracture, membrane with two visible veins forming two cells, larger cell length greater than one half total length of membrane. *Abdomen:* shorter than half total body length, relatively narrow, width tapering to gonopore. *Genitalia:* Endosoma primarily membranous with two spicules apically, preapical secondary gonopore and several membranous apical lobes (Figs 4A, 5A), phallotheca thin and simple, left paramere tall and crow-bar shaped, sometimes with basal spine projecting perpendicularly to base (Figs 4C, 5C), right paramere small, leaf-shaped, sometimes with apical bifurcation (Figs 4B, 5B).

Female. Similar to males in coloration, surface and vestiture. Interocular distance greater in females, width of pronotum sometimes wider. *Genitalia*: not dissected.

Etymology. The generic name is derived from the country of their discovery (Philippines) and “coris,” meaning bug in Latin. The gender is masculine.

Hosts. Asteraceae.

Distribution. Luzon Island, Philippines.

Discussion. The combination of the basally toothed claw, the relatively wide embolium along the lateral margins of the hemelytron, the shiny and punctate pronotum and hemelytron, and the membranous endosoma clearly place this genus in the Hyaliodini as it is currently defined. Both species also have two apical endosomal spicules and multiple membranous lobes that correspond to other members of Deraeocorinae and Hyaliodini (Akingbohungbe 1979).

Philicoris is similar to the Neotropical genus *Antias* Distant in size and lacks a demarcation between the anterior and posterior portions of the pronotum but instead is tumid, and the hemelytron is not completely hyaline lines (Carvalho 1982). The calli are also not well developed. Unlike *Antias*, however, *Philicoris* has a smooth membrane without any setae, the eyes do not cover the entire area of the head in lateral view, and *Philicoris* has rows of punctation on the surface of the corium, embolium and claval suture lines. *Philicoris* also differs from the African genera *Obudua* Linnavuori and *Linnavuorista* Akingbohungbe by the lack of a narrowed anterior margin, the former by the lack of distinctly swollen calli, and from the latter by lacking a distinct apical spur on the metafemur. The Palearctic and African genus *Stethoconus* Flor also differs from *Philicoris*; the latter lacks an anterior constriction to the pronotum, has a narrow collar, and has a relatively concolorous pronotum and hemelytron versus the highly patterned *Stethoconus*. For these reasons, we argue that this taxon represents a new genus.

Philicoris mayon **sp. n.**

http://zoobank.org/C830548D-70EE-4749-902B-CC8F3D0DCA92
Figs 2–4

Holotype. Adult male (OMNH 7804) collected by K. Menard during daytime surveys on 04 March 2016, on the foothills of Mt. Mayon, Sitio Nagsipit, Barangay Mariroc, Municipality of Tabaco, Albay Province, Luzon Island, Philippines (13.3056'N, 123.687'E; datum = WGS84; 399 m elevation).

Paratypes. One adult male (OMNH 7803) and one female (OMNH 7805), collected during daytime surveys on 11 March 2016, on the foothills of Mt. Mayon, Sitio Nagsipit, Barangay Mariroc, Municipality of Tabaco, Albay Province, Luzon Island, Philippines (13.30563'N, 123.6896'E; datum = WGS84; 382 m elevation).

Diagnosis. Distinguished from its congener by the following combination of characters: (1) reddish orange coloration on lateral margins of hemelytron and legs; (2) extensive and defined rows of punctuation; (3) interocular distance relatively narrow; and (4) endosomal spicules weakly sclerotized.

Description. ***Male.*** **Coloration.** *Head:* light yellowish brown, clypeus and labrum dark brown; labium yellow basally and dark brown apically; first antennal segment light orange-brown with dark brown apices, second antennal segment yellow transitioning to reddish brown then dark brown at distal apex, third antennal segment white basally, dark brown distally, fourth segment completely dark brown. *Thorax:* light yellowish brown, punctures orange-brown, collar lighter yellow, margins of calli more orange, mesoscutellum and scutellum light yellowish brown as pronotum, lateral sclerites of thorax same coloration as pronotum or darker brown, scent gland with same coloration as lateral sclerites, coxae and trochanters light orange-brown, femora light yellowish brown with two orange-red stripes on preapical distal margins, tibiae orange basally and light yellowish brown distally, tarsomeres light yellow. *Hemelytra:*

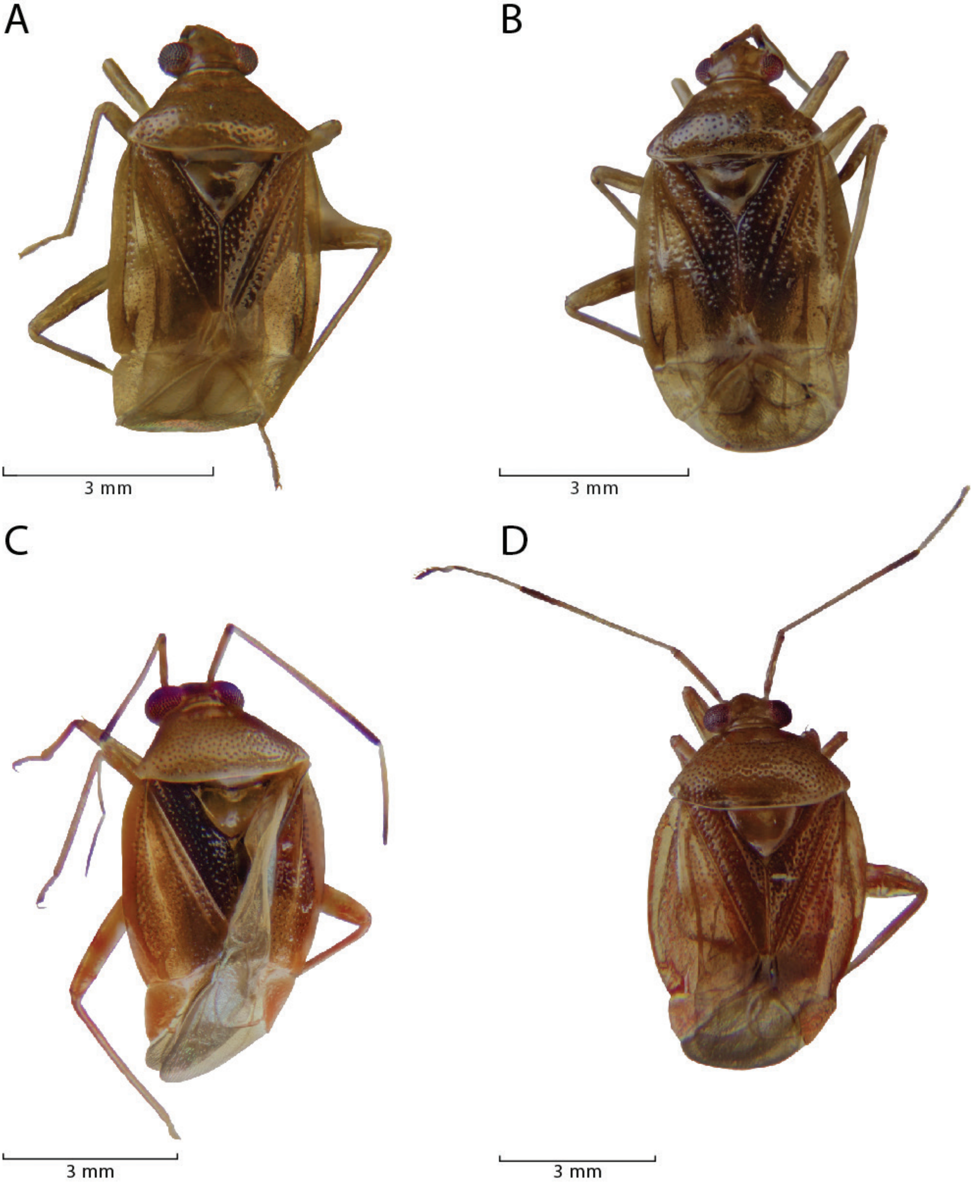

Figure 2. Dorsal habitus images of *Philicoris mayon* sp. n. (**A** male OMNH 66500; **B** female OMNH 66501) and *Philicoris palali* sp. n. (**C** male OMNH 7804; **D** female OMNH 7805).

light yellowish brown with orange tinge, orange tinge most predominant along emboliar margins and cuneus, clavus darker orange-brown to dark brown, corium darker yellowish brown, membrane pale brown with orange veins. *Abdomen:* orange-brown. **Surface and vestiture:** *Head*: smooth and shiny, clothed with dense simple setae, antennal segments covered with simple setae of uniform length. *Thorax:* collar and calli smooth, remaining surface of pronotum punctate, covered with dense simple setae,

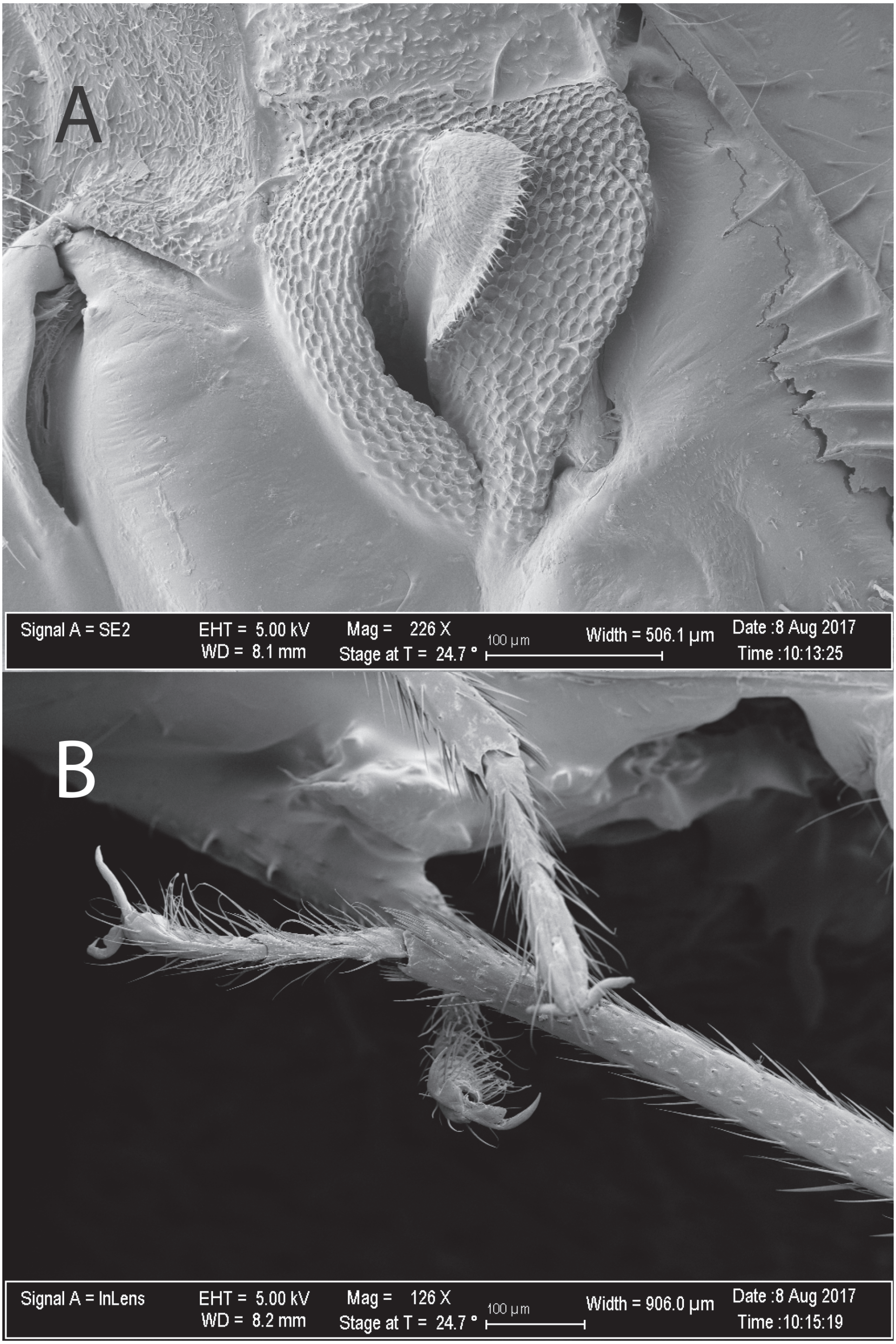

Figure 3. Scanning Electron Micrographs of *Philicoris mayon* sp. n. visualizing the **A** scent gland evaporative area, and **B** the pretarsus.

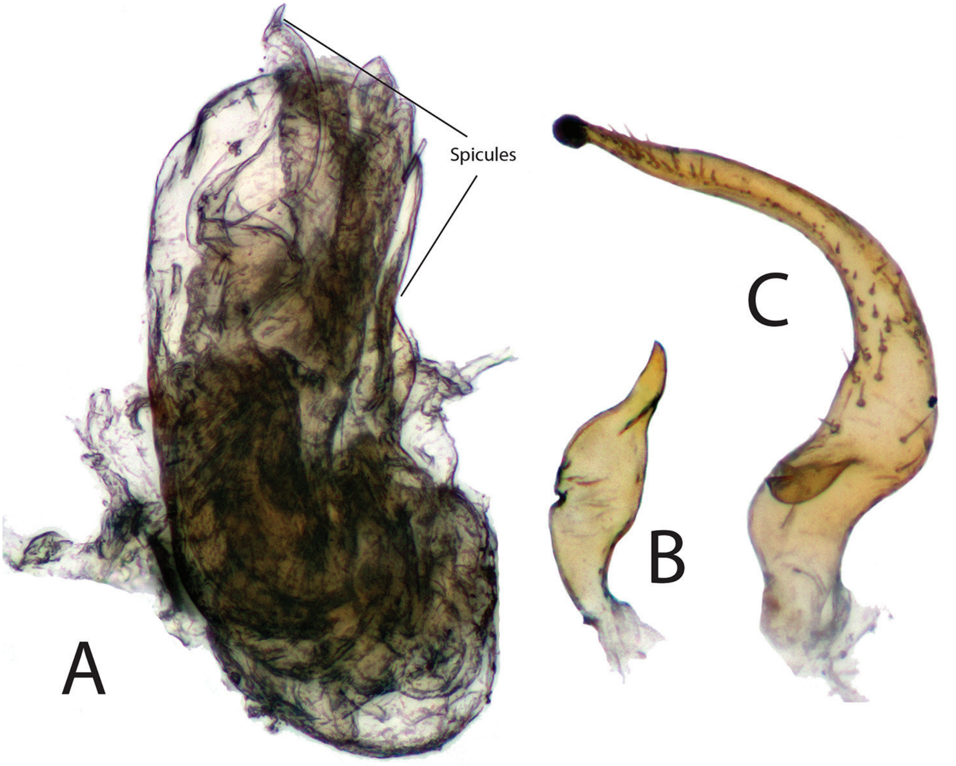

Figure 4. Male genitalia of *Philicoris mayon* sp. n. showing **A** endosoma **B** right paramere, and **C** left paramere. Images taken at 100× using a compound light microscope.

scutellum and lateral sclerites of thorax with simple setae. *Hemelytra*: simple setae covering hemelytral surface, hemelytra surface shiny with dense punctuation in regular rows on clavus, and corium, dorsal surface of emboliar margins and cuneus smooth. *Abdomen*: clothed with simple setae. **Structure:** *Head*: wider than high, clypeus not visible in dorsal view, frons convex, vertex flat, declining posteriorly towards anterior pronotal margin, eyes relatively large, taking up most of head in lateral view, dorsal surface confluent with vertex, posterior margin removed from anterior margin of pronotum, interocular width narrower than width of single eye, first antennal segment length wider than interocular distance, less than half length of second segment, second antennal segment longest, apically narrower than first segment, distally widening to width equivalent to first, antennal segments three and four half width of antennal segment one, individually nearly equidistant in length to segment one; apex of labium extending to metacoxae. *Thorax*: pronotal collar narrow and rounded, dorsal surface of pronotum convexly rounded, anterior and posterior portions of pronotum not demarcated, pronotum trapezoidal with nearly straight lateral margins, calli fused into single weakly protruding plate surrounded by well-defined rows of punctures, posterior margin of pronotum straight, mesoscutum mostly hidden or not visible, scutellum tumid, metathoracic scent gland relatively large, taking up greater than half area of metathoracic sclerite (Fig. 3A), pretarsal claws with basal tooth, parallel hair-like parempodia, pulvilli absent (Fig. 3B). *Hemelytra*: weakly transversely rounded, lateral margins convex with relatively wide embolium, cuneus longer than wide, bent ventrally at fracture, membrane with two visible veins forming two cells, larger cell length greater than one half total length of membrane. *Abdomen:* shorter than half total body length, relatively narrow, width tapering to gonophore. *Genitalia:* Endosoma primarily membranous with two weakly sclerotized spicules and preapical secondary gonopore surrounded by several membranous apical lobes (Fig. 4A), phallotheca thin and simple, left paramere tall and scythe-shaped with basal spine projecting perpendicularly to base and apex with round "hook" (Fig. 4C), right paramere small, leaf-shaped with apex pointed (Fig. 4B).

Female. Similar to males in coloration, surface and vestiture. Pronotum wider in females, interocular distance greater. Genitalia not dissected.

Measurements (in mm for male/female). male/female: tylus-cuneus length 2.50–2.70/2.80, hemelytron width 2.0–2.20/2.10, head width 0.85–0.90/0.85, interocular distance 0.28–0.30/0.35, pronotum length 0.75–0.80/0.75, pronotum width 1.50–1.55/1.75, antennal segment I length 0.60/0.65, antennal segment II length 1.50–1.55/1.55.

Etymology. Named for Mt. Mayon, the type locality. Noun in apposition.

Hosts. Unknown.

Distribution. Luzon Island, Philippines.

Discussion. This species was found on an unidentified prostrate plant in a relatively agricultural area of Mt. Mayon, around banana and palm farms. Its coloration is unique and roughly matches the pinkish red flowers of the plant it was found on.

Philicoris palali **sp. n.**

http://zoobank.org/ECD59B10-F399-4261-8383-BDBAE63A6741
Figs 2, 5

Holotype. Adult male (OMNH 65500), hand collected by K. Menard during daytime surveys on 09 June 2017 on the foothills of Mt. Palali, Municipality of Quezon, Nueva Vizcaya Province, Luzon Island, Philippines (16.45985'N, 121.22316'E; datum = WGS84).

Paratype. One adult female (OMNH 65501), same information as holotype.

Diagnosis. Recognized by mostly tan overall coloration, lateral pale greenish maculation on scutellum, white scent gland, tan thorax, interocular distance wider than width of eye, relatively narrower and straight emboliar margin, less prominent and defined surface punctuation, left paramere lacking basal perpendicular spine, and right paramere apically bifurcate.

Description. *Male.* Coloration. *Head*: tan, clypeus and labrum dark brown; labium basally yellow and dark brown apically; first antennal segment basally dark brown,

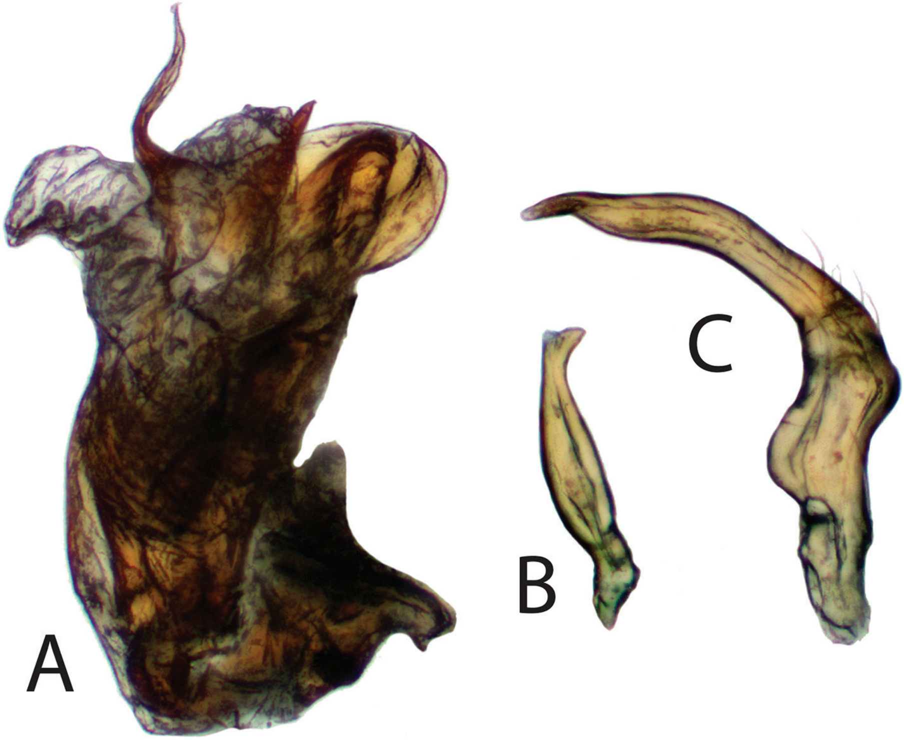

Figure 5. Male genitalia of *Philicoris palali* sp. n. showing **A** endosoma **B** right paramere, and **C** left paramere. Images taken at 100× using a compound light microscope.

distally transitioning to tan, remaining segments tan. *Thorax*: collar and pronotum tan, calli tan with posterior margin with lighter yellow macula, mesoscutum brown with lateral yellow macula when visible, scutellum dark brown medially and light whitish green along majority of lateral margins, apex yellow, lateral sclerites of thorax same coloration as anterior pronotum, scent gland and evaporative area whitish, procoxae light yellow, remaining coxae light brown apically, yellowish distally, femora and tibiae tan, tarsomeres tan. *Hemelytra:* embolium and cuneus tan, lateral margins of corium tan transitioning to light brown, clavus dark brown with light tan area along anterior 1/3 of margin with corium, and corium, membrane and veins beige. *Abdomen:* tan with dark brown anterior and posterior surfaces, gonopore tan. **Surface and vestiture:** *Head:* smooth and shiny, clothed with simple setae, antennal segments covered with dense simple setae of uniform length. *Thorax:* collar and calli smooth, remaining surface of pronotum punctate, covered with simple setae, scutellum and lateral sclerites of thorax with simple setae. *Hemelytra:* surface with simple setae, shiny, with dense punctuation in regular rows on clavus and corium, dorsal surface of emboliar margins and cuneus smooth. *Abdomen:* clothed with simple setae. **Structure:** *Head:* wider than high, clypeus not visible in dorsal view, frons convex, vertex flat, declining posteriorly towards anterior pronotal margin, eyes relatively large, taking up most of head in lateral view, dorsal surface confluent with vertex, posterior margin removed from anterior margin of pronotum, interocular width greater than width of single eye, first antennal segment length wider than interocular distance, less than half length of second segment, second antennal segment longest, apically narrower than first segment, widening distally to width equivalent to first, antennal segments three and four half width of antennal segment one, individually nearly equidistant in length to segment one; apex of labium extending to metacoxae. *Thorax:* pronotal collar narrow and rounded, dorsal surface of pronotum convexly rounded, anterior and posterior portions of pronotum not demarcated, pronotum trapezoidal with nearly straight lateral margins, calli fused into single weakly protruding plate surrounded by weakly defined rows of punctures, posterior margin of pronotum straight. *Hemelytra:* weakly transversely rounded, lateral margins straight with relatively wide embolium, cuneus longer than wide, bent ventrally at fracture, membrane with two visible veins forming two cells, larger cell length greater than one half total length of membrane. *Abdomen:* shorter than half total body length, relatively narrow, width tapering to gonophore. *Genitalia:* endosoma primarily membranous with two sclerotized spicules surrounded by several membranous apical lobes (Fig. 5A), phallotheca thin and simple, left paramere scythe-shaped without spine projecting perpendicularly to base (Fig. 5C), right paramere small, leaf-shaped with apical bifurcation (Fig. 5B).

Female. Similar to males in coloration, surface and vestiture. Interocular distance greater in females. Genitalia not dissected.

Measurements (in mm for male/female). Tylus-cuneus length 2.10/2.40, hemelytron width 1.55/1.70, head width 0.75/0.70, interocular distance 0.30/0.38, pronotum length 0.75/0.75, pronotum width 1.40/1.45, antennal segment I length 0.45/0.50, antennal segment II length 1.40/1.35.

Etymology. We name the new species in reference to Mt. Palali, the type locality. Noun in apposition.

Hosts. Purple composite (Asteraceae).

Distribution. The new species is known from mid-elevation habitats at the type locality on Mt. Palali, Nueva Vizcaya Province, Luzon Island, Philippines.

Discussion. This species was found by sweeping an unidentified purple composite along a trail up Mt. Palali, approximately 800 m away from an area cleared for banana and agricultural cultivation. Therefore, the host plant might be an introduced species in the regional flora. The additional sampling of local plants, including varieties introduced for agriculture, may yet yield additional new species.

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Sulawesimetopus henryi, a new genus and species of Isometopinae (Hemiptera, Heteroptera, Miridae) from Sulawesi

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Abstract

A new genus and species, *Sulawesimetopus henryi* Herczek, Gorczyca & Taszakowski, **sp. n.**, are described from Sulawesi, Indonesia. Photographs of the male and female habitus and male genitalia are presented and a short comparison with morphologically similar genera is drawn.

Keywords

Heteroptera, Miridae, Isometopinae, *Sulawesimetopus*, Indonesia

Introduction

The Isometopinae are one of the least numerous and poorly known subfamilies within Miridae. The group has a worldwide distribution (Schuh 2002–2013, Casis and Schuh 2012, Cassis 2016) but, due to a cryptic habitus, the representatives are relatively rare in collections. Forty-three genera and 249 species have been described in this most thoroughly studied subfamily of Miridae. The most diverse genera are *Isometopus* Fieber and *Myiomma* Puton (Herczek and Popov 2011). An autapomorphic subfamily, the Isometopinae differ from other mirids in possessing paired ocelli between the compound eyes. Previous information clearly indicated that isometopines either inhabit bark, where they feed on scale insects (Wheeler and Henry 1978, Yasunaga and Hayashi 2002), or are predators of soft-bodied insects. Akingbohungbe (1996), Wheeler (2001) and Yasunaga (2005) reviewed the biology of isometopines.

Schwartz and Schuh (1990) established the new genus *Gigantometopus* and species *G. rossi*, from Sumatra. Akingbohungbe (2012) described *G. schuhi* as a new species from Borneo, and Yasunaga and Hayashi (2002) created a new genus *Astroscopometopus,* which comprises *A. gryllocephalus* (Miyamoto, Yasunaga & Hayashi, 2002) from Japan and *A. formosanus* (Lin, 2005) from Taiwan. All authors recognized a close relationship between the described genera and *Isometopidea lieweni* Poppius from Sri Lanka. Lin (2005) described a second species of *Isometopidea*, *I. yangi* from Taiwan. Recently several specimens (one female and eight males) were found in the Heteroptera collection of the Royal Belgian Institute of Natural Sciences (Brussels); they represent a new genus and species that seem closely related to the above-mentioned genera.

Material and methods

Color photographs were obtained using a Leica M205C (stereomicroscope), Leica DFC495 (camera), and Leica application suite 4.9.0 (software). Photographs were obtained using a Nikon Eclipse E 600 microscope and the computer program NIS Elements, ver. 4.10. Specimens for SEM analysis were prepared using a modified method of Kanturski et al. (2015) and were imaged with the Phenom XL field emission scanning electron microscope and the Hitachi SU8010 field emission scanning electron microscope FESEM.

Measurements were made with a micrometer and are presented in millimeters (mm). Dissections of male genitalia were performed using Kerzhner and Konstantinov's (1999) technique. The terminology for genital structures follows Konstantinov (2003). The study was based on material deposited in the collection of the Royal Belgian Institute of Natural Sciences (R.I.Sc.N.B).

Taxonomy

Genus *Sulawesimetopus* gen. n.

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Type species. *Sulawesimetopus henryi* sp. n.

Diagnosis. Dorsum densely and deeply punctuate, with uniformly distributed dark-brown, semierect long setae. Head vertical, flattened in front, almost as high as pronotal disc, covering very narrow collar and very poorly marked calli (partly). Front and lateral parts of head strongly wrinkled and deeply punctuate, lateral edges of head with long, protruding setae (Fig. 2A). Eyes large, nearly at same level as vertex, producing concavity behind it. Fovea antennalis removed from ventral eye margin (Fig. 1A–C). Antennal segments I and II of almost same thickness, III and IV thinner. All segments except 1st with white, adjacent setae of diameter not exceeding segment

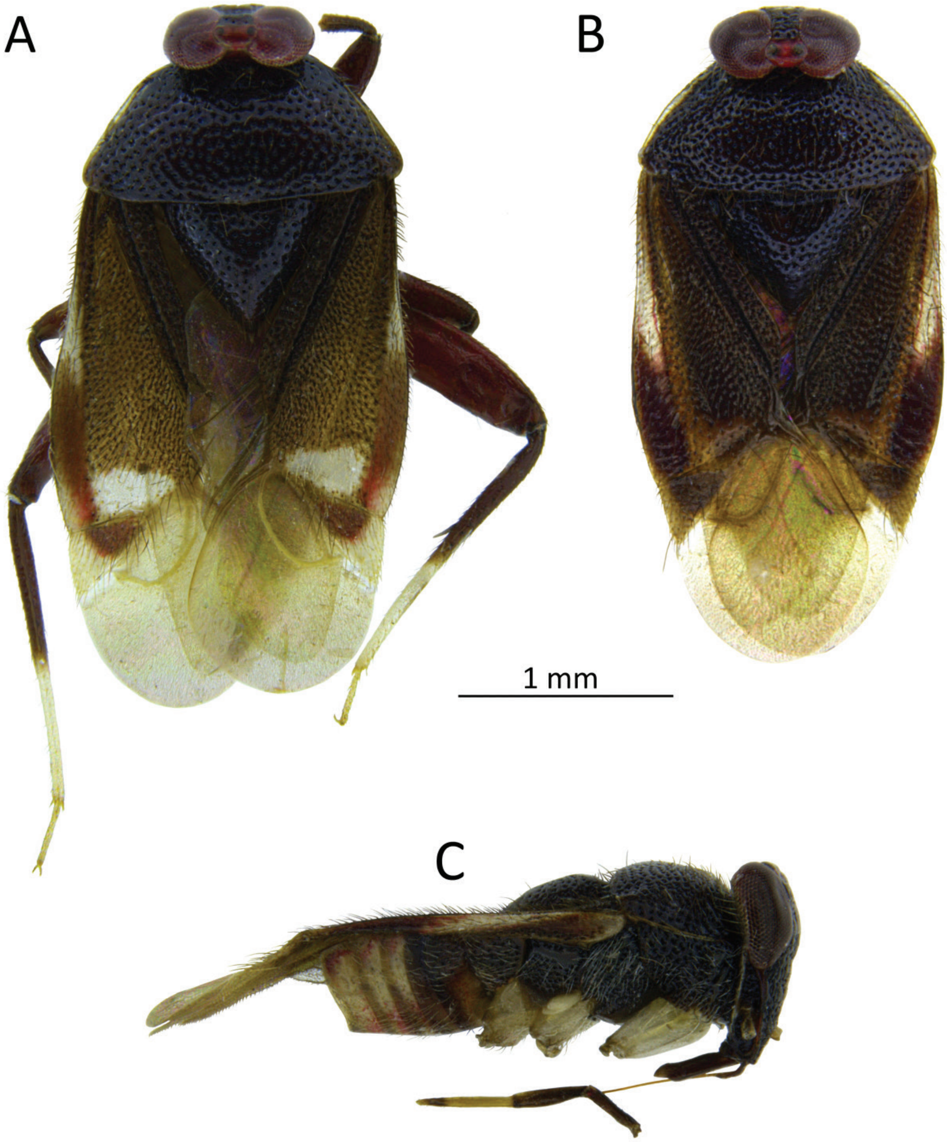

Figure 1. *S. henryi*, female (**A**) and male (**B, C**) dorsal and lateral view.

thickness (Fig. 2B). Labium reaching second abdominal segment. Pronotum with very weakly marked calli, narrow but distinct collar, narrow lateral carina and slightly convex posterior margin. Mesoscutum very narrow, scutellum strongly tumid, sunken basomedially (Fig. 1A, B). Exocorium, pro-, meso- and metapleuron densely and deeply punctuate. Mesofemora with five, metafemora with 6 trichobotria (Fig. 9A–D). All tarsi two-segmented with second segments longer than 1st, incompletely divided (Fig. 5). Claws without subapical tooth (Fig. 6 A). Ostiolar peritreme occupying entire

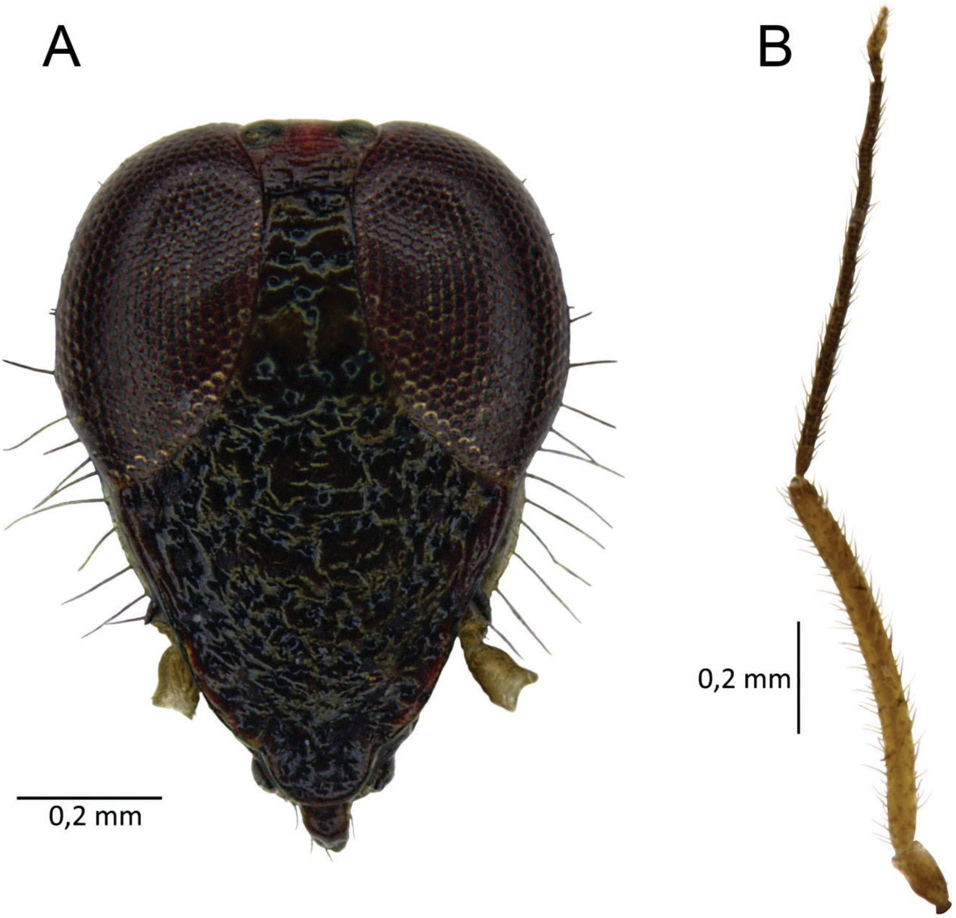

Figure 2. *S. henryi*, male, front of head (**A**), left antenna (**B**).

lower part of metepisternum and apical part of metafemur (Fig. 8B). Aedeagus delicate, endosoma sacciform and membranous, weakly sclerotized inside (Fig. 7D). Left paramere scythe-shaped, sensory lobe with several long setae; apical process elongated, expanded at middle with several tiny spikes; right paramere short, with knee-shaped sensory lobe, hypophysis with several tiny spikes (Fig. 7B, C).

Etymology. Name combines Sulawesi (the type locality) with part of the generic name *Isometopus*, the type genus of the subfamily.

Remarks. Herczek (1993) established Gigantometopini, one of four tribes belonging to Isometopinae. At that time, only one genus and species had been described: *Gigantometopus rossi* Schwartz & Schuh, 1990. This species is the largest known isometopine (6.98 mm). Distinctive features of this tribe include the size of body, distinct calli separated by a deep incision, a strongly swollen scutellum, a well-marked 1A on the clavus, 5 and 6 meso- and metafemoral trichobothria, 3-segmented tarsi and claws

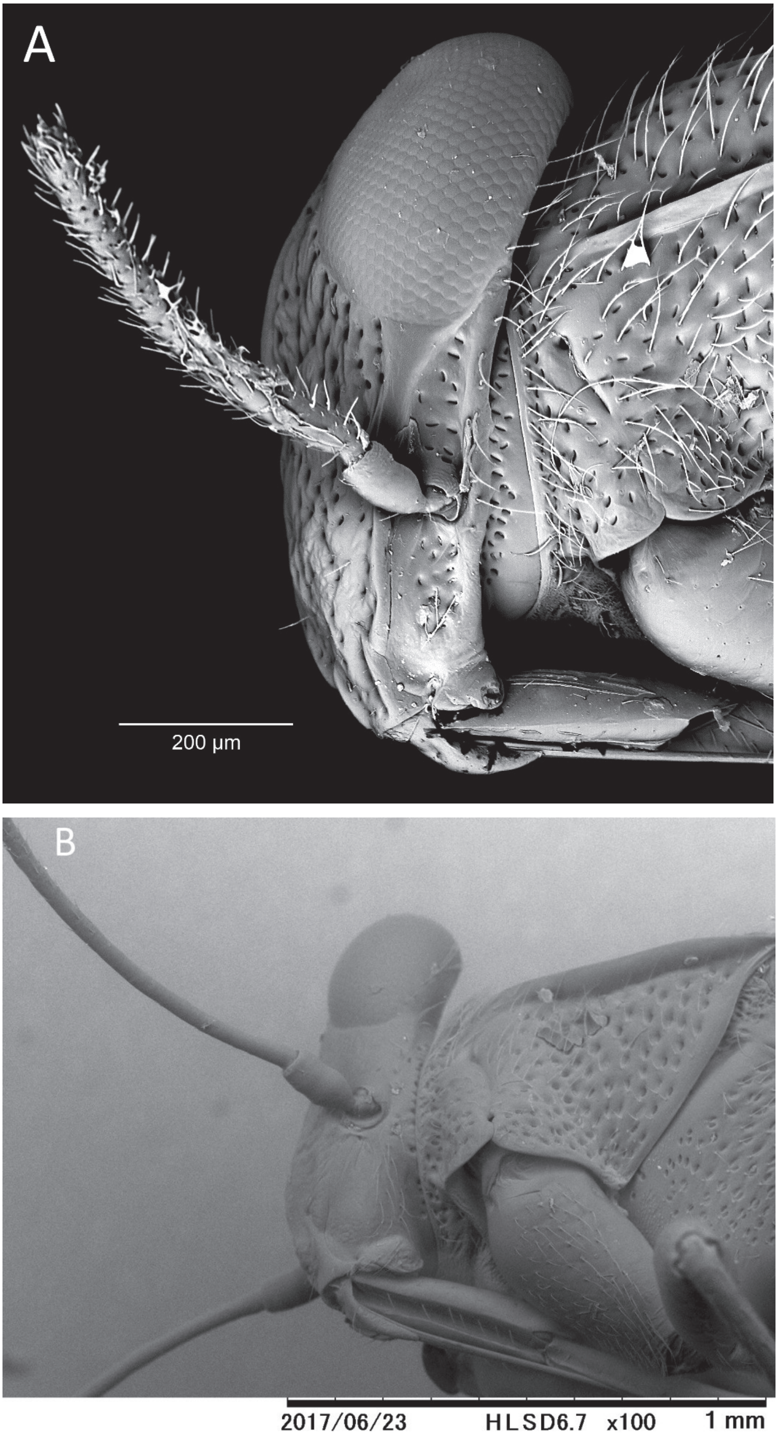

Figure 3. *S. henryi* sp.n., male, head, lateral view (**A**), *Astroscopometopus gryllocephalus*, male, head, lateral view (**B**).

without a subapical tooth. *Gigantometopus schuhi* from Borneo, described by Akingbohungbe in 2012, is significantly smaller than *G. rossi*, but other features allow it to be placed in this genus. We agree with Akingbohungbe's (2012) opinion that the large size is peculiar to the nominotypical species but not to the genus. Additionally, the genus *Astroscopometopus*, described by Yasunaga and Hayashi (2002), has features similar to those of *Gigantometopus* Schwartz and Schuh, 1990 and *Isometopidea* Poppius, 1913. Also *Sulawesimetopus* resembles the genera *Gigatometopus* and *Isometopidea*, but differs from them in several basic features including deep and densely punctured dorsum and thorax pleurites, pronotum with slightly convex posterior margin and narrow lateral carina, extremely reduced calli, and the lack of a middle fossa. Other differences include a very narrow (or lack of) mesoscutum and an indistinct division of the 2nd and 3rd tarsomeres. In addition, *Sulawesimetopus* differs from *Isometopidea* Poppius by the shape of the head, placement of fovea antennalis, shorter claval commissure and shorter cuneus. These species, however, share numerous femoral trichobothria. Such a combination of characters allows the new genus and species to be assigned to Gigantometopini. However, as has been done by Yasunaga et al. (2016), it is necessary to revise the suprageneric classification of the Isometopinae.

Sulawesimetopus henryi **sp. n.**

http://zoobank.org/45CD9418-019C-4790-940B-B095762D4E38

Diagnosis. Same as genus.

Etymology. Named in honor of the well-known American hemipterologist Dr. Thomas J. Henry, who has made a great contribution to the study of Miridae.

Description. Male. *Coloration* (Fig. 1A–C): body mostly shiny, dark brown. *Head*: dark brown, 1.34 in male and 1.47 in female, as high as wide and respectively 0.51 and 0.47 of pronotal width; eyes brownish red, the area around ocelli reddish. Antennae thin (particularly segments III and IV), I and II yellowish, III brown, IV yellow brown (Fig. 2B). Labium shiny, first three segments brown, IV with a dark ring in distal part (Fig. 1C). *Thorax*: pronotum chocolate brown, lateral edges clear, transparent and slightly raised. Mesoscutum very narrow, blackish brown, scutellum chocolate brown, excavated mesally, 0.80 as long as wide. Propleuron, mesopleuron and metapleuron dark brown. Claval commissure distinct, 0.46 as long as length of scutellum. *Abdomen*: bicolored: four segments before genital one lighter, yellowish tinged with pink, others dark brown. Ostiolar peritreme ivory, evaporative area brown (Figs 1C, 8, 9). *Hemelytron*: in various shades of brown, a bit lighter than pronotum and scutellum. Median part of embolium with elongate white spot. Lateral and apical part of cuneus and part of medial fracture adjacent to cuneus yellowish brown. Cuneus as long as wide, yellowish brown, central part dark brown. Membrane pale grey, semitransparent, with two yellowish-brown cells (the small one barely visible). *Legs*: coxae pale, almost white, femora and basal ½ tibiae chestnut-brown. Distal part of tibiae and tarsi almost white. Metacoxae flattened and thickened (Fig. 4D).

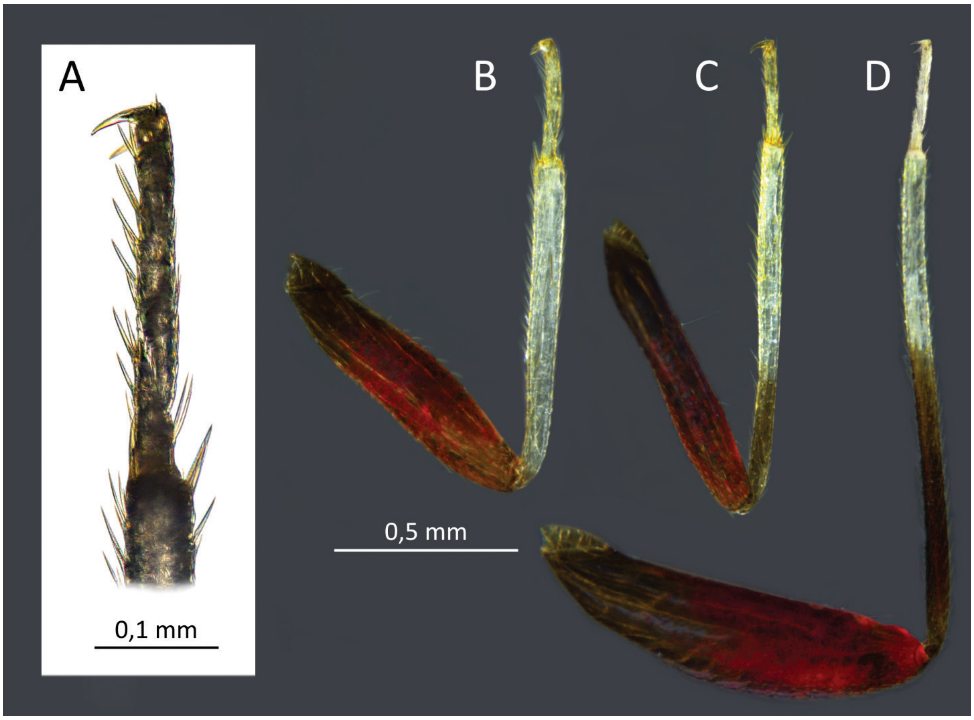

Figure 4. *S. henryi*, male, 1st leg tarsus (**A**), legs: 1st (**B**), 2nd(**C**), 3th(**D**).

Female. Larger, head and pronotum similar to male in coloration, structure and texture. Mesoscutum covered by pronotum, invisible. Corium yellowish brown, median part of exocorium and part of corium adjacent to cuneus and most of cuneus white (Fig. 1A). Distal part of embolium near cuneal fracture red tinged. Membrane with creamy veins. Second tarsal segments incompletely divided.

Measurements. Holotype, male (number of measured specimens and range of variation in parentheses): body length: 3.10 (n = 6: 3.05–3.25), width: 1.47 (n = 6: 1.37–1.52); head length: 0.27 (n = 8: 0.27–0.30), width: 0.71 (n = 8: 0.68–0.74), height: 0.95 (n = 8: 0.92–1.03); dorsal width of eye: 0.30 (n = 8: 0.28–0.32); vertex width: 0.19 (n = 8: 0.19–0.21); antennal segments: I–0.13 (n = 8: 0.11–0.13), II–0.71 (n = 7: 0.65–0.72), III–0.78 (n = 8: 0.8–0.78), IV–0.13 (n = 7: 0.19–0.13); rostral segments: I–0.35 (n = 3: 0.38–0.35), II–0.45 (n = 3: 0.45–0.50), III–0.33 (n = 2: 0.33–0.38), IV–0.39 (n = 2: 0.39–0.50); pronotum length: 0.57 (n = 8: 0.57–0.62), anterior width: 0.74 (n = 8: 0.68–0.77), posterior width: 1.37 (n = 8: 1.32–1.46); mesoscutum length: 0.03 (n = 8: 0.02–0.04); scutellum length: 0.69 (n = 8: 0.61–0.72), width:0.81 (n = 8: 0.79–0.83) ; claval commissure length: 0.37 (n = 7: 0.28–0.37); hind leg: femur length: 1.05 (n = 2: 1.05–1.17), width: 0.30; tibia length: 1.40 (n = 3: 1.30-1.45), tarsus: 0.30 (n = 3: 0.25–0.30) I-0.11, II-0.25 (supposedly two segments 0.11+0.13); cuneus length: 0.36 (n = 8: 0.34–0.37), width: 0.35 (n = 8: 0.34–0.36).

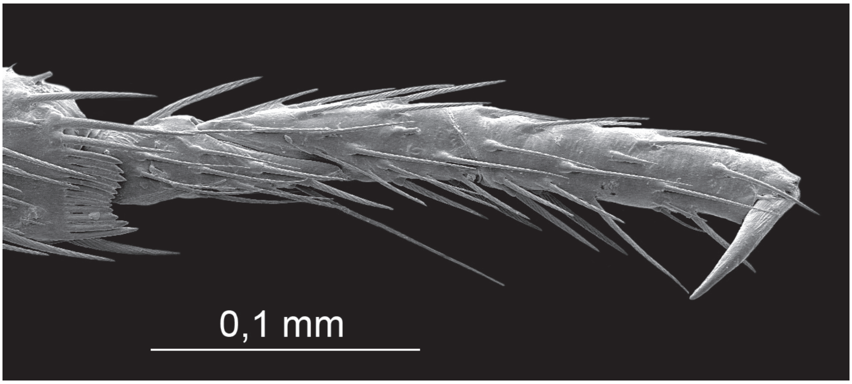

Figure 5. *S. henryi*, male, 1st leg tarsus.

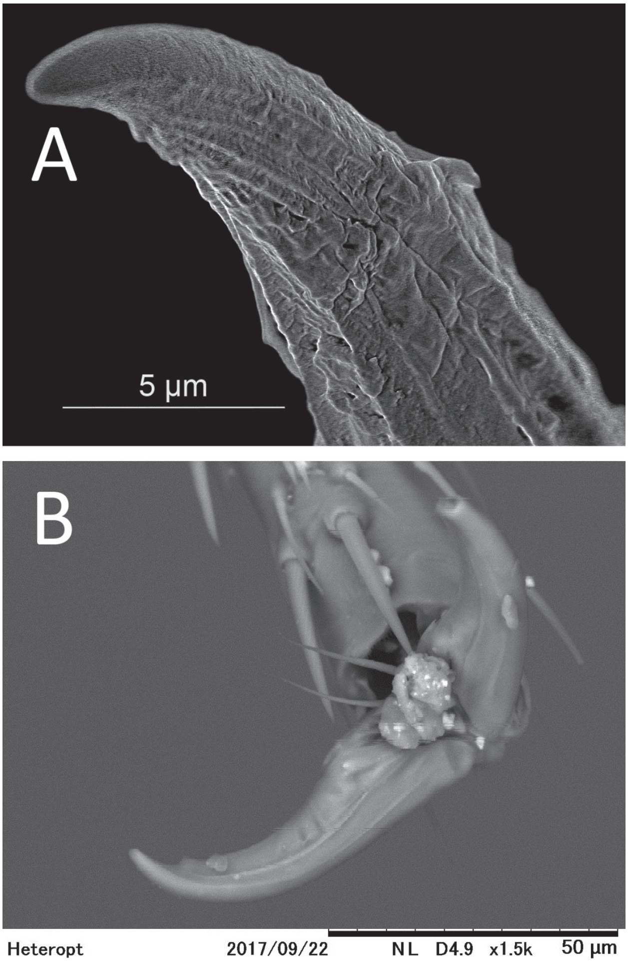

Figure 6. *S. henryi*, male, claw, 2nd leg (**A**), *Astroscopometopus gryllocephalus*, male, claws (**B** images taken by T. Yasunaga, courtesy of CSR Division, Hitachi High –Technologies Corporation, Tokyo).

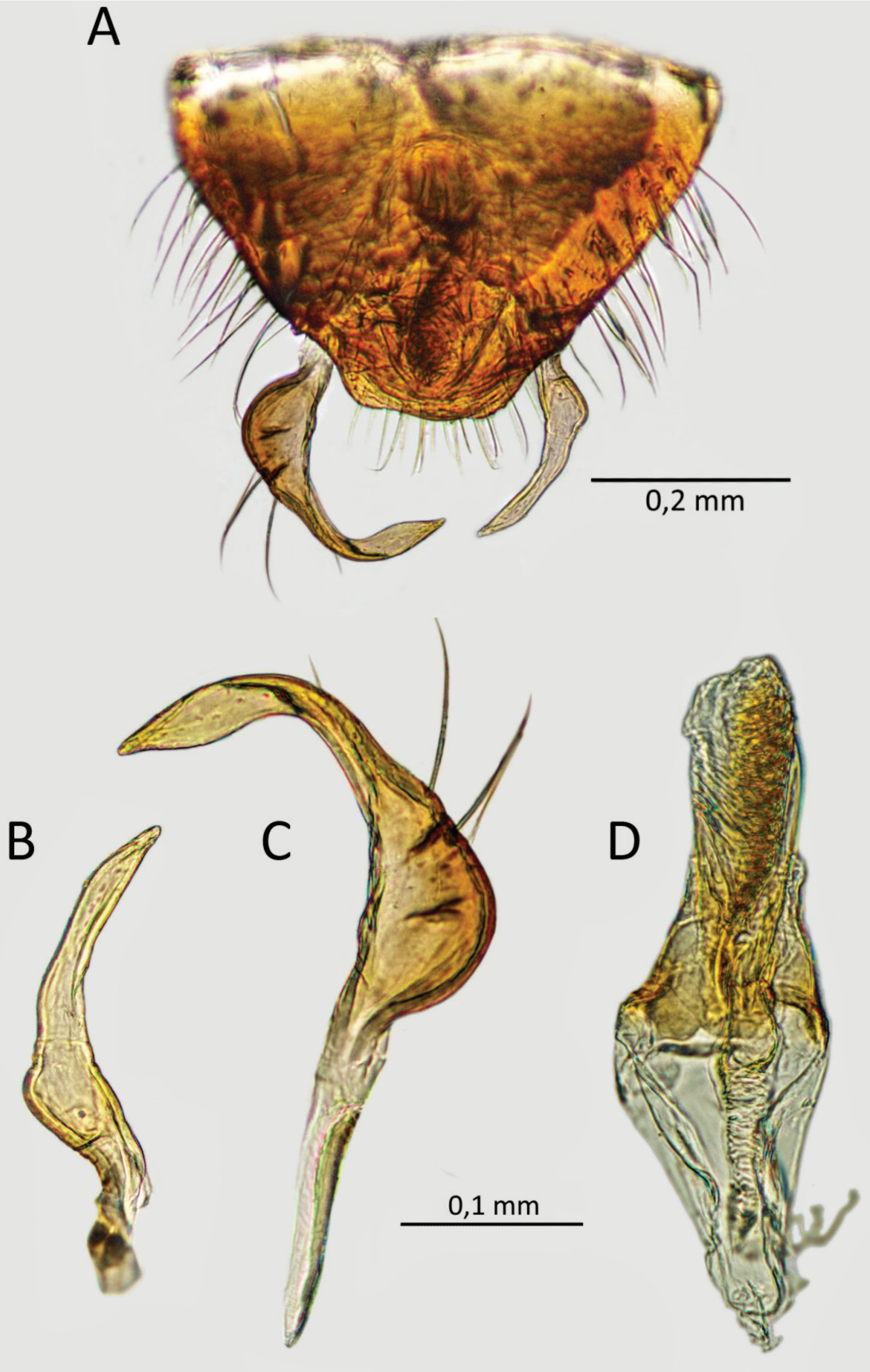

Figure 7. *S. henryi*, male genitalia genital capsule (**A**), right paramere (**B**), left paramere (**C**), phallus (**D**).

Female (one specimen): body length: 3.25, width: 1.55; head length: 0.25, width: 0.70, height: 1.03; dorsal width of eye: 0.29; vertex width: 0.20; antennal segments: I–0.12, II–0.65, III–0.87, IV–0.18; rostral segments: invisible; pronotum length: 0.67, anterior width: 0.88, posterior width: 1.50; scutellum length: 0.65; claval commissure length: 0.38; hind leg: femur length: 1.13, width: 0.35; tibia length: 1.45, tarsus: 0.35 (I–0.07, II+III–0.30); cuneus length: 0.36; width: 0.36

Material examined**.** Holotype: male. Indonesia, Sulawesi Utara, P.P.R. bungalow (P.M.), 8/18 XI 1985, Station: 099, Project Wallace, leg: R. Bosmans & J. Van Stalle.

Female: Sulawesi Utara, Dumoga-Bone Nat.Park, Hogg'sBack subcamp (660m), 15-XI-1985. Station: 095. Project Wallace, leg: R. Bosmans & J. Van Stalle. L.G. nº 26.977.

Paratypes: : 2 ♂♂. Indonesia, Sulawesi Utara, P.P.R. bungalow (P.M.), 8/18 XI 1985, Station: 099, Project Wallace, leg: R. Bosmans & J. Van Stalle; 5♂♂ Sulawesi Utara, Dumoga-Bone Nat.Park, Hogg'sBack subcamp (660m), 15-XI-1985. Station: 095. Project Wallace, leg: R. Bosmans & J. Van Stalle. L.G. nº 26.977. The holotype and paratypes are deposited in the R.I.Sc.N.B.

Remarks. The new species can be distinguished from all others belonging to *Gigantometopus*, *Astroscopometopus* and *Isometopidea* by its body structure, combination of color, and metric features. The newly described species is the smallest of those in the three genera (Table1). The following metric features distinguish *Sulawesimetopus henryi* sp.n.: head width to vertex width ratio 3.55 (vs. *Gigantometopus schuhi* 2.05, *Astroscopometopus gryllocephalus* 3.11, *A. formosanus* 3.25 and *Isometopidea yangi* 7.0), head width to pronotum width 0.51 (and respectively 0.28, 0.45, 0.46 and 0.54), antennal segments II:I length ratio 5.96 (and respectively 6.5, 7.67, 6.50 and 7.5), pronotum width to head width 1.94 (and respectively 3.51, 2.24, 2.15 and 1.85). In the new species the claval commissure is shorter than in others. Additionally *S. henryi* sp.n. differs from *A. gryllocephalus* by position of the scutellar depression, antennal hairs (Fig. 3A, B) and the lack of a subapical claw tooth. Certain color features also differ: *S. henryi* sp.n. is darker than the others, the apical part of the rostrum is dark brown, the hemelytra are almost monochromatic (dark brown), and only the middle part of the embolium is white. The hemelytra in *G. schuhi* are largely dark golden to reddish brown, in contrast to the hemelytra light brown with a creamy spot in the middle in *G. gryllocephalus*, grey with a dark brown clavus and a circular creamy spot mesially in *A. formosanus* and the yellowish brown semitransparent hemelytra in *Isometopidea yangi*. The color pattern of the legs also is species–specific.

The construction of the aedeagus and parameres is similar to other compared species. The differences are relatively small (as with most other species of Isometopinae and Psallopinae) and refer to the extent of sclerotization of the aedeagus and the shape of the sensory lobe of the left paramere.

The female of *S. henryi* sp. n. is indistinguishable from a female of *A. gryllocephalus* by the length of antennal segments, posterior width of the pronotum, and the shorter hind femur, tibia and tarsus. The proportions of body length to width, head width to vertex width, and corium length to cuneus length also differ (respectively: 2.09 and 2.72, 3.50 and 3.88, 6.94 and 4.11). Clear differences occur in coloration. The distal

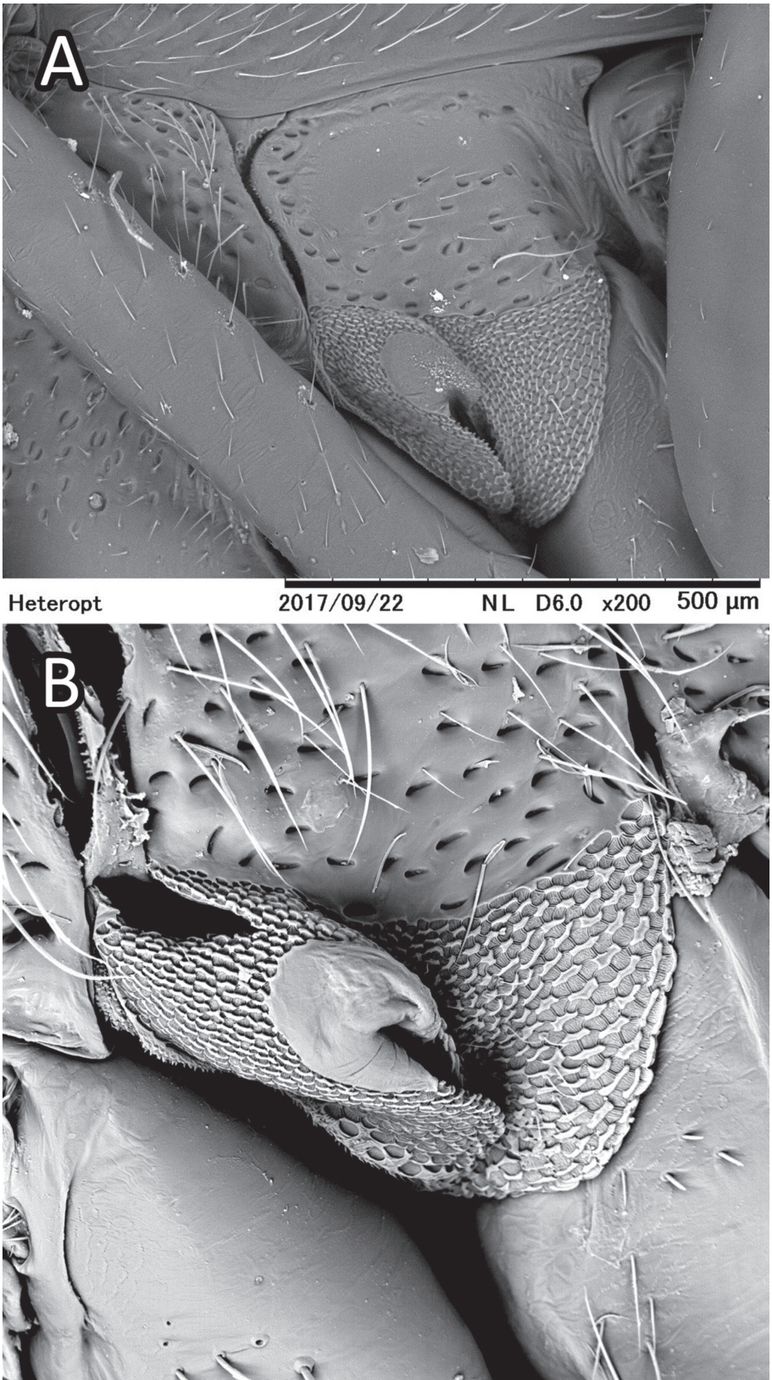

Figure 8. *Astroscopometopus gryllocephalus*, male, ostiolar peritreme (**A** images taken by T. Yasunaga, courtesy of CSR Division, Hitachi Hig Male) **B** *S. henryi*, male, ostiolar peritreme.

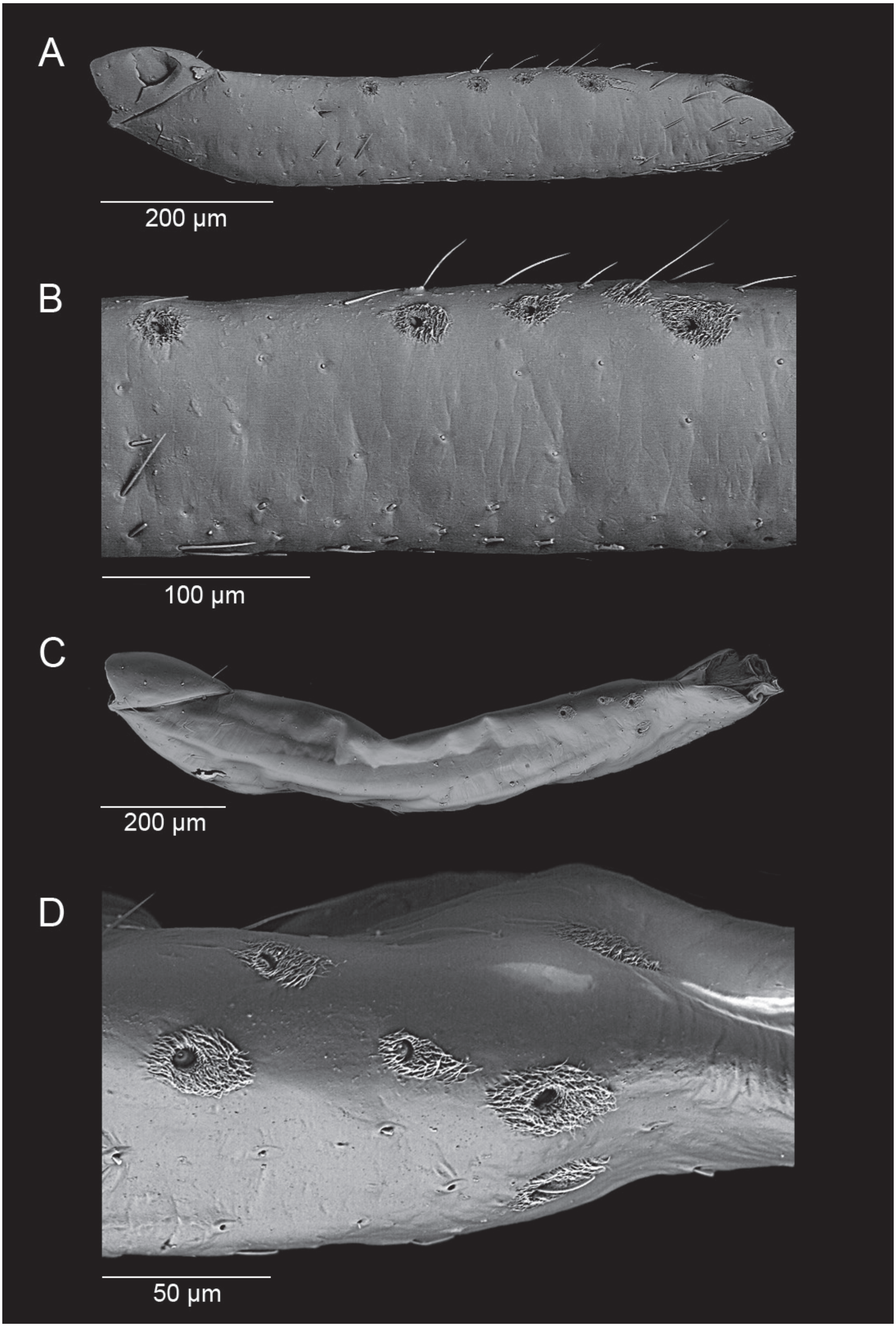

Figure 9. *S. henryi*, male, femoral trichobothria. **A, B** mesofemora **C, D** metafemora.

Table 1. Comparison of metric features of known species of *Sulawesimetopus*, *Gigantometopus*, *Astroscopometopus* and *Isometopidea*.

Measurement	***S. henryi* sp. n.**		***G. schuhi***	***G. rossi***	***A. gryllocephalus***		***A. formosanus***	***I. yangi***
	♂*	♀	♂	♀	♂	♀	♂	♂
Body length	3.10	3.25	3.28	6.98	3.6	4.06	4.1	4.2
Body width	1.48	1.55	1.44	1.49	1.50	1.49	1.6	1.7
Head length	0.28	0.25	0.27	?	?	0.23	0.30	0.30
Head width	0.71	0.70	0.41	1.03	0.59	0.62	0.65	0.70
Head height	0.95	1.03	1.06	1.71	0.97	0.99	1.1	1.0
Dorsal width of eye	0.31	0.29	0.13	0.35	0.20	0.23	0.23	0.30
Vertex width	0.20	0.20	0.20	0.32	0.19	0.16	0.20	0.10
Antennal segments I:II:III:IV	0.12:0.72: :0.78:0.13	0.12:0.6: 0.87:0.18	0.14:0.91: 0.93:0.20	0.23:1.64: 1.10:0.9	0.15:1.18: 0.67:0.29	0.16:1.00: 0.78:0.25	0.20: 1.30:-:-	0.2:1.5 :0.3:0.2
Rostral segments I:II:III:IV	1.5 (0.35:0.45 :0.33:0.39)	invisible	1.84	3.10 0.88:-:-:-	?	1.89	2.0	2.0
Pronotum length	0.59	0.67	0.60	1.55	0.69	0.63	0.90	0.6
Posterior width of pronotum	1.38	1.50	1.44	2.69	1.32	1.38	1.40	1.3
Scutellum length	0.69	0.65	0.64	?	?	0.69	0.60	0.6
Scutellum width	0.81	0.77	0.69	?	?	0.37	0.7	0.6
Claval commissure	0.32	0.38	0.30(?)	?	?	?	0.4	0.5
Hind femur length	1.11	1.13	?	?	1.14	1.26	?	?
Hind tibia length	1.43	1.45	?	?	1.81	1.90	?	?
Tarsus length	0.30	0.35	?	?	0.36	0.34	?	?
Tarsal segments length I:II:III	0.11:0.25 (0.11:0.13)	0.07:0.30	?	?	?	0.13:0.16 :0.19	0.60	?
Cuneus length	0.36	0.35	0.53	0.78	?	?	0.6	0.7
Cuneus width	0.36	0.35	0.31	?	?	?	?	0.3

* averaged values are given

part of the embolium near the cuneal fracture in *S. henryi* sp. n. is tinged with red, the median part of exocorium adjacent to the cuneus is yellowish brown and the cuneus is mostly white, whereas in *A. gryllocephalus* the embolium is pale brown and semitransparent, the corium is yellowish with a white spot in the middle, and the inner half of the cuneus is yellowish white.

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RESEARCH ARTICLE

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Two new deraeocorine plant bug species from Japan (Heteroptera, Miridae, Deraeocorinae)

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Abstract

Two new deraeocorine plant bug species, *Fingulus henrytomi* and *Stethoconus takaii*, are described from Japan. A color habitus image of live individuals and scanning electron micrographs are shown for each taxon to aid an unequivocal identification. A checklist and keys to species are also provided for Japanese *Fingulus* and *Stethoconus*.

Keywords

Deraeocorinae, *Fingulus*, Heteroptera, Insecta, Japan, Miridae, new species, *Stethoconus*

Introduction

The plant bug subfamily Deraeocorinae is the fifth largest in the family Miridae (Henry 2017). This group is defined by a toothed tarsal claw, hair-like parempodium (Figs 22, 27–28) and membranous endosoma, sometimes with sclerites on the lobes. The subfamily contains numerous predatory species that sometimes resemble their insect prey. Previous studies of the Japanese fauna of this subfamily include those by Miyamoto (1965) and Nakatani (1995, 1996), which have resulted in thirty-nine species being confirmed. The present paper documents two new species of the

Deraeocorinae, *Fingulus henrytomi* (tribe Deraeocorini) and *Stethoconus takaii* (Hyaliodini), which were found in the temperate climate zones of southeastern Japan. Although the majority of the members of *Fingulus* Distant and *Stethoconus* Flor are thermophilic and known predominantly from the tropics and subtropics (Nakatani et al. 2000, Nakatani and Yasunaga 2001, Schuh 1995, 2002–2014, Stonedahl and Cassis 1991, Yasunaga et al. 1997, 2016), the new species extend the range of these genera farther north than expected. The new species are also considered predacious, as species belonging to *Fingulus* and *Stethoconus* in other regions are well known as predators (e.g., Henry et al. 1986; Neal et al. 1991; Wheeler 2001; Yasunaga et al. 1997, 2016). Color habitus images of live individuals and scanning electron micrographs are presented for the two new species and their closely related congeners.

Materials and methods

Specimens used in this present work were deposited in American Museum of Natural History, New York, USA (**AMNH**); Institute of Agro-Environmental Sciences, NARO (**NIAES**) and T. Yasunaga Collection (**TYCN**). Terminal segments of the male abdomen were boiled in 5% KOH solution for 5 min to observe the genital structures. Matrix code labels are attached to the holotype and some representative specimens, which uniquely identify each specimen, and are referred to as 'unique specimen identifiers' (USIs). The USI codes [e.g., AMNH_PBI 012345] comprise an institution and project code (AMNH_PBI) and a unique number (012345). These data were digitized on the Arthropod Easy Capture (formerly the Planetary Biodiversity Inventory) database maintained by the American Museum of Natural History, New York, USA (http://research.amnh.org/pbi/) and are also searchable on 'Heteroptera Species Pages' (http://research.amnh.org/pbi/heteropteraspeciespage/). All measurements were made with an ocular micrometer and are given in millimeters. The synonymic lists for known taxa were omitted, as comprehensive catalogs are now available (Schuh 1995, 2002–2014; Kerzhner and Josifov 1999; Aukema et al. 2013 online catalog). Scanning electron micrographs were taken with a Hitachi Tabletop Microscope TM3030.

Checklist of *Fingulus* and *Stethoconus* in Japan

Genus *Fingulus* Distant, 1904

F. collaris Miyamoto, 1965; Japan (Ryukyus; Ishigaki and Iriomote Islands), Laos, Thailand, India.
F. henrytomi sp. n.; Japan (Shikoku, Tsushima Island)
F. longicornis Miyamoto, 1965; Japan (Honshu, Shikoku, Kyushu, Ryukyus), Philippines (Mindanao)
F. takahashii Nakatani, Yasunaga & Takai, 2000; Japan (Ryukyus).

Genus *Stethoconus* Flor, 1861

S. japonicus, Schumacher, 1917: Japan (Honshu, Shikoku, Kyushu, Ryukyus), Russia (Primorye), Korea, China, USA (Maryland, adventive)

S. praefectus Distant, 1909: Japan (Ryukyus: Ishigaki and Iriomote Islands), China, Taiwan, India, Sri Lanka, USA (Florida, adventive)

S. takaii sp. n.: Japan (Honshu, Shikoku)

Key to the Japanese species of *Fingulus* Distant

1 Head paler than remainder of body; pronotal collar impunctate (Fig. 19); corium with pale markings **2**

– Dorsum uniform in coloration; pronotal collar punctate (Fig. 24) **3**

2 Frons widely pale; yellowish-brown markings laterally at base of corium .... ***F. henrytomi***

– Frons gradually paler anteriorly; apical part of corium narrowly pale..... ***F. collaris***

3 Dorsum blackish brown; femora and basal tibiae dark brown.......... ***F. longicornis***

– Dorsum reddish brown; legs entirely pale yellow .... ***F. takahashii***

Key to the Japanese species of *Stethoconus* Flor

1 Scutellum distinctly projecting, the tip extended posteriorly (Fig. 31) .... ***S. praefectus***

– Scutellum somewhat weakly projecting, the tip not extended posteriorly **2**

2 Antennal segment II yellowish brown with apical 1/3 darkened; a pair of yellowish-brown markings laterally on scutellum; mesepimeron mostly whitish yellow .... ***S. japonicus***

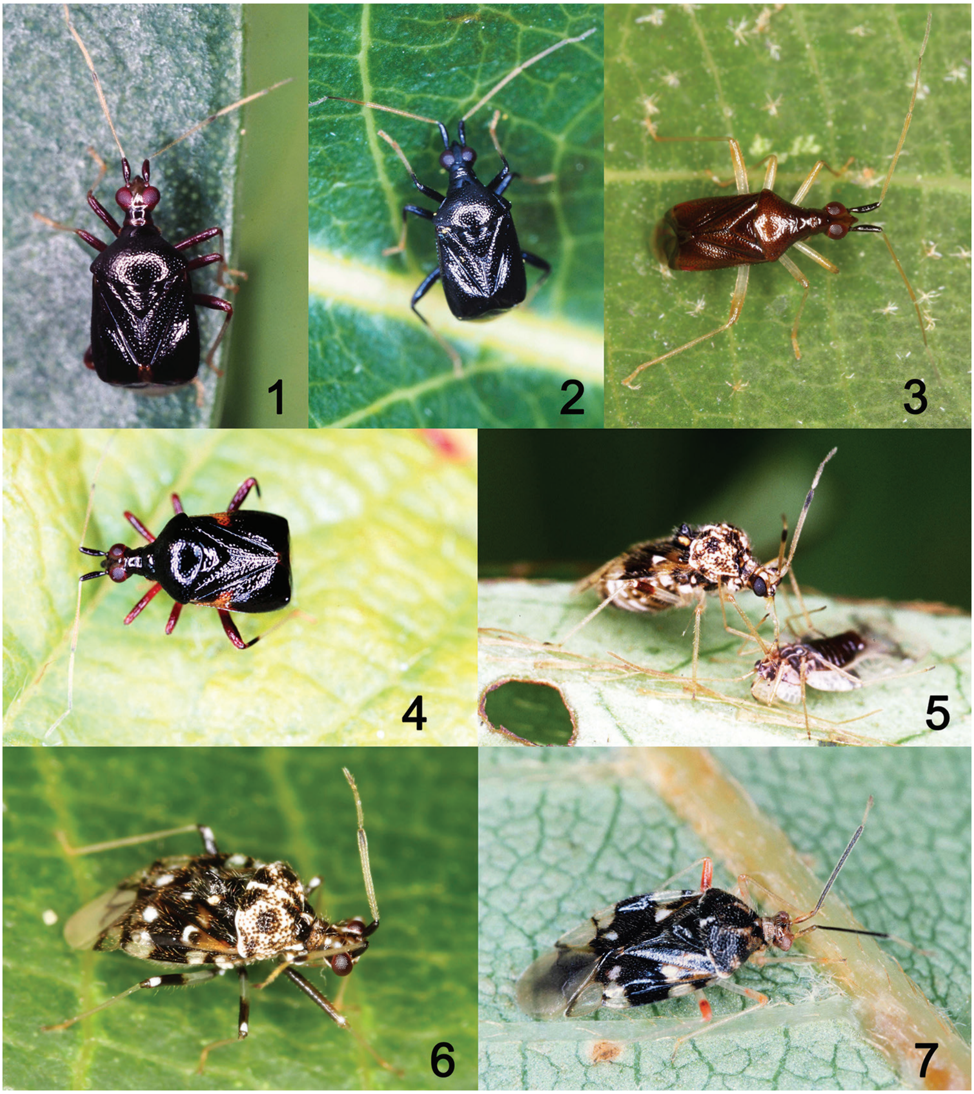
– Antennal segment II entirely or basal and apical 1/3 dark; scutellum and mesepimeron entirely dark .... ***S. takaii***

Results

Fingulus henrytomi sp. n.

http://zoobank.org/A0CE92C6-82DF-4C82-AB18-2975CEA5E64A
Figs 4, 8–9, 19–22

Type material. Holotype: ♀, **Japan:** Shikoku, Kochi, Monobe, Nishikuma-keikoku, 5.VIII.2000, M. Takai (AMNH_PBI 00380591) (NIAES). **Paratype:** 1♀, Nagasaki, Tsushima Island, Mt. Tatera, 34°09'00"N, 129°13'30"E, 25 Sep 1993, T. Yasunaga (AMNH_PBI 00380592) (TYCN)

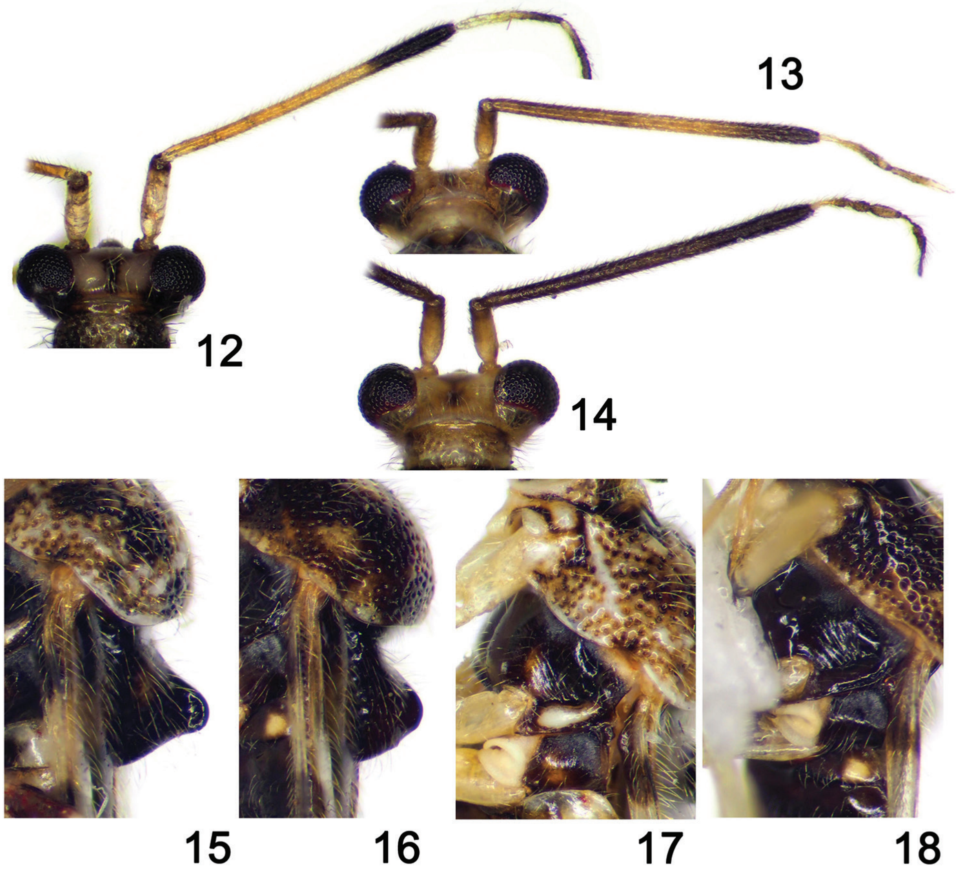


Figures 1–7. Habitus images of *Fingulus* spp. and *Stethoconus* spp. from Japan. **1** *F. collaris* from Ishigaki Island. Ryukyus **2** *F. longicornis* from Amami Island, Ryukyus **3** *F. takahashii* from Ishigaki Island **4** *F. henrytomi* sp. n. from Kochi, Shikoku, holotype, female **5** *S. japonicus* preying on *Stephanitis pyrioides* (Scott) (Tingidae), from Ibaraki, Honshu **6** *S. praefectus* form Ishigaki Island **7** *S. takaii* from Kochi, Holotype, Male.

Diagnosis. Dorsum dark brown with a pair of pale markings on hemelytra; head slightly pale; pronotum trapeziform, strongly convex; femora and bases of tibiae infuscate. In general appearance, this new species resembles *F. collaris* Miyamoto, from which it can be distinguished by its hemelytral coloration.

Description. Female: Body dark chestnut brown with a pair of paler markings on hemelytra, highly polished and punctate. Head slightly paler than remainder of body,

Figures 8–11. Holotype material of *F. henrytomi* (**8–9**) and *S. takaii* (**10–11**). Scale bar: 2mm.



Figures 12–18. Magnified images of *Stethoconus* species. **12–14** Heads and antennae **15–16** scutellum, lateral aspects **17–18** pleura **12, 15, 17** *S. japonicus* **13–14, 16, 18** *S. takaii*.

suddenly restricted anterior to compound eye; tip of tylus infuscate; jugum, lorum, and gena paler than frons; vertex somewhat depressed; postocular part elongate, neck-like; buccula tinged with red. Antennal segment I dark chestnut brown, apparently thicker than other segments; segments II–IV pale yellowish brown. Labium castaneous; apical 1/3 of segment III pale brown. Pronotum entirely dark chestnut brown, highly polished and punctate, trapeziform and strongly convex; posterior margin rounded; collar flattened and weakly punctate; prosternum somewhat pale, conically projecting; ostiolar peritreme whitish yellow. Hemelytra widely dark chestnut brown except marking on basal 1/3 of corium brown. Membrane infuscate adjacent to red-tinged vein. Femora dark reddish brown; tibiae pale yellow except base infuscate; tarsi pale yellow. Abdomen dark chestnut brown.

Measurements. (♀). Total body length: 3.64–4.17; width head across eyes: 0.50–0.59; width vertex: 0.15; length labium: 1.23–1.38; length of antennal segments I–IV: 0.41–0.43, 1.07–1.11, 0.83–0.86, 0.49–0.50; length pronotum including collar: 1.10–1.18; width base of pronotum: 1.41–1.48; maximum width across hemelytra: 1.65–1.70; length of hind femur, tibia, and tarsus: 1.20–1.48, 1.47–1.55, 0.30–0.32.

Etymology. Named in honor of Dr. Thomas J. (Tom) Henry, our honorable friend and mentor.

Distribution. Japan (Shikoku: Kochi Pref., Tsushima Island).

Biology. The habits of this new species remain unknown; the only information is that the type specimens were collected by using a UV light trap or sweeping broadleaf trees.

Remarks. This new species can be distinguished from its congeners by the coloration described above. Based on the generally ovoid body and rather weakly porrect head, our new species is assumed to be most closely related to *F. collaris*. As in certain other congeners, the population density of *F. henrytomi* is extremely low, as only two females have been collected, in spite of our continuing efforts and those of our enthusiastic colleagues to find additional specimens.

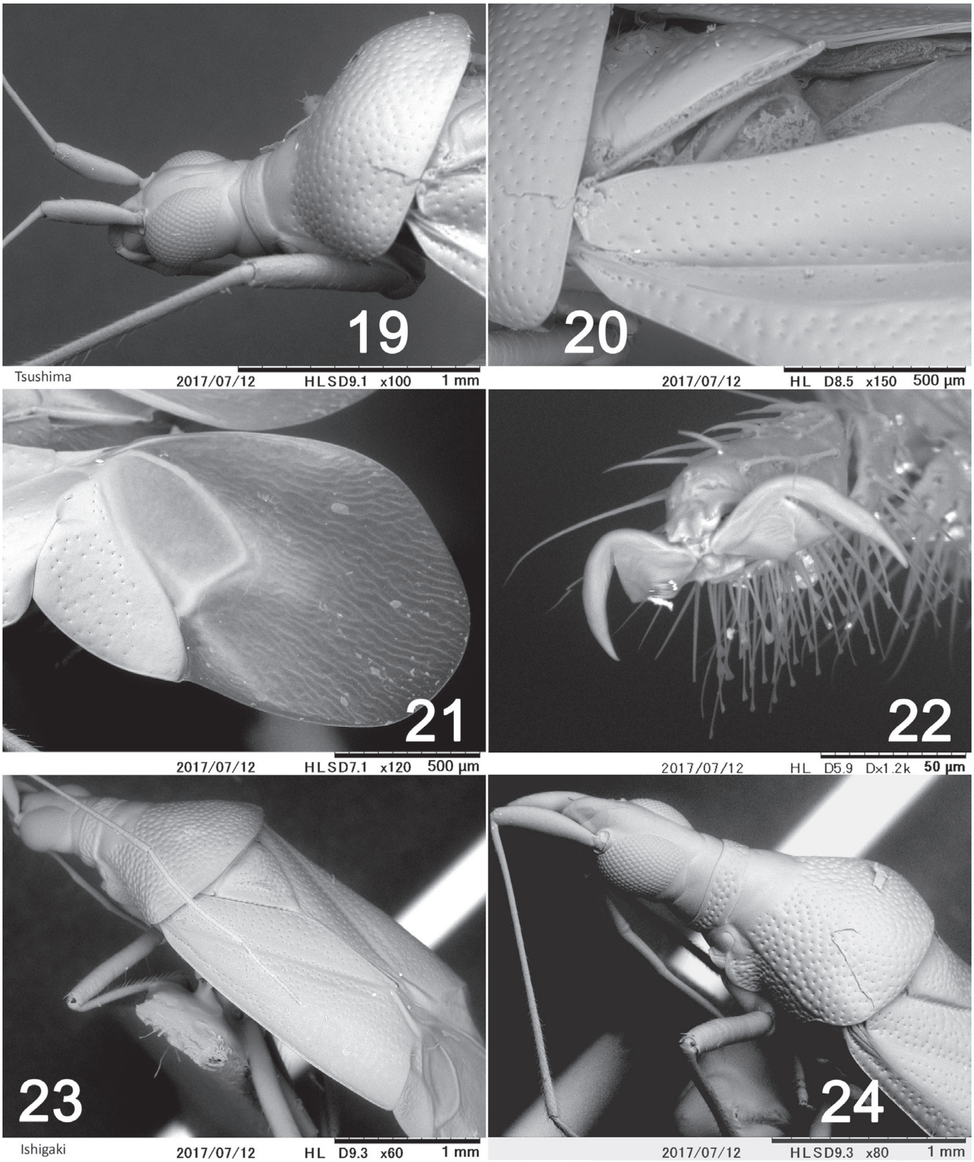
Stethoconus takaii sp. n.

http://zoobank.org/10AB9347-913A-4842-9BF0-2777816555E2

Figs 7, 10–11, 13–14, 16, 18, 25–29, 32–37

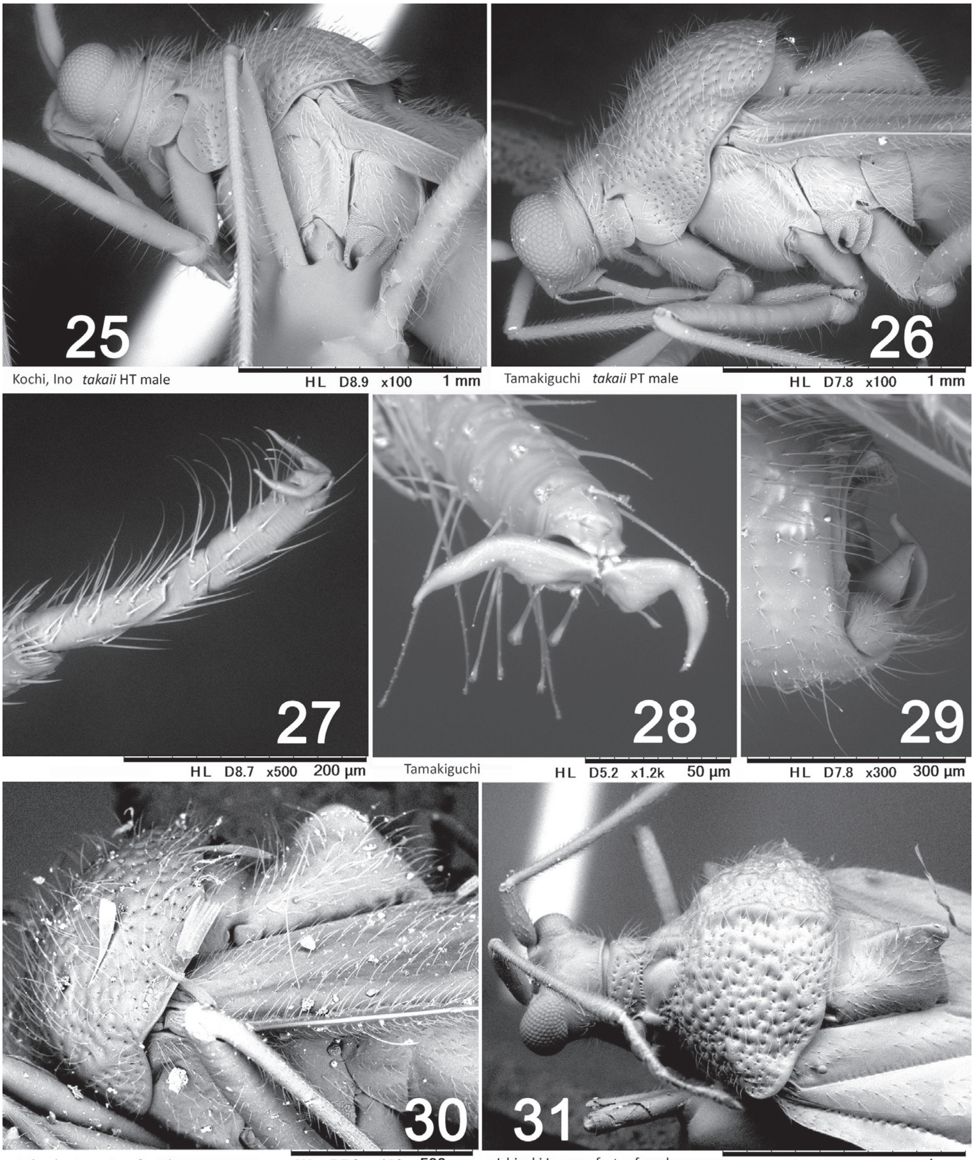
Stethoconus japonicus: Yasunaga et al. 1997 (part), Nakatani and Yasunaga 2001(part).

Type material. Holotype: ♂. **Japan**: Shikoku, Kochi., Agawa, Ino, 33.56N, 133.39E, 2 Aug 1998, M. Takai (AMNH_PBI 00380593) (NIAES). **Paratypes**: [Honshu] 1♀, Shizuoka, Atami alt. 300m, 22 Jul 1996, T. Ueda (NIAES); 1♂, Gifu, Gujou, Yamatocho-uchigatani, 28–29 Sep 2004, T. Ueda (NIAES); 1♂, Mie, Mt. Hirakura, 23 Jun 1953, Y. Miwa (NIAES); 2♂, Osaka, Minoo, 21 Jul 1995, K. Temma (NIAES); 1♂, Hyogo, Inagawa, Tsukunami, at light, 12 Jun 1997, Y. Nakatani (NIAES); 1♂, Nara, Kawakami, Shionoha, at light, 15 Jun 1993, Y. Nakatani (NIAES); 6♂1♀, Nara, Kawakami, Kitamata, at light, 15 Jun 1993, Y. Nakatani (AMNH & NIAES); 2♂,



Figures 19–24. Scanning electron micrographs of *Fingulus* species. **19–22** *F. henrytomi* **23–24** *F. takahashii* **19, 24** head and pronotum **20, 23** hemelytra **21** membrane **22** tarsal claw.

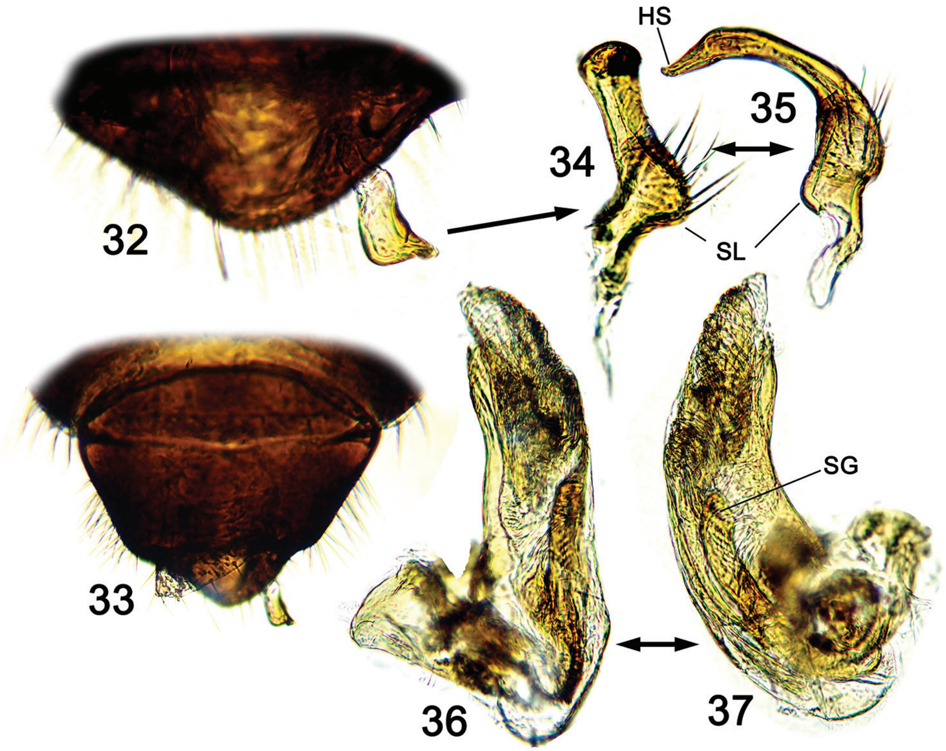
Nara, Kamikitayama, Mt. Wasamata, at light, 9 Aug 1995, T. Hirowatari & Y. Sawada (NIAES); 1♂: Wakayama, Kumanogawa, Doro Valley, Tamakiguchi, 33°53'53"N, 135°52'23"E, 15 Jun 1993, S. Gotoh (AMNH_PBI 00380594) (TYCN); 1♂, Wakayama, Shingu, Shirami, 9 Sep 1999, K. Temma (NIAES). [Shikoku] 1♀, same data as for holotype (TYCN).



Figures 25–31. Scanning electron micrographs of *Stethoconus* species. **25–29** *S. takaii* **30** *S. japonicus* **31** *S. praefectus* **27** tarsus **28** tarsal claw **29** terminal abdomen.

Diagnosis. Coloration generally dark; antennal segment II, or at least basal and apical 1/3, darkened; areas between pronotal punctures rather smooth; scutellum weakly elevated and blackish; mesepimeron blackish; abdomen mostly blackish.

Description. Body generally maculate; dorsum shiny, densely clothed with long erect yellowish setae. Head shiny yellowish brown; brown stripe on vertex. Antenna dark brown; basal 1/3 or half of segment I somewhat pale, sometimes tinged with red;



Figures 32–37. Male genitalia of *S. takaii*. **32–33** Pygophore **34–35** left paramere **36–37** endosoma. Abbreviations: HS = hypophysis, SL = sensory lobe, SG = Secondary gonophore.

middle portion of segment II sometimes pale; base of segment III pale. Labium yellowish brown except tip brown, reaching anterior margin of mesosternum. Pronotum dark brown with yellowish quotation mark-shaped markings, strongly convex and distinctly punctate, densely covered with long erect yellowish setae; collar yellowish brown with dark base punctate, length 0.56 of width; triangular yellowish marking on mesal calli; short longitudinal whitish stripe on base of disc; posterior margin narrowly pale; areas between punctures on disc somewhat swollen but not calloused; prosternum yellowish brown, conically projecting. Scutellum entirely dark, gradually elevated to posterior with rounded carinate process; meso- and metapleura dark except for ostiolar peritreme whitish yellow. Hemelytron smooth, shiny and transparent with two transverse brown bands; anterior 1/4 and posterior half dark brown; mesal half of posterior end of corium brown, both sides of marking connected with posterior transverse band; posterior part of embolium narrowly brown; posterior part of cuneus and membrane veins tinged with brown. Legs pale yellowish brown; hind femur with apical 1/3 brown or with red band. Abdomen almost entirely dark brown in male, lateral half of segments II, IV and VII yellowish brown in female; marking on female segment II convex. Male genitalia as in Figs 32–37. Sensory lobe of left paramere slightly swollen near base; right paramere simple; endosoma with spiculate sclerite at base, lacking lobal sclerite.

Measurements (♂/♀). Total body length: 3.70–4.45/4.19–4.62; width head across eyes: 0.74–0.80/0.75–0.85; width vertex: 0.28–0.30/0.33–0.37; length of labium; 0.92–0.97/0.98–1.10; length of antennal segments I–IV: 0.33–0.38/0.44–0.50, 1.40–1.58/1.44–1.65, 0.38–0.43/0.44–0.60, 0.33–0.41/0.33–0.36; length of pronotum including collar: 1.00–1.08/1.0–1.26; width base of pronotum: 1.45–1.60/1.66–1.81; maximum width across hemelytra: 1.80–20.4/2.04–2.21; length of hind femur, tibia, and tarsus: 1.28–1.45/1.52–1.68, 1.69–2.01/1.61–2.18, 0.27–0.30/0.29–0.36.

Distribution. Japan (Shikoku: Kochi Pref., Tsushima Island).

Etymology. Named after Mr. Mikio Takai, who first suggested the presence of this new species.

Biology. According to Mr. M. Takai (pers. obs.), *Stethoconus takaii* was associated with a colony of *Stephanitis yasumatsui* Takeya, 1951 (Tingidae) on an evergreen broadleaf tree, *Trochodendron aralioides* Siebold et Zucc. (Trochodendraceae). This tingid species is assumed to be a prey item for the mirid.

Remarks. The male genital structure of this new species is similar to that of *S. japonicus* except for the shape of the left paramere. *Stethoconus takaii* can be distinguished from the latter by the following characters. Antennal segment II dark, if middle pale, at least basal 1/3 infuscate (Figs 12–14); areas between punctures on pronotum weakly swollen, but not calloused (Figs 25–26, 30–31); scutellum weakly elevated and dark without marking (Figs 15–16); pale marking on mesepimeron absent (Figs 17–18); basal part of left paramere somewhat swollen. Some specimens of the new species have been misidentified as *S. japonicus* (Yasunaga et al. 1997, Nakatani and Yasunaga 2001). The description and illustration by Nawa (1910), on which the specific name *S. japonicus* was based (Schumacher 1917; see also Yasunaga et al. 1996), unequivocally correspond to what has been identified as *S. japonicus* (with only an apically infuscate antennal segment II and a yellow marking on scutellum).

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Atahualpacoris henryi, a new species of plant bug from Colombia (Heteroptera, Miridae, Mirini)

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Abstract

A new species of plant bug in the genus *Atahualpacoris* Carvalho, tribe Mirini, is described. Morphological characters differentiating *Atahualpacoris* from the related genus *Calocorisca* are provided, and a diagnosis of each known species of *Atahualpacoris* is presented. Specimens of the new species were collected by light trap in a natural ecosystem of the Andes Mountains, Department of Tolima, Colombia. The adult and male genitalia are illustrated.

Keywords

Atahualpacoris, description, morphology, Neotropical Miridae

Introduction

Carvalho (1985) described *Atahualpacoris* in the subfamily Mirinae, tribe Mirini. Currently, the genus contains six species distributed in Andean America: *A. columbiensis* Carvalho, 1985 (Colombia and Peru), *A. impunctatus* Carvalho, 1985 (Venezuela), *A. incaicus* Carvalho, 1985 (Peru), *A. lojaensis* Carvalho, 1985 (Ecuador), *A. tamboensis* Carvalho, 1985 (Colombia, Ecuador and Peru), and *A. venezuelensis* Carvalho, 1985 (Venezuela) (Carvalho 1985, Schuh 2002–2013).

In this paper, a new species, *Atahualpacoris henryi*, is described. Illustrations of the adult and male genitalia and a key to species are provided to facilitate species recognition.

Materials and methods

Specimens were collected by light trap in the central cordillera of the Andes mountains, Cajamarca, at Tolima department of Colombia. The collection areas correspond to Veredas: Cristales La Paloma, Vereda La Luisa and include Montane Wet Forest and Very Humid Montano Low Forest, with elevations ranging from 2100 to 3200 meters above sea level. Rainfall exceeds 2000 mm/year, and temperatures are lower than 18 °C. The rugged topography is characterized by steep slopes (Holdridge 1967).

Ten traps were used to take 11 samples in two areas from May 2012 to March 2013. Traps (Luiz de Queiroz model) with a UV 15-watt fluorescent lamp were installed 2 m above ground (Ferreira and Martins 1982). Traps were activated one day a week from 1800–0700 hr and all specimens were collected after 0700 hr.

Male genitalia were prepared by immersing them in room temperature KOH for 24 hours until they were softened and cleared. After being rinsed in distilled water, genitalia were placed in an excavated microscopic slide containing glycerol, and the endosoma, right and left parameres, and phallotheca were dissected using a Leica M205 A stereoscope. Material was preserved in glycerin in a microvial that was the pinned below the specimen. Terminology for male genitalia follows Cassis (2008). Images of the adult male and male genitalia were captured using a Leica MC170 HD digital microscope camera.

The holotype and paratypes are deposited in the Regional Museum of Entomology of the Federal University of Viçosa, MG, Brazil (UFVB).

Taxonomy

Atahualpacoris Carvalho

Diagnosis. Medium to large size (6–10 mm), oval-elongate, covered with short, adpressed pubescence. Front striated and vertex grooved. Pronotum trapeziform, narrowed to head, strongly punctate with lateral margins rounded; calli smooth; collar shiny and well defined. Scutellum rough and punctate, shiny and swollen. Hemelytra smooth, covered with short, adpressed pubescence.

Remarks. *Atahualpacoris* and *Calocorisca* (Carvalho 1985, 1986) are morphologically similar genera. *Atahualpacoris* has the body elongate with the lateral margins parallel or nearly so, and the scutellum is convex and raised at the middle, with its apex acute, slightly curled upward. The hemelytral membrane length is longer than in

Calocorisca (*Atahualpacoris* length of hemelytra 1.7 to 1.9 times length of membrane; *Calocorisca* length of hemelytra 2.2 to 2.5 times length of membrane). Antennal segment I is covered by short setae mixed with common hairs, whereas in *Calocorisca* this segment is covered by erect setae longer than the width of the segment.

Key to the species of *Atahualpacoris*

1 General color brown or dark brown to black..**2**

– General color light brown, yellowish brown or reddish brown **6**

2 Collar of pronotum brown to dark brown; antenna uniformly brown or yellowish, or apex of segments II, III and IV, black; scutellum uniformly brown or dark brown with a pale longitudinal stripe or with yellowish spots. Male: endosoma with one or two spicules; longer spicule lacking many flat spines on ventral surface; area near secondary gonopore with spines, denticles or serrate edges; left paramere with sensorial lobe not crenulate..........................**3**

– Collar yellowish; scutellum not uniformly brown, with two lateral irregular stripes and apex yellow; antennal segment I yellowish with a basal and lateral black spots; II to IV black with apex yellow. Male: endosoma with three spicules; area near secondary gonopore absent; left paramere C- shaped and twisted toward broad apex; sensorial lobe stout and weakly crenulate........... ....***A. henry* sp. n.**

3 Clavus brown; hemelytron membrane darkened; scutellum dark brown without pale longitudinal stripe. Male: endosoma with one spicule; area near secondary gonopore with outer margin bearing long spine, smaller spines of different sizes and denticles, or with enlarged apical region with edge serrate, or broad area with dorsal margin formed by series of denticles and one acute elongate extension..**4**

– Clavus with longitudinal yellowish stripe following claval vein; hemelytron membrane pale with numerous small brown spots; scutellum dark brown with pale yellowish spots, apex and longitudinal median stripe pale. Male: endosoma with two spicules, a longer spicule curved, apex acute, a small spicule more robust, thickened to tip with apex curved and sharp; area near secondary gonopore with distal region denticulate; left paramere with well-developed sensorial lobe nearly 1/3 of paramere length, apical region twisted, apex broad with lateral edges acute ....***A. columbiensis* Carvalho**

4 Scutellum and cuneus uniformly brown; hemelytron membrane with two light spots on outer margin, and veins pale. Male: endosoma with long, narrow and curved spicule tapered in apical 1/3, with apex acute; area near secondary gonopore with outer margin bearing long spine, smaller spines of different sizes, and denticles; left paramere with sensorial lobe bearing small tubercles, apex forked and twisted.......................***A. impunctatus* Carvalho**

– Not as above **5**

5 Antenna yellowish; scutellum dark brown with apex and scattered spots pale; cuneus with small pale spots; hemelytron membrane darkened with many small brown spots. Male: endosoma with long spicule, apical third tapered and curved; area near secondary gonopore with enlarged apical region with serrated edge; left paramere strongly curved; sensorial lobule well developed, very small denticles on surface .... ***A. incaicus* Carvalho**

– Antenna brown; scutellum dark brown with small spots at apex yellowish; cuneus with small rounded yellowish spots; hemelytron membrane darkened with numerous small yellowish spots. Male: endosoma with long, broad spicule, apex tapering and curved; area near secondary gonopore broad, its dorsal margin formed by series of denticles and acute, elongate spinelike extension; left paramere sickle-shaped with apex blunt; sensorial lobe small, rounded, dorsal surface with many small denticles and long hairs .... ***A. venezuelensis* Carvalho**

6 Antenna yellowish; pronotum yellowish with brown spots; collar black; scutellum dark brown with apex and small spots whitish; clavus and cuneus with small black spots along claval suture; hemelytron membrane darkened with scattered small brown spots, and large pale spot close to apex of cuneus; Male: endosoma with long stout spicule, apical 1/3 bent at right angle, extreme apex tapered and twisted; area near secondary gonopore absent; left paramere with sensorial lobe developed and flattened; apex strongly curved and blunt .... ***A. jojaensis* Carvalho**

– Antennal segment I reddish with tiny sclerotized black dots; pronotum reddish with numerous small yellowish spots; collar reddish; scutellum with brown and yellowish spots; clavus reddish brown; cuneus with basal area dark; hemelytron membrane darkened with many small brown spots and red veins. Male: endosoma with long spicule, curved and tapering to apex; area near secondary gonopore with apical margin serrate; left paramere falciform, sensorial lobe strongly developed with long hairs, apex twisted and blunt .... ***A. tamboensis* Carvalho**

***Atahualpacoris henryi* sp. n.**

http://zoobank.org/D976195C-C98A-414F-A631-44087BAE7601
Figs 1–4

Diagnosis. Distinguished from other species of *Atahualpacoris* by large size (8.0 to 9.5 mm) with general color dark brown to black; hemelytra dark brown; two large yellowish spots on corium; cuneus with yellowish spots near cuneal fracture on inner basal angle and at apex; hemelytral membrane darkened with many small, rounded, scattered, pale spots; absence of black spot at base of larger cells of hemelytral membrane; male genitalia: endosoma with three spicules of different size and shape, acute distally; longer spicule with many flat spines on ventral surface; left paramere sickle shaped, apex broad and twisted, sensorial lobe crenulate.

Figure 1. *Atahualpacoris henryi* sp. n. male, holotype (dorsal view).

Holotype male (Figs 1–3); measurements (Table 1).

Description. *Body* shiny, parallel sided, length ca. 2.5 times width, dorsal vestiture with short, semi-erect hairs; general color dark brown to black with spots and small marks yellowish. **Head** declivous, shiny, broader than long, weakly convex dorsally; in

Table 1. Characters measurements in millimeters taken from Holotype first, followed by range (minimum and maximum) of five males and five females specimens, and average for each character.

Caracteres	Holotype	Male			Female		
		min	max	average	min	max	average
Body length	9	7,60	9,00	8,60	8,40	10,00	9,44
Body width	3,5	3,10	3,70	3,40	3,40	3,80	3,60
Head length	0,7	0,50	0,70	0,62	0,50	0,70	0,60
Head width	1,4	1,30	1,40	1,32	1,30	1,40	1,34
Head distance between eyes	0,36	0,33	0,38	0,36	0,44	0,49	0,46
Antennal segment I length	0,90	0,79	0,90	0,85	0,79	0,87	0,84
Antennal segment II length	1,97	1,90	2,41	2,09	1,87	2,10	2,03
Antennal segment III length	0,79	0,79	0,92	0,86	0,82	0,92	0,88
Antennal segment IV length	0,59	0,59	0,69	0,65	0,62	0,67	0,64
Pronotum length	1,38	1,21	1,41	1,35	1,18	1,38	1,32
Pronotum width at base	3,05	2,72	3,08	2,95	3,03	3,25	3,16
Hind femur length	2,38	2,21	2,64	2,45	0,85	0,92	0,89
Hind tibia length	3,31	3,16	3,50	3,33	3,22	3,47	3,33
Hind tarsus length	0,90	0,79	0,92	0,88	0,85	0,92	0,89
Scutellum length	1,46	1,33	1,49	1,41	1,54	1,69	1,59
Scutellum width	1,54	1,36	1,62	1,49	1,59	1,69	1,64
Hemelytron length	7,27	6,45	7,60	7,16	6,94	8,43	7,95
Cuneus length	1,41	1,05	1,41	1,30	1,41	1,64	1,53
Cuneus width	1,33	1,18	1,46	1,35	1,26	1,49	1,41
Rostrum length	2,22	2,13	2,75	2,41	2,19	2,81	2,39

dorsal view dark brown with yellowish stripes; frons with longitudinal median groove; eyes prominent, contiguous to collar, occupying most of head in dorsal view; vertex with transverse sulcus; antennal vestiture with short pilosity, less than width of segment; antennal fossa above jugal-loral suture dark brown; antennal segment I shorter than width of vertex between eyes, bearing short setae mixed with common hairs, yellowish with extreme base and lateral spots black; segments II–IV black, extreme apex yellow, with whitish adpressed pilosity; relative lengths of antennal segments in ascending order II < I < III< IV; eyes black; rostrum brown with light brown spots, reaching mesosternum; lateral margins of clypeus, posterior area of juga and loral-jugal suture dark brown; epipharynx brown at base. **Pronotum** dark brown, trapeziform, two times wider than long, vestiture with sparse, short, pale hairs; collar yellowish; callus black, swollen, shiny, smooth with lateral sides slightly marginate; disc of pronotum convex, shiny, distinctly rugose and punctate with irregular yellowish spots; humeral angles slightly depressed; pronotum ventrally with xypho of prosternum yellowish with brown spots; propleura dark brown, shiny, rugose and punctate with sparse, adpressed hairs; mesosternum dark brown, slightly rugose and punctate; mesepisternum and metaepisternum dark brown; ostiolar peritreme brown with median lobe developed and evaporative area yellowish; coxae and femora with semierect hairs shorter than width of segment; coxae black with yellowish spots; posterior margins of median coxae yellowish; femora black with scattered yellowish spots; tibiae brown with scattered yellowish spots, parallel rows of tiny

Figure 2. *Atahualpacoris henryi* sp. n. male, holotype (ventral view).

black spines along entire length, and vestiture of common semi-adpressed pale hairs mixed with dark bristles shorter or equal to width of segment; length of hind tibia more than 3.5 times length of hind tarsus; tarsi brown, darkening to apex. **Scutellum** triangular, rugose, shiny, slightly convex, and raised at middle, with apex acute, slightly curled upward; general color dark brown with two lateral irregular stripes, apex yellow; clothed with sparse semi-erect hairs. **Hemelytron** dark brown, elongate, subparallel, lateral mar-

Figure 3. *Atahualpacoris henryi* sp. n. male, holotype (lateral view).

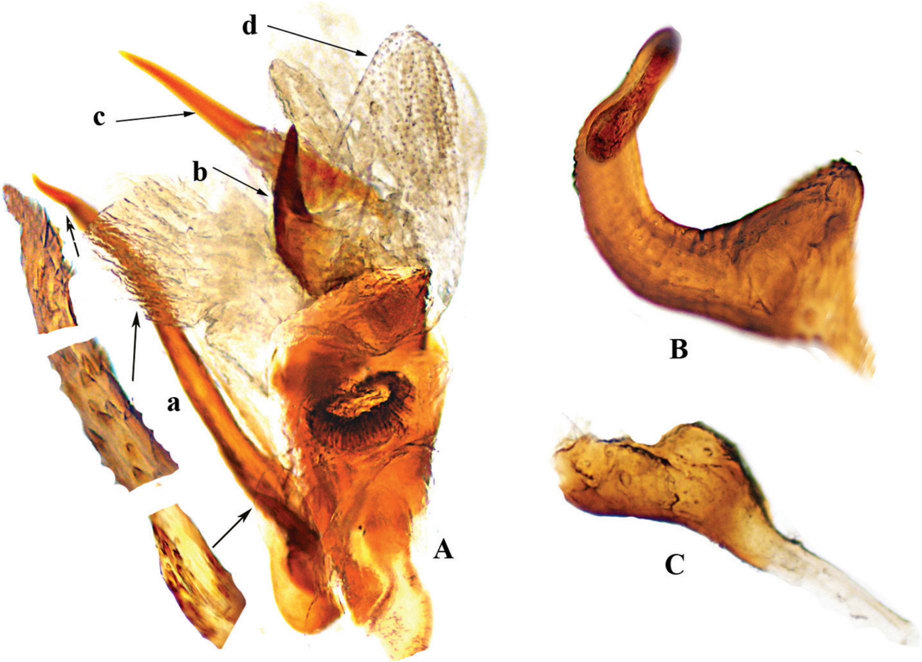

Figure 4. *Atahualpacoris henryi* sp. n. male, holotype **A** endosoma **a** longer spicule with many flat spines **b** shorter sickle-shaped spicule **c** third spicule larger at base **d** membranous lobes with tiny teeth **B** left paramere **C** right paramere.

gins slightly rugose with short, pale, adpressed pubescence mixed with dark hairs; clavus black; two large, somewhat rounded spots on corium, and small patches throughout embolium yellowish; claval-corial suture and embolio-corial suture impunctate; embolium delimited along entire length; cuneus slightly longer than wide with small spots

Table 2. Results of Principal Component Analysis for *Atahualpacoris henryi* sp. n. (PCA). Bold values are the ones that most influence the divergences.

	Jolliffe cut-off: 0,003	
	PCA1	**PCA2**
Eigenvalue	0,073315	0,005824
% Variance	83,874	6,6633
Body length	0,003118	0,02205
Body width	0,03958	0,2028
Head length	**0,1118**	0,1741
Head width	0,07589	0,2386
Head distance between eyes	**-0,1176**	0,3677
Antennal segment I	**0,1056**	0,2467
Antennal segment II	**0,1111**	0,1195
Antennal segment III	0,06692	0,2308
Antennal segment IV	**0,1068**	0,2588
Pronotum length	**0,1088**	0,213
Pronotum width at base	0,0297	0,2007
Hind femur length	**0,9408**	-0,1782
Hind tibia length	0,08981	0,2269
Hind tarsus length	0,07514	0,1453
Scutellum length	-0,01467	0,257
Scutellum width	0,006607	0,2507
Hemelytron length	-0,00684	0,005071
Cuneus length	**-0,05448**	0,1889
Cuneus width	0,06587	0,4241
Rostrum length	0,08813	0,07838

on outer margin, broad spot near cuneal fracture, spot on inner basal angle and apex yellowish; hemelytral membrane opaque, glabrous and slightly rugose, darkened with many scattered, small, pale spots. **Abdomen** brown with yellowish areas, vestiture with adpressed or semi-erect hairs.

Male genitalia (Figure 4). Endosoma (Figure 4A) with membranous lobes covered with tiny teeth (Figure 4Ad), and three thick spicules of different size and shape, acute distally; longer process narrow, rising below secondary gonopore, ventral surface with many flat spines (Figure 4Aa); second process shorter, broad, sickle-shaped (Figure 4Ad); third process larger at base, narrowed to acute apex (Figure 4Ac); secondary gonopore large, distinct, with rim wide and ribbed. Left paramere (Figure 4B) C-shaped in dorsal aspect, twisted toward broad apex; sensorial lobe relatively stout and weakly crenulate. Right paramere (Figure 4C) reduced, sensorial lobe relatively stout.

Female. Similar to males in structure and vestiture. Measurements (Table 1).

Geographic distribution. Colombia (Tolima).

Host plant. Unknown.

Etymology. Named in honor of Dr. Thomas J. Henry (National Museum of Natural History, Washington D.C.) for his great contributions to the knowledge of Heteroptera, especially the family Miridae.

Table 3. Comparison of morphometric characters (in percentage) used in the diagnosis of sexual dimorphism of *Atahualpacoris henryi* sp. n. Only characters with greater percentage differences of the relations between the characters. Min. = Minimum values. Max. = Maximum values. DP = standard deviation.

CHARACTERS	Holotype (male)	Male				Female			
		Min.	Max.	Average	DP	Min.	Max.	Average	DP
Body length									
Hind femur length	26,50	26,50	30,71	**28,54**	1,64	8,81	10,07	**9,42**	0,47
Body width									
Hind femur length	68,13	68,13	77,68	**72,15**	3,71	23,56	25,64	**24,67**	1,03
Head length									
Hind femur length	29,35	22,67	29,35	**25,33**	3,40	54,17	80,29	**67,82**	9,40
Head width									
Head distance between eyes	25,64	25,64	29,59	**27,22**	1,65	31,14	35,50	**34,09**	1,84
Hind femur length	170,33	169,63	203,16	**185,94**	15,69	64,10	69,03	**66,24**	1,90
Head distance between eyes									
Antennal segment I	40,00	37,14	45,45	**42,30**	3,61	51,52	56,25	**54,61**	1,87
Hind femur length	15,05	12,62	16,28	**14,71**	1,32	48,57	54,55	**51,46**	2,33
Hind tarsus length	40,00	37,14	45,16	**41,06**	3,44	48,57	54,55	**51,46**	2,33
Hind femur length									
Antennal segment I	37,63	32,63	37,63	**34,83**	2,44	88,57	97,06	**94,27**	3,45
Antennal segment II	120,78	107,45	127,16	**117,78**	7,18	41,46	45,21	**43,83**	1,42
Pronotum length	172,22	172,22	194,34	**181,86**	9,49	62,96	76,09	**67,56**	5,31
Pronotum width at base	78,15	78,15	88,79	**82,97**	3,94	27,35	28,43	**28,05**	0,44
Leg hind tibia length	71,99	69,87	77,53	**73,52**	2,85	25,13	27,61	**26,65**	0,99
Leg hind tarsus length	265,71	263,89	297,06	**279,67**	15,53	100,00	100,00	**100,00**	0,00
Scutellum length	163,16	163,16	190,57	**174,52**	10,97	54,55	57,38	**55,83**	1,17
Scutellum width	155,00	155,00	174,58	**164,98**	8,38	51,52	56,45	**54,09**	2,16
Hemelytron length	32,79	32,04	37,60	**34,29**	2,15	10,66	12,19	**11,19**	0,59
Cuneal length	169,09	169,09	209,76	**189,43**	16,30	53,13	63,64	**58,01**	3,90
Cuneal width	178,85	177,19	186,96	**181,23**	4,06	56,90	71,43	**63,51**	6,40
Rostrum length	107,48	91,70	115,77	**102,58**	9,85	31,00	39,89	**37,35**	3,60
Cuneal length									
Antennal segment I	63,64	59,62	78,05	**65,99**	7,66	51,56	56,36	**54,58**	1,87
Pronotum length	98,18	98,18	114,63	**104,14**	6,78	83,64	88,52	**85,93**	2,24
Leg hind femur length	169,09	169,09	209,76	**189,43**	16,30	53,13	63,64	**58,01**	3,90
Leg hind tibia length	42,57	33,31	42,57	**39,04**	3,53	42,98	47,34	**46,03**	1,86

Material examined. Holotype male, Colombia,Tolima, Cajamarca, La Colosa, C. Andina, Armadilha Luminosa, Febrero 2013, Benevides Lopes J.L. (ICN- Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá) **Paratypes**: (Same locality of holotype): female, IX/2012; male, 4 females, XI/2012; 3 males, female, XII/2012; male, 2 females I/ 2013; 4 males, female II/ 2013 (UFVB- Universidade Federal de Viçosa, MG, Brazil).

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RESEARCH ARTICLE

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Henryhalticus philippinensis gen. et sp. n., a minute halticine from the Philippines (Insecta, Heteroptera, Miridae, Orthotylinae)

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Abstract

Henryhalticus philippinensis **gen. et sp. n.** is described from a single location in the Negros Oriental Province of the Philippines. The male and female genitalia are described and illustrated. On the basis of the genitalic characters, external morphology, and size and color, the new species is erected as a monotypic genus.

Keywords

Heteroptera, Miridae, taxonomy, new taxon, Philippines

Introduction

Representatives of the hyperdiverse family Miridae are found in most regions and terrestrial ecosystems of the world (Cassis and Schuh 2012), and as with other species-rich families, they display an astonishing range of morphologies and feeding preferences (Wheeler 2001). The subfamilial classification is stabilized, with eight subfamilies routinely recognized, of which the Orthotylinae are the third most diverse, with six included tribes (Cassis and Schuh 2012). The tribe Halticini is now routinely considered an ingroup within the Orthotylinae, although Wagner (1973) previously regarded it as worthy of subfamilial ranking, but this has no significant contemporary support.

The present work involves the discovery of a minute halticine species from the Philippines. Specimens have been held in the American Museum of Natural History for a considerable time, and numerous colleagues have been uncertain about its supra-generic position and if it represents a new taxon. In this work I assign it to the Halticini based on genitalic and pretarsal characters, and recognize it as a new genus and new species, with commentary about its affinities.

This work is dedicated to Dr. Thomas J. Henry, whom I have known from the early 1980s. My memory is not precise but I do recall going on a fieldtrip to the Cascade Mountains with Tom, a trip organized by my Ph.D. supervisor, the late John D. Lattin. I also recall near the end of the trip a very large fir tree had fallen across a dirt road, and we had no other option but to retrace our tracks, adding many hours to our return journey. This gave us many hours to talk about the Miridae, a journey that we share with few other entomologists. Tom has worked with the previous miridology greats, including his close friend, the late Jose Carvalho. In the ensuing years he has become one of the mirid greats himself, and it is an honor to name a new genus after him. I wish him well in his taxonomic and personal exploits in the years to come.

Materials and methods

Specimens were borrowed from the American Museum of Natural History (**AMNH**). Two pairs of paratypes are to be housed at the University of New South Wales (**UNSW**). The specimens were digitized in the Plant Bug Inventory database (https://research.amnh.org/pbi/locality/).

Male and female genitalia were macerated in 5% KOH, rinsed in distilled water, and dissected and examined in glycerol. The genitalia were illustrated using a camera lucida attached to a Leica DMB compound microscope. External characters were examined and measured using a Leica 205C automated stereomicroscope and Leica digital software. External characters were also documented with a Hitachi Desktop TM3000 scanning electron microscope.

Taxonomy

***Henryhalticus* gen. n.**

http://zoobank.org/813CB8C6-AC79-4BB9-A895-B210BE065EA9
Figures 1–4

Type species. *Henryhalticus philippinensis* sp. n., by original designation.

Diagnosis. *Henryhalticus* is recognized by the following combination of characters: body minute, oval (Figs 1, 2A,B); posterior margin of head weakly carinate (Figure 2C);

Figure 1. Male and female representatives of *Henryhalticus philippinensis* gen. et sp. n.; dorsal and lateral views.

antennae inserted in front of and dorsad of ventral margin of eyes (Figure 2D); first antennal segment short (Figure 2D); labium very short, reaching only procoxae; costal fracture deep (Figs 1, 2A); evaporative area restricted to posterior margin of metepisternum, not reaching mesepimeron (Figure 2E); metafemora greatly enlarged (Fig. 2B, F); parameres overlapping (Figs 2H, 3B); endosoma without sclerotization (Fig. 3E–G); secondary gonopore large, apical, extending to apex of phallotheca at rest (Fig. 3E–G).

Description. STRUCTURE. Body minute, oval, dorsal surface weakly convex, cuneus strongly deflexed (Figs 1, 2A, B). Head strongly dorsoventrally oriented, face strongly convex (Figs 1, 2A, B, C); vertex partly carinate (Figure 2C); eyes contiguous with anterior margin of pronotum (Fig. 2A, B, C). Antennae short, inserted anterior to eyes, and dorsad to ventral margin of eyes (Figure 2D); AI shorter than interocular distance; AII shorter than anterior margin of pronotum. Labium thick, very short, reaching only procoxae (Figure 2D). Pronotum large, subtrapezoidal; without collar; lateral margins linear; humeral angles broadly rounded; posterior margin deeply excavated (Figs 1, 2C). Scutellum large, broad, with mesoscutellum broadly exposed (Figs 1, 2C). Hemelytra oval, with costal margins broadly rounded; clavus large; embolium thickened; costal fracture deeply incised; cuneus transverse, lateral margins rounded; two membrane cells present, large vein rounded (Figs 1, 2A). Metathoracic gland efferent system well developed, arcuate, with peritreme reaching dorsal margin of metepisternum; peritreme tongue-like, reaching dorsal margin of evaporative area; evaporative area not reaching mesepimeron; metathoracic spiracle weakly exposed, without evaporative bodies (Figure 2E). Profemora and mesofemora small, metafemora greatly enlarged (Fig. 2B, F); parempodia lyre-shaped (Figure 2G). Male parameres overlapping (Figs 2H, 3B); aedeagus without sclerotization, secondary gonopore apical (Fig. 2E–G). Female posterior wall without inter-ramal lobes (Figure 3A).

See species description for coloration, texture, vestiture, and fine details of genitalia.

Remarks. *Henryhalticus* is unlike other halticines in color, size, and shape. This is one of the smallest mirids described, with both sexes <2 mm in length. This genus keys to the Australian genus *Goodeniaphila* Tatarnic, in Tatarnic and Cassis' (2012) global conspectus of the tribe Halticini. As with this latter genus, *Henryhalticus* lacks inter-ramal lobes on the posterior wall of the bursa copulatrix, but differs by possessing sclerotized rings on the dorsal labiate plates of the internal female genitalia. These two genera share a similar oval body, but *Henryhalticus* lacks any punctation or rugosity on the body, whereas *Goodeniaphila* has a rugose pronotum. The parempodia of these two genera are similar; however, *Henryhalticus* lacks tarsal pulvilli, in contrast to the former genus, which has large pulvilli. The male aedeagus is the most distinctive fine-scale difference between these two genera, with *Goodeniaphila* having multiple large endosomal spicules, whereas *Henryhalticus* lacks any endosomal sclerotization.

The aedeagus of *Henryhalticus* is most like that of *Halticus* Hahn. Both genera lack endosomal sclerotization, the posterior margin of the head is contiguous with the pronotum, and the posterior margin of the vertex is carinate. *Henryhalticus*, however, lacks sclerotized rings and tarsal pulvilli, and the efferent system of metathoracic glands is less well developed. In addition, the pronotum is more rounded posteriorly in *Halticus* and the mesoscutum is not as exposed in *Henryhalticus*.

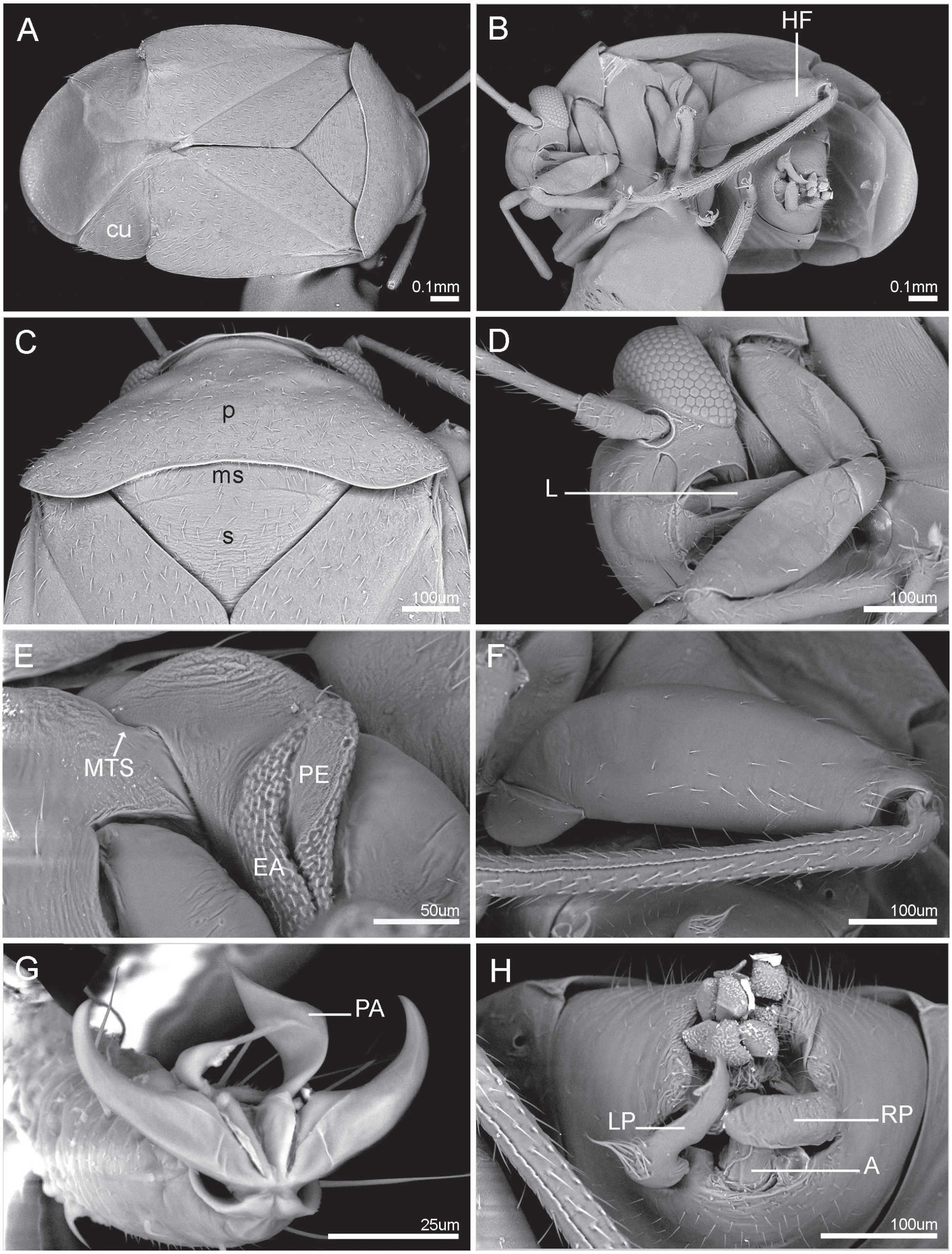

Figure 2. Scanning electron micrographs of key characters of *Henryhalticus philippinensis* gen. et sp. n. **A** Dorsal view of body **B** Ventral view of body **C** Pronotum and scutellum **D** Lateroventral view of head and thorax **E** Pterothoracic pleura, incl. external efferent system of metathoracic glands **F** Metafemur and metatibia **G** Pretarsus, dorsal view **H** Genital opening of pygophore. Abbreviations: A = aedeagus; cu = cuneus; EA = evaporative area; HF = hind femur; L = labium; LP = left paramere; ms = mesoscutum; MTS = metathoracic spiracle; PA = parempodia; PE = peritreme; p = pronotum; RP = right paramere; s = scutellum.

Henryhalticus philippinensis sp. n.

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Figures 1–4

Material examined. Holotype: PHILIPPINES: Negros Oriental: Camp Lookout, Dumaguete, Negros Island, 9.294°N 123.218°E, 396 m, 15 Feb 1961 - 15 Apr 1961, T. Schneirla & A. Reyes, ♂ (UNSW_ENT 00029095) (AMNH). **Paratypes**: PHILIPPINES: same locality as holotype; 15 Feb 1961 - 15 Apr 1961, T. Schneirla & A. Reyes, 15♂♂ (UNSW_ENT 00029096-UNSW_ENT 00029110) (AMNH); 06 Mar 1961, T. Schneirla & A. Reyes, 1♂ (UNSW_ENT 00029126) (AMNH); 21 Apr 1961, T. Schneirla & A. Reyes, 4♂♂ (UNSW_ENT 00029132-UNSW_ENT 00029135) (AMNH); 02 May 1961, T. Schneirla & A. Reyes, 2♂♂ (UNSW_ENT 00029118, UNSW_ENT 00029119), 3♀♀ (UNSW_ENT 00029120-UNSW_ENT 00029122) (AMNH); 03 May 1961, T. Schneirla & A. Reyes, 2♂♂ (UNSW_ENT 00029124, UNSW_ENT 00029125) (AMNH); 18 May 1961, T. Schneirla & A. Reyes, 1♂ (UNSW_ENT 00029131) (AMNH); 20 May 1961, T. Schneirla & A. Reyes, 22♂♂ (UNSW_ENT 00029136-UNSW_ENT 00029157), 6♀♀ (UNSW_ENT 00029158-UNSW_ENT 00029163) (AMNH); 21 May 1961, T. Schneirla & A. Reyes, 2♂♂ (UNSW_ENT 00029127, UNSW_ENT 00029128) (AMNH); 22 May 1961, T. Schneirla & A. Reyes, 2♂♂ (UNSW_ENT 00029129, UNSW_ENT 00029130) (AMNH); 24 May 1961, T. Schneirla & A. Reyes, 7♂♂ (UNSW_ENT 00029172-UNSW_ENT 00029178) (AMNH); 25 May 1961, T. Schneirla & A. Reyes, 10♂♂ (UNSW_ENT 00029179-UNSW_ENT 00029188), 3♀♀ (UNSW_ENT 00029190-UNSW_ENT 00029192) (AMNH); 26 May 1961, T. Schneirla & A. Reyes, 6♂♂ (UNSW_ENT 00029194-UNSW_ENT 00029199), 5♀♀ (UNSW_ENT 00029193-UNSW_ENT 00029203) (AMNH); 28 May 1961, T. Schneirla & A. Reyes, 6♂♂ (UNSW_ENT 00029164-UNSW_ENT 00029169), 2♀♀ (UNSW_ENT 00029170, UNSW_ENT 00029171) (AMNH).

Diagnosis. *Henryhalticus philippinensis* is recognized by the following combination of characters: body oval; minute, <2 mm in length; orange (Figure 1); body with moderately dense distribution of decumbent simple setae (Figs 1, 2A, C); genital opening of pygophore terminal, oval (Figs 2H, 3A, B); left paramere V-shaped, with apex recurved, plus apical flange (Figure 3C); right paramere upright, spoonlike apically (Figure 3D); ovipositor greatly elongate (Figure 1); gonapophyses 8 basally membraneous, nearly symmetrical (Figure 4A); posterior wall simple, membraneous, laterally spiculate, without discrete inter-ramal lobes (Figure 4B).

Description. ***Coloration.*** Body and appendages orange, with anterior lobe of pronotum, femora, clypeus and lateral regions of head, thoracic pleura and abdominal venter partly reddish orange; exocorium partly hyaline; hemelytral membrane smoky (Figure 1).

Vestiture. Body with moderately dense distribution of decumbent hairlike setae; setae more erect on antennae, legs, and abdominal venter (Figs 1, 2A, B).

Texture. Impunctate, shiny (Figs 1, 2A, B).

Structure. As in generic description.

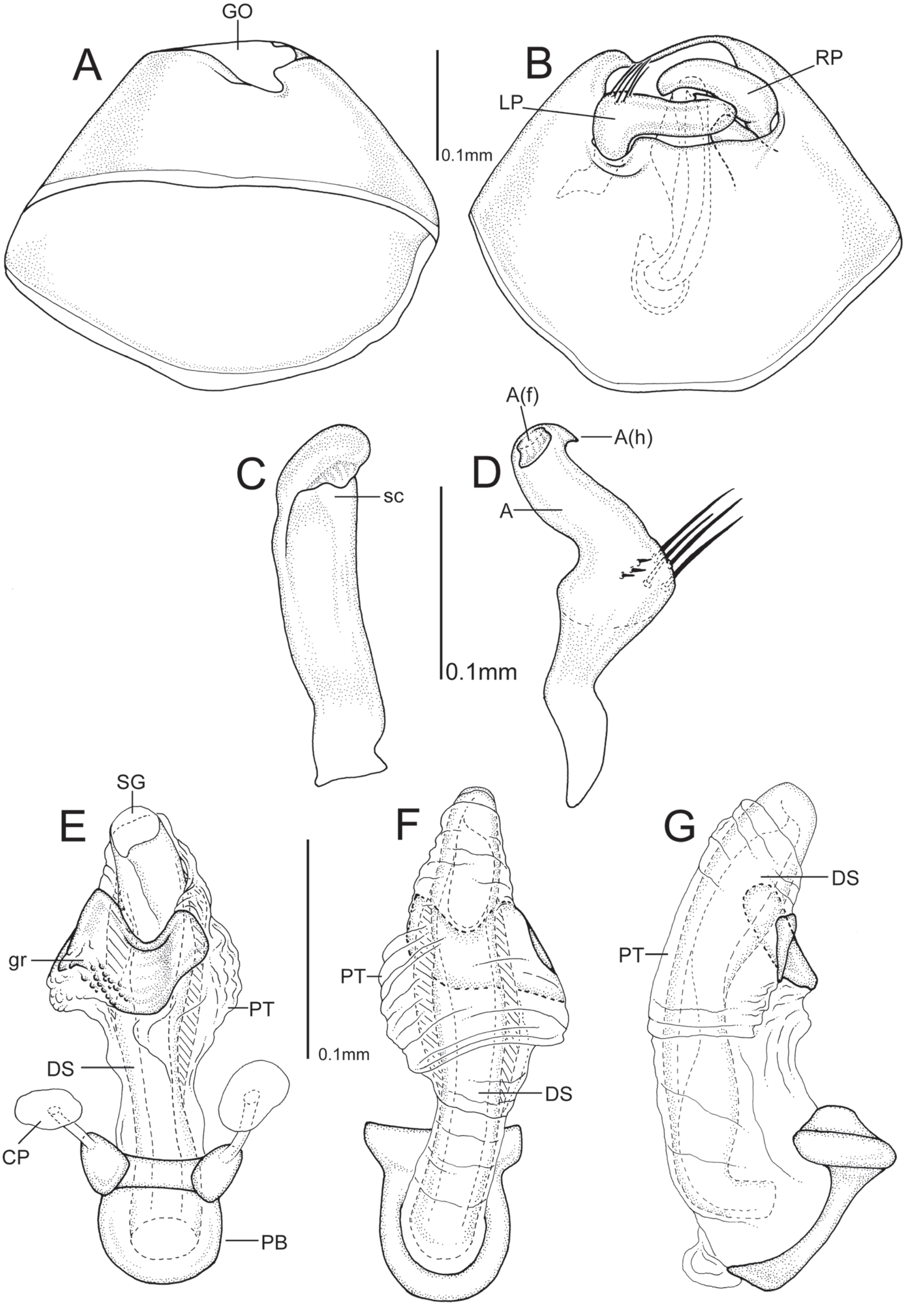

Figure 3. Male genitalia of *Henryhalticus philippinensis* gen. et sp. n.

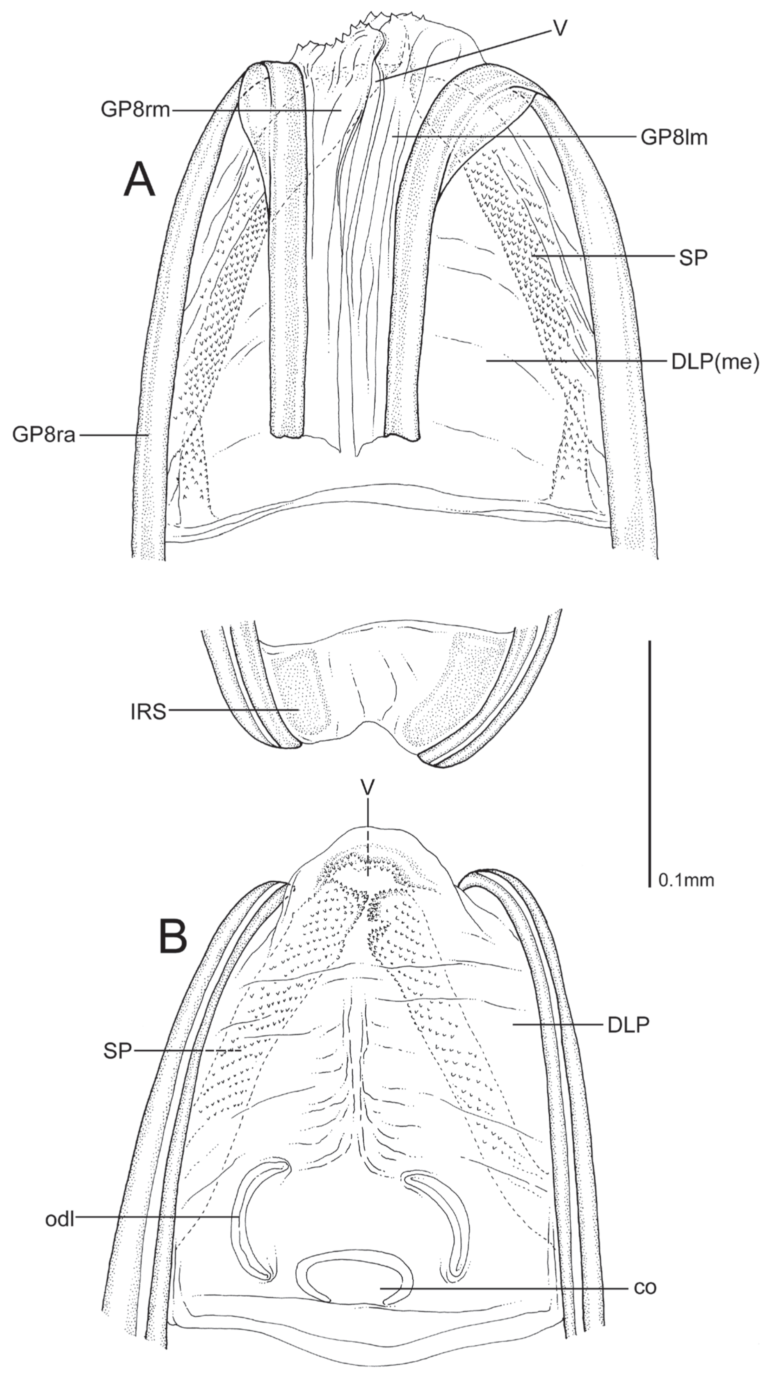

Figure 4. Female genitalia of *Henryhalticus philippinensis* gen. et sp. n. **A** Ventral view of external female genitalia, including posterior wall of bursa copulatrix **B** Dorsal view of external female genitalia. Abbreviations: co = common oviduct; DLP(me) = dorsal labiate plate, mesial surface; GP8lm = gonapophyses 8 basal left membrane; GP8rm = gonapophyses 8 basal right membrane; IRS = inter-ramal sclerite; odl = lateral oviduct; SP = spiculate area of mesial surface of dorsal labiate plate; V = vestibulum.

Table 1. Measurement of key characters of *Henryhalticus philippinensis*. All measurements given in millimeters. Mean, standard deviation, range, minimum, and maximum values given for each species. Abbreviations: CunClyp = maximum length between apex of clypeus and tip of cuneus, Pron = pronotum, Scut = scutellum, InterOc = Interocular distance, AntSegI–IV = antennal segment I–IV.

		Length						Width			InterOc	AntSegI	AntSegII	AntSegIII	AntSegIV
		Body	Cun Clyp	Head	Pron	Scut	Cun	Head	Pron	Scut					
M (n=5)	Mean	1.607	1.090	0.152	0.215	0.184	0.294	0.428	0.690	0.299	0.256	0.082	0.346	0.196	0.177
	SD	0.104	0.061	0.033	0.017	0.014	0.020	0.023	0.035	0.016	0.007	0.010	0.025	0.003	0.004
	Range	0.287	0.158	0.091	0.042	0.042	0.054	0.069	0.094	0.048	0.017	0.031	0.079	0.007	0.009
	Min	1.493	1.029	0.101	0.196	0.163	0.272	0.388	0.624	0.278	0.249	0.067	0.305	0.193	0.173
	Max	1.781	1.187	0.192	0.238	0.205	0.326	0.457	0.718	0.326	0.266	0.098	0.384	0.199	0.181
F (n=5)	Mean	1.774	1.207	0.161	0.222	0.212	0.289	0.493	0.860	0.374	0.263	0.114	0.311	0.085	0.164
	SD	0.131	0.056	0.045	0.031	0.021	0.052	0.007	0.015	0.019	0.021	0.021	0.170	0.000	0.000
	Range	0.357	0.147	0.119	0.088	0.057	0.117	0.021	0.046	0.051	0.063	0.048	0.341	0.000	0.000
	Min	1.525	1.147	0.073	0.194	0.181	0.235	0.482	0.843	0.351	0.232	0.095	0.140	0.085	0.164
	Max	1.882	1.294	0.192	0.281	0.238	0.352	0.502	0.889	0.401	0.294	0.143	0.481	0.085	0.164

MALE GENITALIA. Pygophore conical (Figure 3A, B); genital opening terminal, large, suboval (Figs 2H, 3A, B). Parameres interlocking (Figs 2H, 3B); right paramere upright, distally spoon-shaped (Figure 3C); left paramere v-shaped, sensory lobe weakly developed with a few stiff bristlelike setae, apophysis short, with apex recurved, and with a flange-like process (Figure 3D). Aedeagus simple; phallotheca simple, mostly membraneous, with mediodorsal region weakly denticulate; ductus seminis broad, weakly ribbed; secondary gonopore broad, opening apically (Fig. 3E–G).

FEMALE GENITALIA. Ovipositor greatly elongate, almost reaching thoracic-abdominal boundary (Figure 1); membraneous regions of gonapophyses 8 nearly symmetrical (Figure 4A); vestibulum simple, with membraneous apex weakly denticulate (Figure 4A); mesial region of dorsal labial plate narrowly spiculate (Figure 4B); posterior wall of bursa copulatrix simple, membraneous, with lateral regions weakly spiculate (Figure 4A).

Measurements. See Table 1.

Distribution. Known only from the type locality on Negros Island, in the Philippines, between February 15 and May 28, 1961.

Remarks. See generic remarks.

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RESEARCH ARTICLE

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A new species of *Carvalhomiris* from Colombia with an assessment of its phylogenetic position (Heteroptera, Miridae, Orthotylinae)

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Abstract

Plant bugs, species of Miridae (Heteroptera), are not well known in the Neotropics, and Colombia is not an exception. Based on data from the available systematic catalog (Schuh 2002–2013) fewer than 150 species are recorded from the country, clearly an underestimation. Recent fieldwork has resulted in several new interesting taxa from Colombia. *Carvalhomiris* Maldonado & Ferreira, 1971, contains three described species from Colombia and Ecuador. From specimens collected in Jardín, Antioquia, *Carvalhomiris henryi* **sp. n.** is described. Images of the dorsal habitus and the male and female genitalia are provided. Based on morphological examination of the new species and published information, morphological characters were coded to construct a phylogenetic matrix for a cladistic analysis in which the phylogenetic position of the new species is assessed. *Carvalhomiris henryi* **sp. n.** is the northernmost species of the genus and noteworthy because it is the first record of any species of the genus in the Western Cordillera: all other species are known from the eastern flank of the Andes (Ecuador) or the Eastern Cordillera (Colombia). Natural history observations of the new species, including associations with composites (Asteraceae) are provided. It is speculated that the mirid might be predacious.

Keywords

Andes, genitalia, Hemiptera, Neotropical region, *Zanchius* group

Introduction

Miridae are the most diversified family of Heteroptera with more than 11,000 described species (Ferreira et al. 2015, Wheeler and Krimmel 2015, Henry 2017). In the Neotropics, taxonomic efforts to reveal the family's diversity were carried out most notably by José Candido de Melo Carvalho and colleagues (Carvalho and Froeschner 1987, 1990, 1994, Henry and Wheeler 1995). Taxonomic knowledge for the family in the Neotropics is still inadequate (Wheeler 2001), partly because the fauna of certain areas is poorly documented. Colombia, for instance, despite being considered a megadiverse country (Mittermeier 1988, Mittermeier et al. 2011, Arbeláez-Cortés 2013), has only about 150 mirid species listed (Schuh 2002–2013), which clearly underestimates the family's actual diversity.

Among mirid subfamilies, the Orthotylinae comprise six tribes (Schuh 2002–2013), one of which is the paraphyletic Orthotylini (Cassis and Schuh 2012). Within this tribe, Schuh (1974) recognized several informal generic groupings, one of which is the *Zanchius* group, which includes *Carvalhomiris* Maldonado & Ferreira, 1971 (Forero 2009). The generic composition of the *Zanchius* group has varied through time (Schuh 1974, Henry 1995, Forero 2009), but a phylogenetic analysis for the group is not yet available.

Carvalhomiris is characterized by an overall pale yellow coloration with greenish areas, usually strong brachypterism in both sexes, and eyes removed from the anterior margin of the pronotum (Maldonado and Ferreira 1971, Forero 2009). The genus has three described species: *C. brachypterus* Maldonado & Ferreira, 1971 and *C. truncatus* Forero, 2009, from three localities in Colombia on the Eastern Cordillera, and *C. bifurcatus* Forero, 2009, from a locality in Ecuador on the eastern flank of the Andes.

Recent fieldwork in Jardín, Antioquia, Colombia, led to the discovery of an additional undescribed species of *Carvalhomiris*. This new species represents the northernmost distribution of the genus and highlights the wide distributional gap among the known species. Additionally, the discovery of this new species allows the putative synapomorphies for *Carvalhomiris* proposed by Forero (2009) to be tested. Therefore, we describe this new species of *Carvalhomiris*, propose the first phylogenetic hypothesis for the genus, and evaluate the phylogenetic position of the new species with respect to previously described species.

Materials and methods

Study area and specimens

Specimens were collected near Jardín, Antioquia, Colombia, by beating vegetation along the road. Specimens were mounted, labelled, and deposited in the Entomological collection of the Museo Javeriano de Historia Natural Lorenzo Uribe S.J., of the Pontificia Universidad Javeriana, Bogotá, Colombia (**MPUJ_ENT**) and in the Entomology Collection of the National Museum of Natural History, Smithsonian Institution, USA (**USNM**). Quotation marks were used for specimen data cited verbatim. Different labels were separated by a backslash, with comments placed between square brackets.

Dissection and terminology

Genitalia were dissected and examined using a Zeiss Discovery V20 stereoscope or a Nikon SMZ1270 stereoscope following Forero (2008). Digital photographs were taken with a Nikon D5300 attached either to a Nikon SMZ1270 stereoscope or a microscope Nikon Eclipse E100. When taking digital photographs using the Nikon SMZ1270 stereoscope, a modified light dome illumination system (Kawada and Buffington 2016) was used. We used a ring LED illumination system from an Olympus stereoscope.

Terminology for male genitalia follows Kelton (1959), Konstantinov (2003), and Forero (2008), except for "vesica"; instead, we refer to the membrane and sclerotizations attached to the phallotheca as endosoma (Cassis 2008, Schwartz 2011); terminology for female genitalia follows Davis (1955), Scudder (1959), and Forero (2008). For the description we assumed that characters not mentioned in the text agree with the generic description of *Carvalhomiris* (Forero 2009).

In proposing a rationale and terminology for the endosomal sclerotizations of male Austromirini, Cassis (2008) designated them as dorsal and ventral endosomal spicules (DES and VES, respectively). Schwartz (2011) expanded the discussion and application of these terms to the Orthotylini, discussing the various configurations of the DES. Schwartz (2011) also noted that several genera of the Orthotylini have a single spiculum that he homologized with the DES. Until further evidence among additional members of the *Zanchius* group is available, we treated the single spiculum of *Carvalhomiris* as the DES, despite not completely agreeing with Cassis (2008) that the base of the DES has an expanded keel.

Phylogenetic analyses

Based on the taxonomic revision of *Carvalhomiris* (Forero 2009) and the documentation of the new species described herein, morphological characters were proposed and coded to build a matrix with 45 characters (Appendix 1, Suppl. material 1). All characters were treated as non-additive. The characters coded document variation among the species relative to body size, antennal structure and coloration, pronotum structure, hemelytron development and structure, and male and female genitalia. The matrix includes seven terminals. The ingroup comprises the three previously described species of *Carvalhomiris* (Forero 2009) and our species. As outgroups, we included unidentified species of *Parachius* Distant, 1884 and *Itacoris* Carvalho, 1947, both members of the *Zanchius* group (Schuh 1974, Henry 1995, Forero 2009). We also included an additional member of the Orthotylini not closely related to other species of the *Zanchius* group, an unidentified species of *Orthotylus*, which also was used to root the trees.

For the phylogenetic analyses, we used parsimony as the optimality criterion. With the number of terminals very small, an exact solution for the matrix can be provided using a branch-and-bound algorithm (Hendy and Penny 1982, Goloboff et al. 2008). Analyses were carried out using TNT version 1.5 Beta (Goloboff and Catalano 2016).

Results

Carvalhomiris henryi sp. n.

http://zoobank.org/EFF8C336-65BF-44E0-A092-CB005AB88FD0
Figures 1–5

Type locality. COLOMBIA, Antioquia, Jardín, Alto de Ventanas, carretera a Riosucio, 05.5400833°N 75.8035167°W, 2913m, 2 January 2014, D. Forero.

Type specimen. Holotype male, pinned dry brachypterous specimen (figure 1). Original printed labels: "COLOMBIA, Antioquia, Jardín, Alto de Ventanas, carretera a Riosucio, 05.5400833°N 75.8035167°W, 2913m, 2 Ene 2014, D.Forero" / "ex. *Acmella* sp. (Compositae)" / "MPUJ_ENT 0017990" / "♂ Holotype *Carvalhomiris henryi* sp. n. Det. D.Forero 2017" [red printed label] (MPUJ).

Paratypes. 2♂ macropters, same data as holotype / MPUJ_ENT 0017988-MPUJ_ENT 0017989 (MPUJ); 10♂ brachypters, same data as holotype / MPUJ_ENT 0017991, MPUJ_ENT 0017993-MPUJ_ENT 0018000 (MPUJ), MPUJ_ENT 0017992 (USNM); 3♀ macropters, same data as holotype / MPUJ_ENT 0018001-MPUJ_ENT 0018002 (MPUJ), MPUJ_ENT 0018003 (USNM); 3♀ brachypters, same data as holotype / MPUJ_ENT 0018005-MPUJ_ENT 0018007 (MPUJ). 3♂ brachypters, Jardín, Alto de Ventanas, carretera a Riosucio, 05.5648333°N 75.7944500°W, 2640m, 2 Ene 2014, D. Forero / MPUJ_ENT 0018013-MPUJ_ENT 0018015 (MPUJ); 5♀ brachypters, same data / MPUJ_ENT 0018008-MPUJ_ENT 0018012 (MPUJ).

Other material. 1 nymph, same data as holotype / MPUJ_ENT 0018004 (MPUJ).

Diagnosis. Recognized by the large, basally constricted process on posterior margin of right paramere in males.

Description. *Brachypterous male*. Coloration (Figure 1): Overall coloration pale green. Antennal segments I-IV dark, I dorsomedially pale, II with medial broad pale ring, III basally pale yellow. Head yellowish green, postocular region greenish. Legs yellowish green, third tarsomere dark. Structure (see also Table 1): **Head**: Antennal segment II on medial surface of basal third with decumbent, simple setae. **Thorax**: Pronotum: anterior lobe flat. Hemelytron: Relatively short, not reaching apex of abdomen, apex rounded (Figure 1). **Genitalia**: Genital capsule, large, aperture semicircular (Figure 2E, F). Right paramere with ventral portion straight, directed caudad, apically without spines, posterior margin of paramere medially with truncate, basally constricted process with dorsal portion acutely prolongated (Figure 2A, arrow); left paramere with area caudad to dorsal sensory area with medially projected, acute process of narrow base (Figure 2C, D arrows), apex of paramere on ventral surface with small apical process (Figure 2B, arrow). Aedeagus with right margin of phallotheca with preapical area rounded, smooth (Figure 2G); dorsal endosomal spicule with dorsal portion slightly less than one half length of ventral portion, apex slightly upcurved (Figure 2G), straight in dorsal view (Figure 2H), base relatively narrow (Figure 2G); ventral portion of dorsal endosomal spicule surpassing apex of phallotheca, width homogeneous for most of length, apex strongly hooked with hook curved upwards in lateral view (Figure 2G, arrow) and left in dorsal view (Figure 2H).

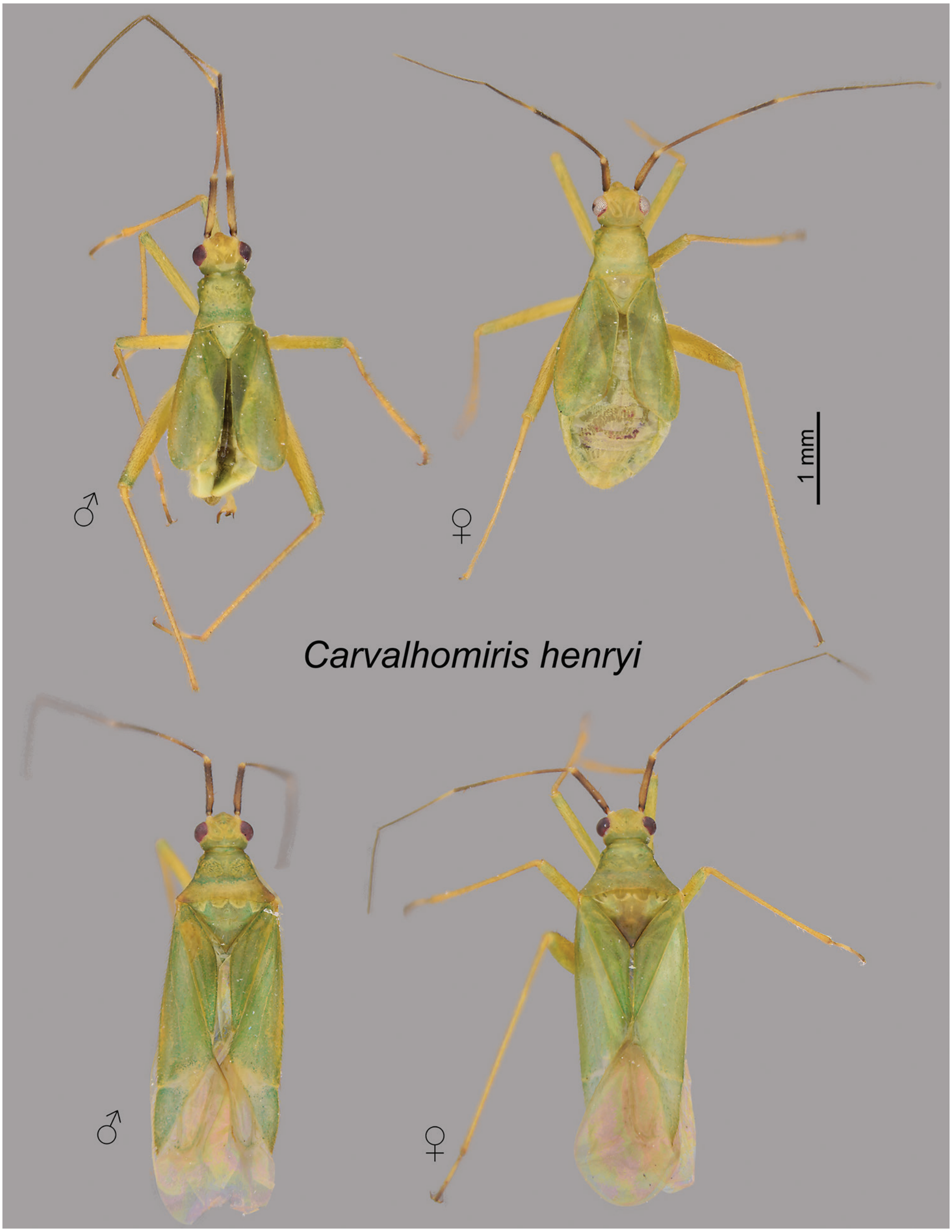

Figure 1. *Carvalhomiris henryi* sp. n. Dorsal habitus images. Male and female brachypterous specimens (upper row), and male and female macropterous specimens (bottom row). The male brachypterous specimen is the holotype.

Macropterous male (Figure 1). Similar to brachypterous male in coloration and structure, but with wider pronotum (Table 1), mesoscutum greatly exposed, and forewings fully developed.

Table 1. Measurements of *C. henryi* sp. n. Abbreviations are as follows. Ant1: antennal segment 1. Brach: brachypter. Cun: cuneus. Cun-clyp: cuneus-clypeus. IntOcDi: interocular distance. Macr: macropter. Mesoscut: mesoscutellum. Pron: pronotum. Scut: scutellum. NA: not available.

Measurements		Length							Width			
		Total	Cun-Clyp	Head	Pron	Mesoscut	Scut	Cun	Head	Pron	IntOcDi	Ant1
Male brach	Mean	2.96	2.50	0.44	0.55	NA	0.38	NA	0.66	0.72	0.38	0.11
	SD	0.07	0.07	0.05	0.02	NA	0.03	NA	0.03	0.04	0.02	0.02
	Range	0.18	0.18	0.15	0.06	NA	0.06	NA	0.07	0.11	0.04	0.04
	Min.	2.85	2.39	0.36	0.53	NA	0.34	NA	0.61	0.65	0.35	0.09
	Max	3.03	2.57	0.51	0.59	NA	0.40	NA	0.68	0.76	0.39	0.13
Female brach	Mean	2.47	1.85	0.35	0.38	NA	0.35	NA	0.54	0.62	0.30	0.07
	SD	0.04	0.10	0.03	0.01	NA	0.16	NA	0.01	0.06	0.00	0.01
	Range	0.05	0.14	0.04	0.02	NA	0.23	NA	0.01	0.08	0.00	0.01
	Min.	2.44	1.78	0.33	0.37	NA	0.23	NA	0.53	0.58	0.30	0.06
	Max	2.49	1.92	0.37	0.39	NA	0.46	NA	0.54	0.66	0.30	0.07
Male macr	Mean	4.51	3.73	0.30	0.48	0.30	0.37	0.78	0.65	1.06	0.37	0.09
	SD	0.01	0.05	0.08	0.10	0.09	0.02	0.02	0.01	0.01	0.04	0.01
	Range	0.02	0.07	0.12	0.14	0.13	0.03	0.03	0.01	0.02	0.05	0.01
	Min.	4.50	3.69	0.24	0.41	0.23	0.35	0.76	0.64	1.05	0.34	0.08
	Max	4.52	3.76	0.36	0.55	0.36	0.38	0.79	0.65	1.07	0.39	0.09
Female macr	Mean	4.50	3.73	0.41	0.53	0.26	0.36	0.74	0.63	1.06	0.38	0.09
	SD	0.26	0.29	0.07	0.01	0.00	0.03	0.06	0.00	0.07	0.02	0.04
	Range	0.37	0.41	0.10	0.02	0.00	0.04	0.08	0.00	1.04	0.37	0.07
	Min.	4.31	3.52	0.36	0.52	0.26	0.34	0.70	0.63	0.07	0.02	0.04
	Max	4.68	3.93	0.46	0.54	0.26	0.38	0.78	0.63	1.11	0.39	0.11

Brachypterous female (Figure 1). Similar to brachypterous male in coloration and structure, but slightly larger. **Thorax**: Hemelytron shorter than abdomen, reaching only abdominal segment 5. Genitalia (Figure 3): Dorsal labiate plate on lateral infoldings with small sclerotized area cephalad of sclerotized infolding (Figure 3A). Anterior wall with medial margin of gonapophysis 8 asymmetrical (Figure 3B, arrow), left margin more protuberant than right one, with sclerotized rounded area cephalad of protuberance. Posterior wall as in generic description (Forero 2009), with large, apically expanded interramal dorsal lobes (Fig 3C).

Macropterous female (Figure 1). Similar to brachypterous female in coloration and structure, except forewings fully developed.

Etymology. We are pleased to dedicate this new species to our friend and colleague Thomas J. Henry. The new name is treated as a Latin noun in the genitive case. Tom is an indefatigable entomologist, always willing to share his knowledge and help others. Tom's enthusiasm for Heteroptera is contagious, not only in the lab but also in the field. Tom collected a long series of specimens of *Carvalhomiris* in Ecuador in 1996 that was described as *C. bifurcatus* (Forero 2009); therefore, we take great pleasure in dedicating this new Colombian species of *Carvalhomiris* to Tom.

Distribution. Known from the type locality on a road near Jardín, Antioquia, in the western Cordillera in Colombia. It was found from 2640 to 2913 meters in eleva-

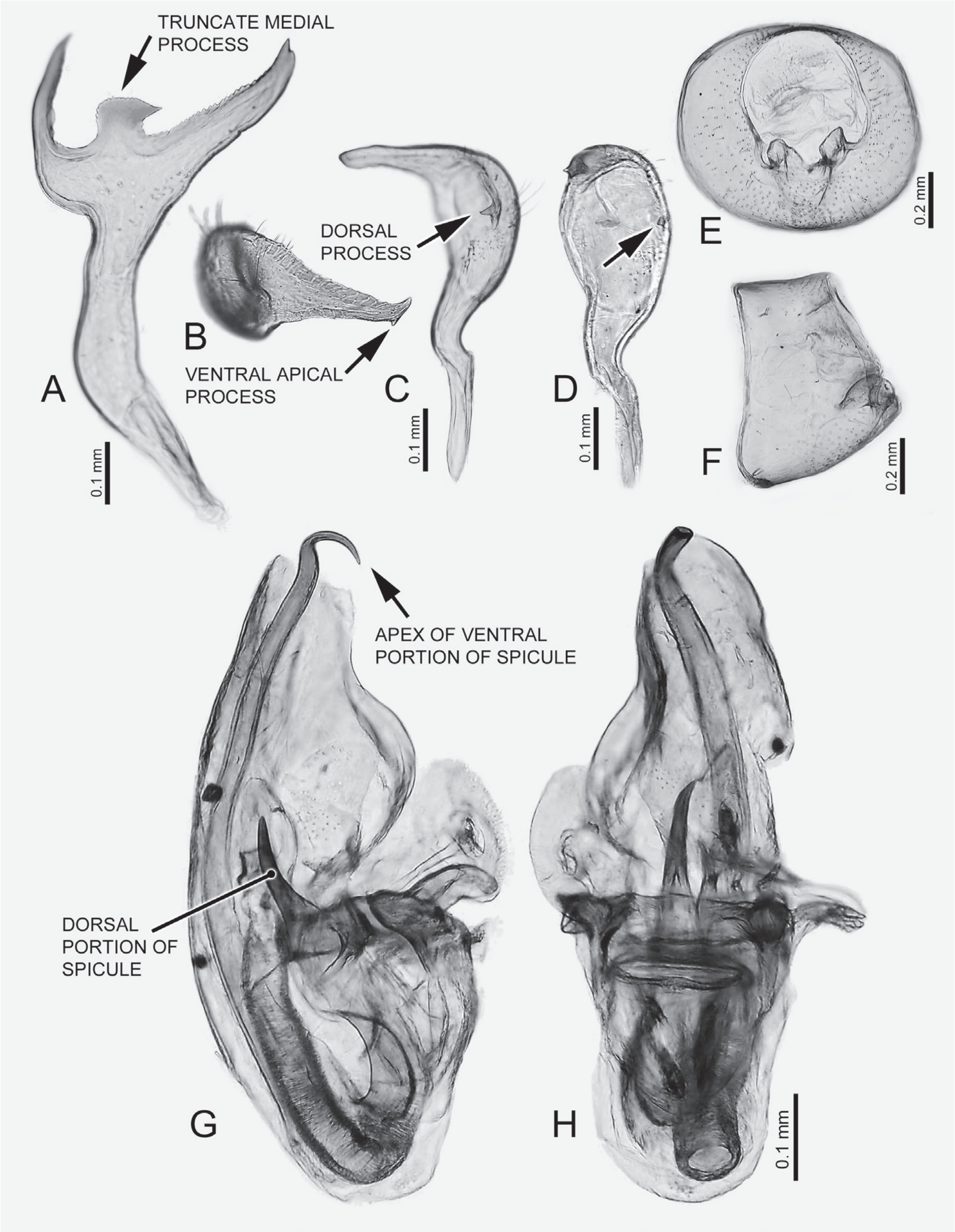

Figure 2. *Carvalhomiris henryi* sp. n. Male genitalia. **A** Right paramere, lateral right view **B–D** left paramere **B** caudal view **C** dorsal view **D** medial view. Arrows on **C** and **D** show the dorsal process **E, F** genital capsule **E** caudal view **F** lateral left view **G, H** aedeagus, not everted **G** lateral right view **H** dorsal view.

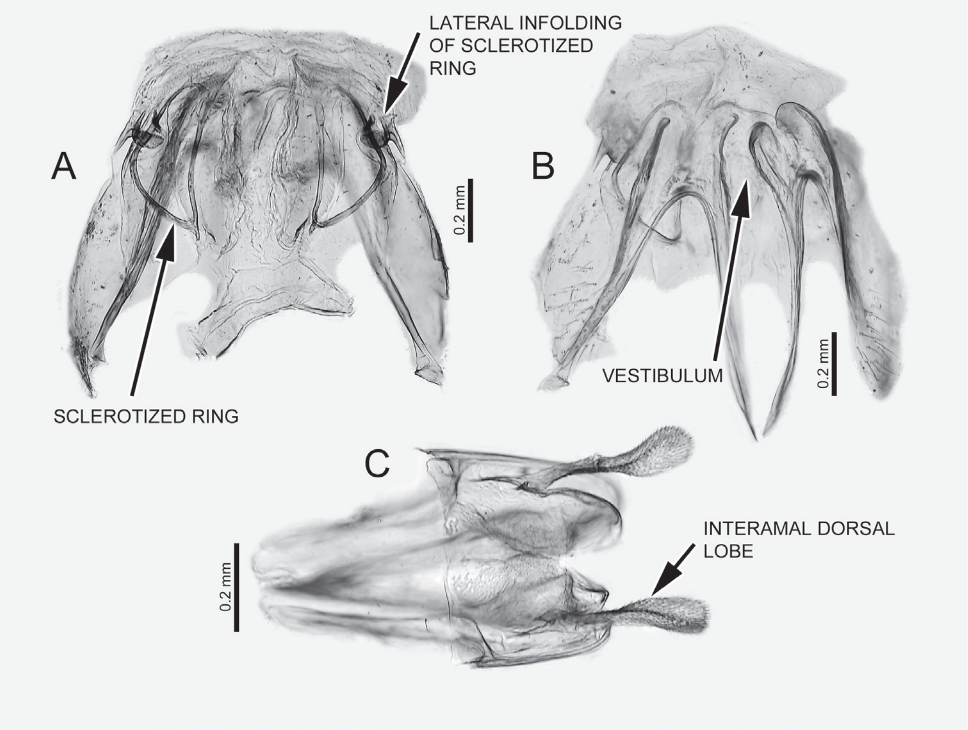

Figure 3. *Carvalhomiris henryi* sp. n. Female genitalia. **A** Dorsal labiate plate and sclerotized rings, dorsal view **B** anterior wall, anterior view, showing the vestibulum, indicating the asymmetrical medial margin of gonapophysis 8 **C** posterior wall, dorsal view, showing the interramal dorsal processes.

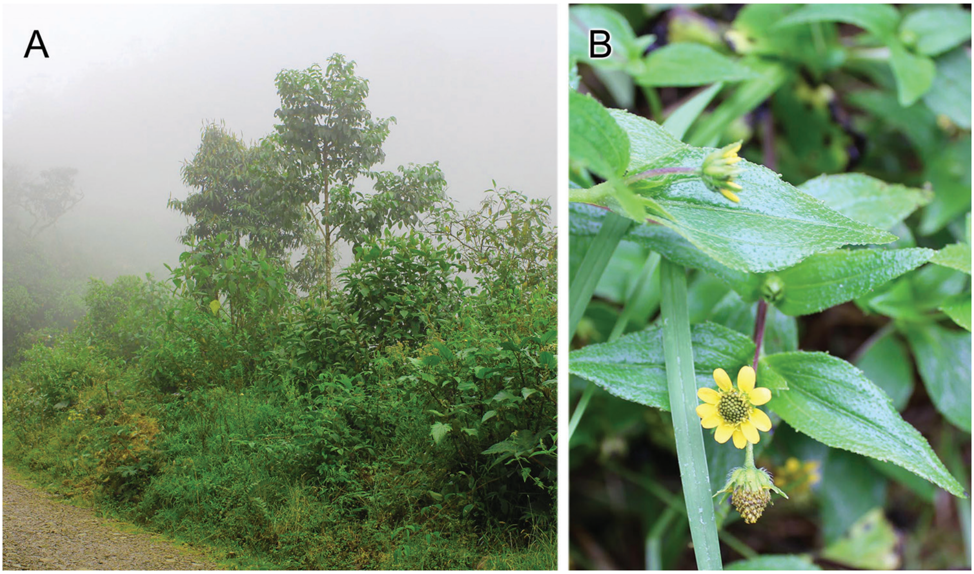

Figure 4. A Roadside vegetation in a montane cloud forest on the road to Ventanas, where *C. henryi* sp. n. was found **B** *Acmella* sp. (Asteraceae), plant on which specimens of *C. henryi* sp. n. were found.

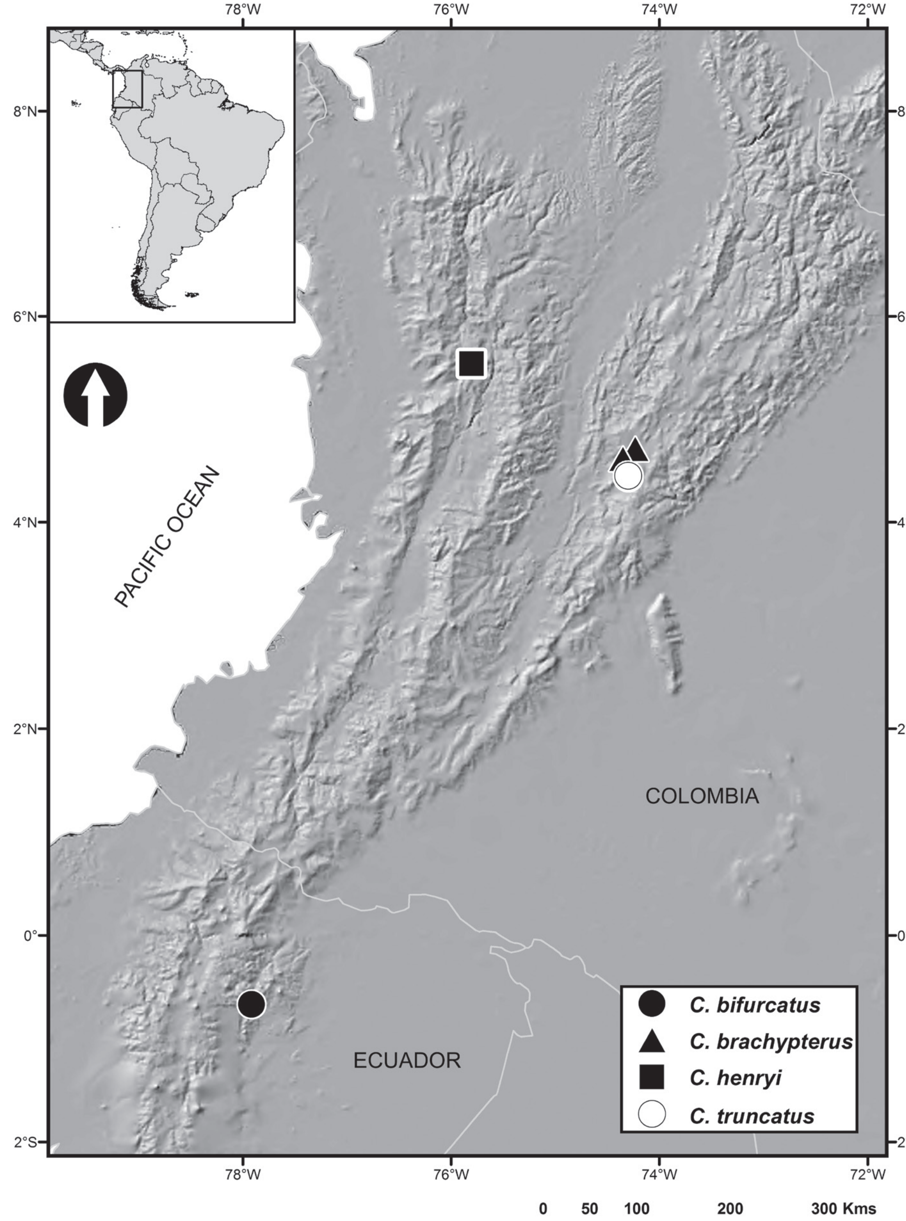

Figure 5. Distribution map of species of *Carvalhomiris*, including *C. henryi* sp. n. (modified from Forero 2009).

tion, in a high Andean cloud forest (Figure 4A). This locality is the northernmost for any species of the genus (Figure 5).

Plant associations. Specimens of the new species were mostly associated with small roadside herbs of *Acmella* sp. (Asteraceae) (Figure 4B). Despite multiple observations, no direct plant feeding was observed.

Discussion

Species of *Carvalhomiris* are rather homogeneous in external morphology, but their male genitalia are distinct (Forero 2009). *Carvalhomiris henryi* sp. n. is more closely related to *C. brachypterus* and *C. truncatus*, than to *C. bifurcatus* based on characters of the male and female genitalia (see also phylogenetic analysis below). *Carvalhomiris henryi* sp. n. is similar to *C. truncatus* in having a medial process on the posterior margin of the paramere, but this process in *C. henryi* sp. n. is basally constricted, whereas in *C. truncatus* it is not. *Carvalhomiris henryi* sp. n. is similar to *C. brachypterus* in structure of the left paramere with an acute, medially directed, dorsal process caudad of the sensory area; in *C. henryi* sp. n. this process is large, not small as in *C. brachypterus*, and differs from that in *C. truncatus* which is large and broad. The structure of the dorsal endosomal spicule differentiates *C. henryi* sp. n. from its congeners. These characters help to identify this new species, but its mixed character associations preclude an unambiguous assessment of phylogenetic relationships.

Heteropteran distributions have been little documented in Colombia, especially for geographically restricted taxa such as species of *Carvalhomiris* in the high Andes. An increased knowledge of biogeographic patterns might reveal diversification processes that produced these distributional ranges. Unknown is what is driving speciation processes in the Andes, a question that relates to the natural history of *Carvalhomiris*. It is not certain that species of this genus are strictly phytophagous. They might be omnivores, as is the case in certain orthotylines (Wheeler 2001). To begin answering these questions, further fieldwork is requisite. Because *C. henryi* sp. n. is known from a different cordillera than its Colombian congeners, the discovery of new species between the known localities can be anticipated. In addition, little-known habitats in Colombia above 2400 m should be thoroughly explored to attain a more complete panorama of the evolution of the group.

The collection of *C. henryi* sp. n. from a composite, *Acmella* sp., represents the second plant association for a species of *Carvalhomiris.* Feeding habits of the new species are unknown, but it might not be strictly phytophagous. The family Tropaeolaceae, on which *C. truncatus* has been found (Forero 2009), is not closely related to the Asteraceae. Although *C. henryi* sp. n. was most numerous on *Acmella*, it also was taken on other plants. This orthotyline might remain on *Acmella* before dispersing to other plant species when the quality of its typical host deteriorates or when prey numbers decline. The documented associated plants in *Carvalhomiris* are not closely related. For example, *C. truncatus* is associated with *Tropaeolum* sp. (Tropaeolaceae) (Forero 2009), a family far removed from the Asteraceae. Specimens of *C. henryi* sp. n. were collected on vegetation along the road, and despite being more abundant on *Acmella*, they were found on other plants in lesser numbers. We suggest that species in *Carvalhomiris* might be predators, or at least facultatively predaceous. In searching for prey, phytophagous insects can be found readily and in abundance on their host plants. The prey of predatory species, and their associated plants, can vary, which also might be the case in other members of the *Zanchius* group.

Key to the species of *Carvalhomiris* (modified from Forero 2009)

1 Right paramere with ventral portion greatly elongated and apically bifurcated; brachypterous male and female with apex of hemelytron acute; medial margin of first gonapophysis nearly symmetrical.... ***bifurcatus*** **Forero, 2009**

– Right paramere neither greatly elongated nor strongly bifurcated on ventral portion; brachypterous male and female with apex of hemelytron rounded; anterior medial margin of first gonapophysis strongly asymmetrical............**2**

2 Posterior serrated margin of right paramere nearly straight.. ***brachypterus*** **Maldonado & Ferreira, 1972**

– Posterior serrated margin of right paramere with a median process **3**

3 Median process of posterior margin of right paramere large, nearly truncate, with wide base; dorsal portion of endosomal spicule with apex strongly left-curved; dorsal process of left paramere short, base wide .... ***truncatus*** **Forero, 2009**

– Median process of posterior margin of right paramere small, constricted basally (Fig. 2A, arrow); dorsal portion of endosomal spicule with apex straight (Fig. 2H); dorsal process of left paramere long and acute, base narrow (Fig. 2C, 2D, arrows)..***henryi*** **sp. n.**

Phylogenetic analysis

The implicit enumeration search strategy for the phylogenetic analysis resulted in two equally parsimonious trees (Figure 6A; Ci: 81, Ri: 67). The strict consensus showed that either *Itacoris* or *Parachius* could be considered the sister group of *Carvalhomiris* depending on the topology chosen. The strict consensus also showed that *Carvalhomiris* is monophyletic, but that their internal relationships are not completely resolved. *Carvalhomiris henryi* sp. n. is placed in a polytomy with *C. brachypterus* and *C. truncatus*, with *C. bifurcatus* as the sister group of this clade. These associations not only show the similarities among the three species, but also point to the particular apomorphies exhibited by *C. bifurcatus*. *Carvalhomiris bifurcatus* is also the southernmost species of the genus (Ecuador); it is not known if there is a particular character transformation scheme in relation to geography. The resulting phylogenetic hypotheses do not allow a clear-cut interpretation of a geographic pattern within the *C. brachypterus* clade. Even though geographically close species also might be expected to be phylogenetically close, the recovered pattern was ambiguous in this respect. The further description of new species of *Carvalhomiris* might resolve this ambiguity.

The monophyly of *Carvalhomiris* was suggested without the testing of a cladistic hypothesis, but a few putative synapomorphies were noted (Forero 2009). An evaluation of these putative characters in our phylogenetic analysis enables most of the previously suggested synapomorphies to be corroborated: strong brachyptery in both sexes; large genital capsule in males with the anterolateral margin strongly curved; dorsal

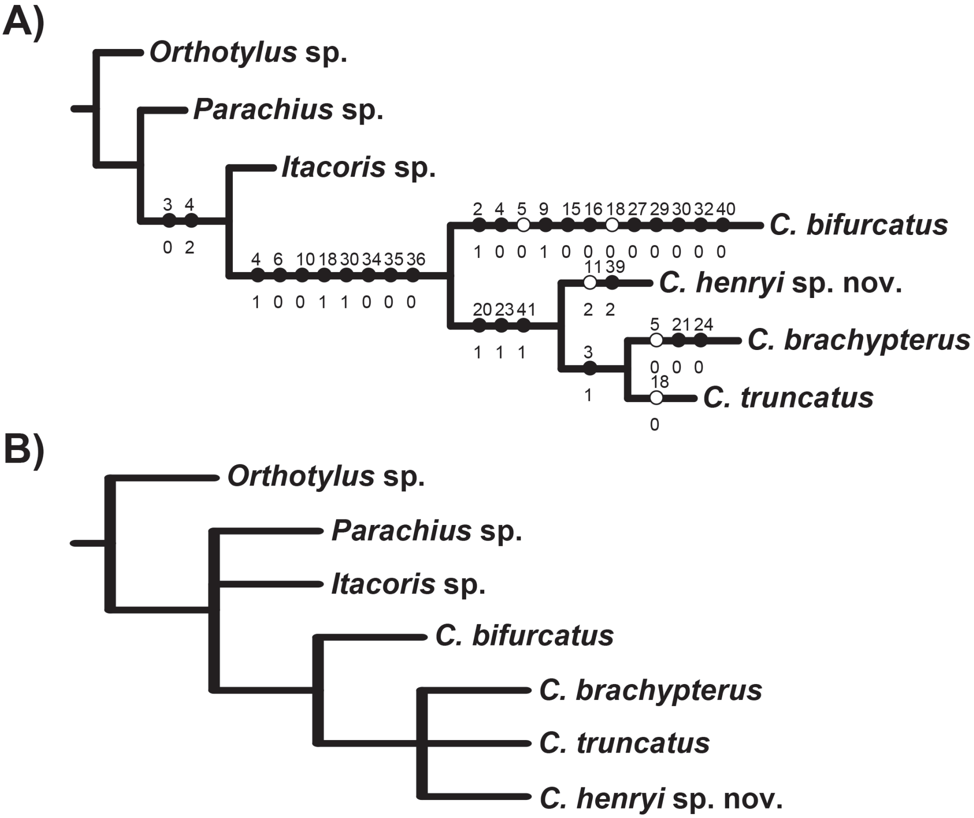

Figure 6. Phylogenetic analysis of *Carvalhomiris* species, including *C. henryi* sp. n. **A** One of the two trees obtained (Ci: 81, Ri: 67) with characters and character states indicated on the branches **B** consensus tree of the two trees obtained.

endosomal spicule C-shaped inserted near the base of the aedeagus; dorsal labiate plate with a median dorsal depression; and lateral infoldings of the sclerotized rings with a caudad acute process. The following were also proposed as putative synapomorphies (Forero 2009), but were not recovered as such in this analysis: right paramere apically expanded, apical margin of paramere serrated, and endosoma with a single spicule.

Further collecting in the wide geographic gap between the known localities of *Carvalhomiris* species might reveal additional species and allow further testing of phylogenetic relationships in the genus.

Acknowledgements

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Appendix 1

Morphological character list and their character states used in the phylogenetic analysis of *Carvalhomiris* species.

0. Relative body size: small (0); medium (1).
1. Antenna, type of setae on segment II medially on basal third: suberect (0); decumbent (1).
2. Antenna, length of setae on segment II medially on basal third: short (0); very short (1).
3. Antennal segment II, coloration: dark brown, pale median band (0); apical half brown, basal half pale (1); dark brown (2).
4. Antennal segment III, coloration: brown, base pale (0); brown, basal half pale yellow (1); brown, basal third pale (2); dark brown (3).
5. Pronotum, anterior lobe, structure of surface: slightly convex (0); flat (1).
6. Hemelytron development: strong brachypterism in both sexes (0); macropterous in both sexes (1).
7. Hemelytron in brachypterous specimen, relative length with respect to abdomen: short, not reaching genital capsule (0); long, reaching genital capsule (1).
8. Hemelytron in brachypterous specimen, shape of apex: acute (0); rounded (1).
9. Hemelytron, density of setae on apex (or cuneus): sparse (0); abundant (1).
10. Genital capsule, relative size to abdomen length: about half abdomen (0); about 2/3 abdomen (1); about 1/3 abdomen (2).
11. Genital capsule, structure of cephalic lateral margin in lateral view: strongly curved (0); straight (1); slightly curved (2).
12. Genital capsule, extent of ventral posterior margin relative to insertion of parameres: not projected (0); greatly projected (1).
13. Right paramere, structure of distal half: clubbed (0); nearly cylindrical (1).
14. Right paramere, structure apex: without a differentiated ventral portion (0); with a differentiated ventral portion (1).
15. Right paramere, structure of ventral portion: strongly curved dorsally (1); straight, directed caudad (1); straight, directed ventrad (2).
16. Right paramere, relative length of ventral portion: as long as apical margin (0); about half as long as apical margin (1).
17. Right paramere, structure of apical ventral portion: with a preapical spine (0); strongly bifurcated (1); as an acute process (2).
18. Right paramere, ornamentation of apical margin: gently serrate (0); strongly serrate (1); smooth, not serrate (2).
19. Right paramere, orientation of apical margin: vertical (0); reclined (1).

20. Right paramere, structure of apical margin: entire, uninterrupted (0); interrupted (1).
21. Right paramere, structure of process on apical margin interrupting margin: medium-sized spine near dorsal portion (0); large, median truncate process (1).
22. Right paramere, base of process on apical margin: constricted (0); not constricted (1).
23. Left paramere, structure of area caudad to dorsal sensory area: flat (0); with a dorsal process (1).
24. Left paramere, relative size of base of dorsal process caudad to dorsal sensory area: narrow (0); broad (1).
25. Left paramere, structure of apex: deeply cleft (0); not cleft (1).
26. Left paramere, structure on ventral surface: flat, not produced (0); with a ventral process (1).
27. Left paramere, size of apical process on ventral surface: large (0); small (1).
28. Left paramere, structure of apical process on ventral surface: acute (0); rounded (1).
29. Left paramere, structure of preapical ventral area: protruding (0); nearly flat (1).
30. Left paramere, cuticle on preapical ventral area: with medium-sized trichia (0); with very small trichia (1); flat, without trichia (2).
31. Phallotheca, structure of basal lateral area with flaplike protuberances: flat (0); with paired protuberances (1).
32. Phallotheca, structure of preapical margin: acute (0); broadly rounded (1).
33. Endosoma, number of spicules: one (0); two (1); three (2).
34. Endosomal spicule DES2, shape of spicule in lateral view: C-shaped (0); straight (1).
35. Endosomal spicule DES2, structure of the base: wide (0); narrow (1).
36. Endosomal spicule DES2, relative position in repose with respect to cephalad portion of aedeagus: close to cephalad portion (0); barely reaching caudal portion of articulatory apparatus (1).
37. Endosomal spicule DES2, C-shaped, dorsal portion, length with respect to ventral portion: three fourths of the length (0); half the length (1).
38. Endosomal spicule DES2, C-shaped, ventral portion, structure of apex: acute (0); expanded (1).
39. Endosomal spicule DES2, C-shaped, ventral portion, structure of apex: straight (0); curved dorsally (1); curved cephalad (2).
40. Endosomal spicule DES2, relative length with respect to apex of phallotheca: not reaching apex (0); reaching or surpassing apex (1).
41. First gonapophysis, symmetry of anterior medial margin: nearly symmetrical (0); strongly asymmetrical (1).
42. Dorsal labiate plate, structure of area of insertion of accessory gland: produced ventrally as a conical depression (0); flat (1).
43. Sclerotized rings of dorsal labiate plate, lateral structure: with lateral infoldings (0); without lateral infoldings (1).
44. Sclerotized rings of dorsal labiate plate, lateral infoldings structure of caudal margin: with acute process (0); rounded (1).

Table A1. Matrix of morphological characters and their states used in the phylogenetic analysis of *Carvalhomiris* species ("–": inapplicable; "?": unknown).

Taxon	**Characters**																						
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
Orthotylus sp.	1	1	0	2	3	–	1	–	–	0	1	2	1	1	0	–	–	–	–	–	–	–	–
Itacoris sp.	0	0	0	0	2	1	1	–	–	0	2	1	1	0	1	1	1	0	2	1	0	–	–
Parachius sp.	0	1	0	2	3	1	1	–	–	1	2	1	0	0	1	2	1	2	2	0	0	–	–
C. bifurcatus	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	0	–	–
C. brachypterus	0	1	0	1	1	0	0	0	1	0	0	0	0	0	1	1	1	0	1	0	1	0	–
C. truncatus	0	1	0	1	1	1	0	0	1	0	0	0	0	0	1	1	1	0	0	0	1	1	1
C. henryi sp. n.	0	1	0	0	1	1	0	0	1	0	0	2	0	0	1	1	1	0	1	0	1	1	0
	23	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	
Orthotylus sp.	0	–	0	0	–	–	1	2	2	1	2	1	1	1	–	–	–	1	0	1	0	1	
Itacoris sp.	0	–	1	0	–	–	1	2	0	1	1	1	1	1	–	–	–	1	?	?	?	?	
Parachius sp.	0	–	1	1	1	1	1	2	0	1	0	1	1	1	–	–	–	1	0	1	0	1	
C. bifurcatus	0	–	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
C. brachypterus	1	0	1	1	1	1	1	1	0	1	0	0	0	0	1	1	1	1	1	0	0	–	
C. truncatus	1	1	1	1	1	1	1	1	0	1	0	0	0	0	1	1	1	1	1	0	0	–	
C. henryi sp. n.	1	1	1	1	1	0	1	1	0	1	0	0	0	0	1	1	2	1	1	0	0	–	

Supplementary material 1

Carvalhomiris matrix (phylogenetic)

Authors: Dimitri Forero, Juanita Rodríguez, Valentina Ocampo

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Review of the subgenus *Plumiger* of *Myrmecophyes*, with description of a new species (Heteroptera, Miridae, Halticini)

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Abstract

The Caucasian subgenus *Plumiger* Horváth, 1927 of the halticine genus *Myrmecophyes* Fieber, 1870 is revised. A key, updated diagnoses, and data on distribution are given for the subgenus and its four species, including *M. tomi* **sp. n.** (Georgia and Dagestan), and the previously unknown male of *M. armeniacus* Drapolyuk, 1989. Illustrations of the male and female genitalia, photographs of the dorsal habitus, and SEM micrographs of selected structures are provided for all species of the subgenus.

Keywords

Alpine meadows, Caucasus, diagnosis, female genitalia, key to species, male genitalia, systematics

Introduction

Myrmecophyes Fieber, 1870 is a distinctive and strikingly myrmecomorphic halticine genus comprising 30 currently recognized species (Schuh 2002–2013, Tatarnic and Cassis 2012, Konstantinov et al. 2013). All *Myrmecophyes* spp. are brachypterous, restricted to relatively small distributional areas and inhabit montane grasslands, except *M. alboornatus*, which spans a large area in Europe and Siberia, reaching Kazakhstan, Mongolia, and northern China in the south. The genus is most speciose in the Central Asian and Caucasian mountains. Species found elsewhere are *M. gallicus* Wagner, 1976 in the Pyrenees; *M. latus* Wagner, 1975 and *M. montenegrinus* Wagner, 1976 described from Western Balkan Mountains; and *M. oregonensis* Schuh & Lattin, 1980, the only North American species, found in Oregon at altitudes from 1500 to 1700 m.

Horváth (1927) described the subgenus *Plumiger* within *Myrmecophyes* to accommodate *M. heterocerus* Horváth, 1927. His diagnosis of the monotypic subgenus was based on the modified first two antennal segments in males. Drapolyuk (1989) published a review of the Caucasian *Myrmecophyes* and described two more species of the subgenus.

Recent collecting by the authors from the Armenian Highlands produced a substantial number of *Myrmecophyes* spp., including long series of *Myrmecophyes* (*Plumiger*) *armeniacus* Drapolyuk, 1989, originally described from two females. Subsequent examination of holdings from the Zoological Institute, Russian Academy of Sciences (ZISP), led to the discovery of a new species belonging to the same subgenus. Thus we recognize four species within *Plumiger*, all restricted to the Caucasus. A phylogenetic analysis of the genus is needed to clarify the status of the subgenus. Pending such a study, which might reveal interesting biogeographic patterns, we are certain that the group is sufficiently distinct to warrant recognition at the subgeneric level. The monophyly of *Plumiger* is corroborated by characters presented in our diagnosis that are not shared by other species of *Myrmecophyes*.

The present paper provides the description of a new species, a key to males and females, a revised diagnosis, and a redescription of the subgenus. A diagnosis, description, measurements, distributional information, a dorsal habitus photograph, and illustrations of male and female genitalia are given for each species of the subgenus.

We are delighted to dedicate this paper to our eminent colleague Dr. Thomas J. Henry on the occasion of his 70th birthday. During a long and distinguished career at the USDA, c/o Smithsonian National Museum of Natural History, Tom Henry has made singular contributions to our knowledge of the Heteroptera worldwide. Despite his many duties, Tom always manages to find time to help his colleagues in their studies and to provide an energetic and supportive environment to all researchers working with the USNM Heteroptera collection.

Materials and methods

Slightly more than 600 specimens were examined for this study. All specimens are retained in the Zoological Institute, St. Petersburg, Russia (**ZISP**) and the National Museum of Natural History, Sofia, Bulgaria (**SOFM**). The holotype of *Myrmecophyes tomi* sp. n. is deposited in the Heteroptera collection of the Zoological Institute in St. Petersburg. All ZISP specimens were associated with bar code labels ("unique specimen identifiers" or "USIs"), which were printed as a matrix code label that also provides an alphanumeric string, e.g., AMNH_PBI 00343231. USI numbers explicitly identify particular specimens and are listed for each species in the "Material examined" section. Additional specimen information for a selected species, including additional figures not included in this paper, can be obtained from the Heteroptera Species Pages (http://research.amnh.org/pbi/heteropteraspeciespage/), which assemble available data from a specimen database. Geo-reference data for each locality were obtained from gazetteers, atlases, handheld GPS and other sources. The distributional maps were created using QGIS 2.18.4 software.

Unless otherwise stated, all measurements are in millimeters. Measurements shown in Table 1 include body length, clypeus to apex of wing pad length, head and pronotum length and width, interocular distance, length of hind tibia, and antennal segments I and II.

Observations, measurements, and digital dorsal color images were made with a Nikon SMZ 1500 stereomicroscope equipped with Nikon D700 digital SLR camera. Images of the genitalic structures were taken with a Leica DM2500 microscope equipped with Leica DFC 450 digital camera. Partially focused images of each specimen or structure were stacked using the Helicon Focus 6.2.2 software. The terminology used for genitalia follows Konstantinov (2003) for males and Schwartz (2011) for females.

Taxonomy

Genus *Myrmecophyes* Fieber, 1870

Subgenus *Plumiger* Horváth, 1927

Plumiger Horváth, 1927: 189 (new subgenus). Type species by monotypy: *Myrmecophyes heterocerus* Horváth, 1927.

Diagnosis. Antenna sexually dimorphic (Figs 5–13), female filiform, male with first two segments modified and clothed ventrally with dense spatulate whitish scales (Figs 20, 21), segment I distinctly swollen, segment II curved and flattened apically; antennal segment III distinctly longer than other segments in both sexes; endosoma of aedeagus without sclerites, composed of several minutely dentate lobes, entirely membranous (Figs 37, 39) or slightly sclerotized (Figs 47, 49).

Remarks. All species of the subgenus *Myrmecophyes* differ from *Plumiger* in having filiform (rather than sexually dimorphic) antennae and two or three variously shaped and typically large sclerites of the endosoma (Bykov 1971: figs 48–96, Schuh and Lattin 1980: fig. 10, Drapolyuk 1989: figs 7–10, Drapolyuk and Kerzhner 2000: figs 14, 22, Konstantinov et al. 2013: fig. 3). Antennal segments in males and females of *Myrmecophyes* spp. are straight, rod-shaped, and thin, with the second segment the longest and only slightly thinner than the first.

Redescription. ***Male***. Total body length 2.8–3.8, brachypterous and distinctly antlike. *Coloration* (Figs 5–7): Dorsum, thoracic pleura, and venter uniformly dark

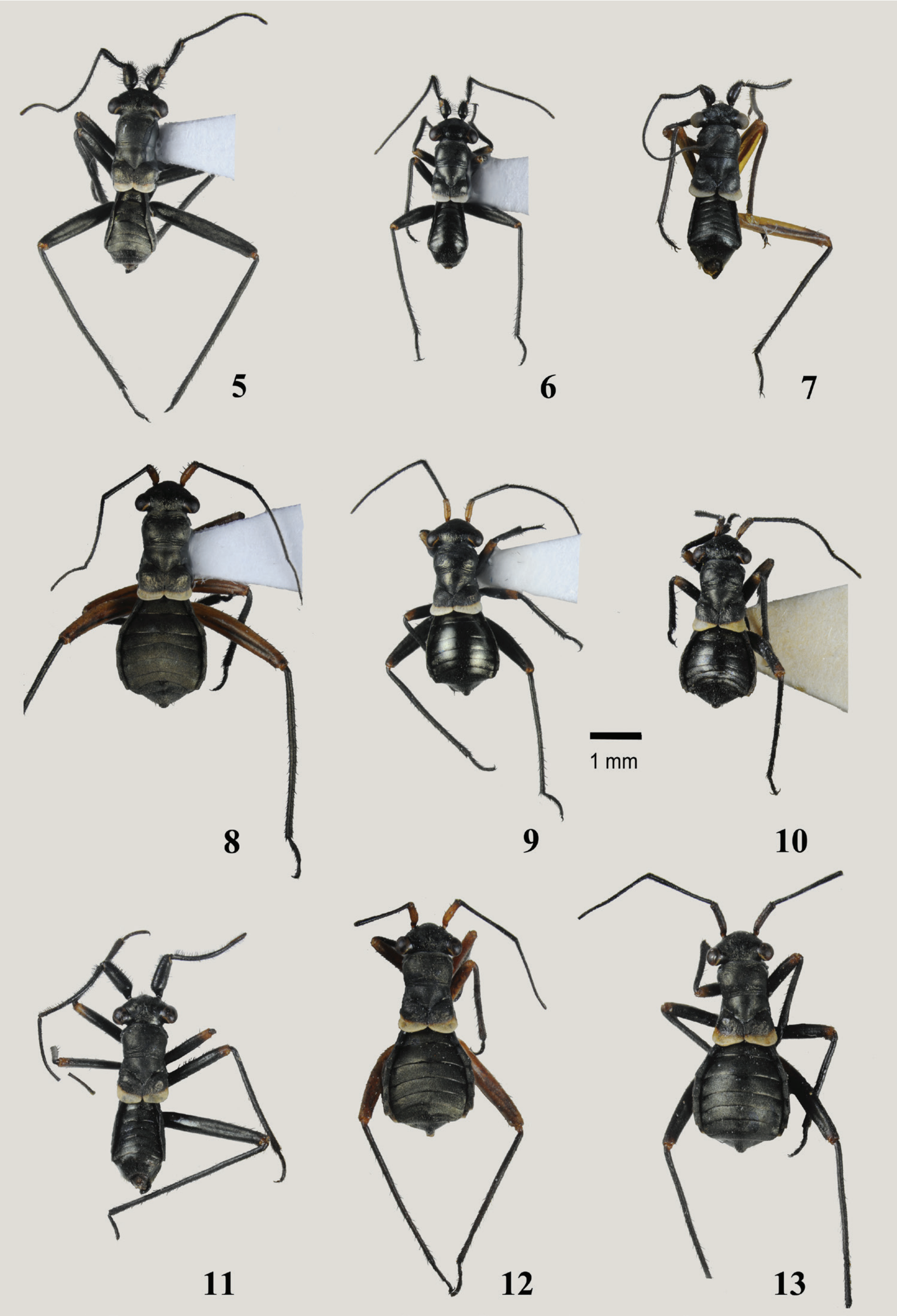
Table 1. Measurements (mm). Abbreviations: Clyp-Wing – distance between apex of clypeus and apex of wing pad in dorsal view, Head Length – distance between apex of clypeus and the highest point of vertex, AntSeg1 – AntSeg2 – length of antennal segments I and II, InterOcDi – width of vertex between inner margins of eyes in dorsal view.

Species		Length							Width		
		Body	Clyp-Wing	Head	Pronotum	Tibia3	AntSeg1	AntSeg2	Head	InterOcDi	Pronotum
Myrmecophyes armeniacus											
♂♂ (n = 5)	**Mean**	**3.46**	**2.07**	**0.55**	**0.65**	**3.27**	**0.48**	**0.67**	**1.15**	**0.56**	**0.85**
	SD	0.11	0.07	0.03	0.02	0.11	0.02	0.03	0.02	0.02	0.03
	Range	0.25	0.16	0.09	0.04	0.28	0.04	0.07	0.04	0.04	0.07
	Min	3.40	2.02	0.50	0.64	3.08	0.46	0.64	1.13	0.53	0.81
	Max	3.65	2.18	0.58	0.67	3.36	0.50	0.71	1.17	0.57	0.88
♀♀ (n = 5)	**Mean**	**3.99**	**2.17**	**0.52**	**0.65**	**3.02**	**0.51**	**1.00**	**1.20**	**0.60**	**0.89**
	SD	0.11	0.11	0.05	0.02	0.11	0.02	0.02	0.04	0.03	0.03
	Range	0.25	0.28	0.11	0.04	0.28	0.05	0.04	0.07	0.07	0.07
	Min	3.86	2.05	0.46	0.64	2.90	0.48	0.99	1.17	0.57	0.85
	Max	4.11	2.34	0.57	0.67	3.19	0.53	1.03	1.24	0.64	0.92
Myrmecophyes heterocerus											
♂♂ (n = 5)	**Mean**	**2.97**	**1.71**	**0.48**	**0.52**	**1.88**	**0.42**	**0.53**	**0.99**	**0.46**	**0.71**
	SD	0.16	0.12	0.06	0.02	1.07	0.00	0.03	0.02	0.01	0.03
	Range	0.42	0.32	0.14	0.04	2.58	0.00	0.07	0.05	0.04	0.07
	Min	2.76	1.52	0.42	0.50	0.00	0.42	0.50	0.97	0.44	0.67
	Max	3.19	1.84	0.57	0.53	2.58	0.42	0.57	1.03	0.48	0.74
♀♀ (n =5)	**Mean**	**3.37**	**1.90**	**0.53**	**0.57**	**2.39**	**0.48**	**0.88**	**1.11**	**0.56**	**0.84**
	SD	0.38	0.10	0.07	0.03	0.10	0.03	0.05	0.04	0.03	0.03
	Range	0.92	0.21	0.18	0.07	0.25	0.07	0.11	0.09	0.05	0.07
	Min	2.90	1.81	0.46	0.53	2.30	0.46	0.81	1.08	0.53	0.81
	Max	3.82	2.02	0.64	0.60	2.55	0.53	0.92	1.17	0.58	0.88
Myrmecophyes nasutus											
♂♂ (n = 2)	**Min**	3.60	2.05	0.46	0.60	3.36	0.85	1.56	1.24	0.64	0.85
	Max	3.75	2.30	0.57	0.64	3.54	0.85	1.59	1.26	0.65	0.88
♀♀ (n =5)	**Mean**	**4.30**	**2.19**	**0.59**	**0.67**	**3.25**	**0.64**	**1.48**	**1.30**	**0.68**	**0.99**
	SD	0.11	0.05	0.03	0.01	0.08	0.02	0.07	0.03	0.03	0.03
	Range	0.28	0.11	0.07	0.02	0.21	0.04	0.18	0.09	0.07	0.07
	Min	4.18	2.12	0.57	0.65	3.12	0.64	1.42	1.26	0.64	0.96
	Max	4.46	2.23	0.64	0.67	3.33	0.67	1.59	1.35	0.71	1.03
***Myrmecophyes tomi* sp. n.**											
♂♂ (n = 1)		3.40	1.88	0.46	0.64	3.19	0.57	0.99	1.13	0.57	0.85
♀♀ (n =5)	**Mean**	**3.33**	**1.84**	**0.52**	**0.57**	**2.48**	**0.46**	**0.86**	**1.10**	**0.56**	**0.81**
	SD	0.16	0.10	0.05	0.03	0.20	0.04	0.04	0.04	0.02	0.04
	Range	0.42	0.25	0.11	0.07	0.46	0.07	0.11	0.11	0.05	0.11
	Min	3.12	1.70	0.46	0.53	2.30	0.42	0.81	1.03	0.53	0.74
	Max	3.54	1.95	0.57	0.60	2.76	0.50	0.92	1.13	0.58	0.85

brown to black, with narrow, contrastingly whitish stripe along apex of wing pad forming transverse band; antenna uniformly black, sometimes with chestnut brown segment I; femora black, sometimes with pale brown apices, rarely almost uniformly

Figures 1–4. Habitats and habitus images of live individuals of *Myrmecophyes* (*Plumiger*) species. **1, 2** Typical habitats of Armenian *Myrmecophyes* (*Plumiger*) species **3, 4** *Myrmecophyes armeniacus* Drapolyuk, 1989 **3** female **4** male.

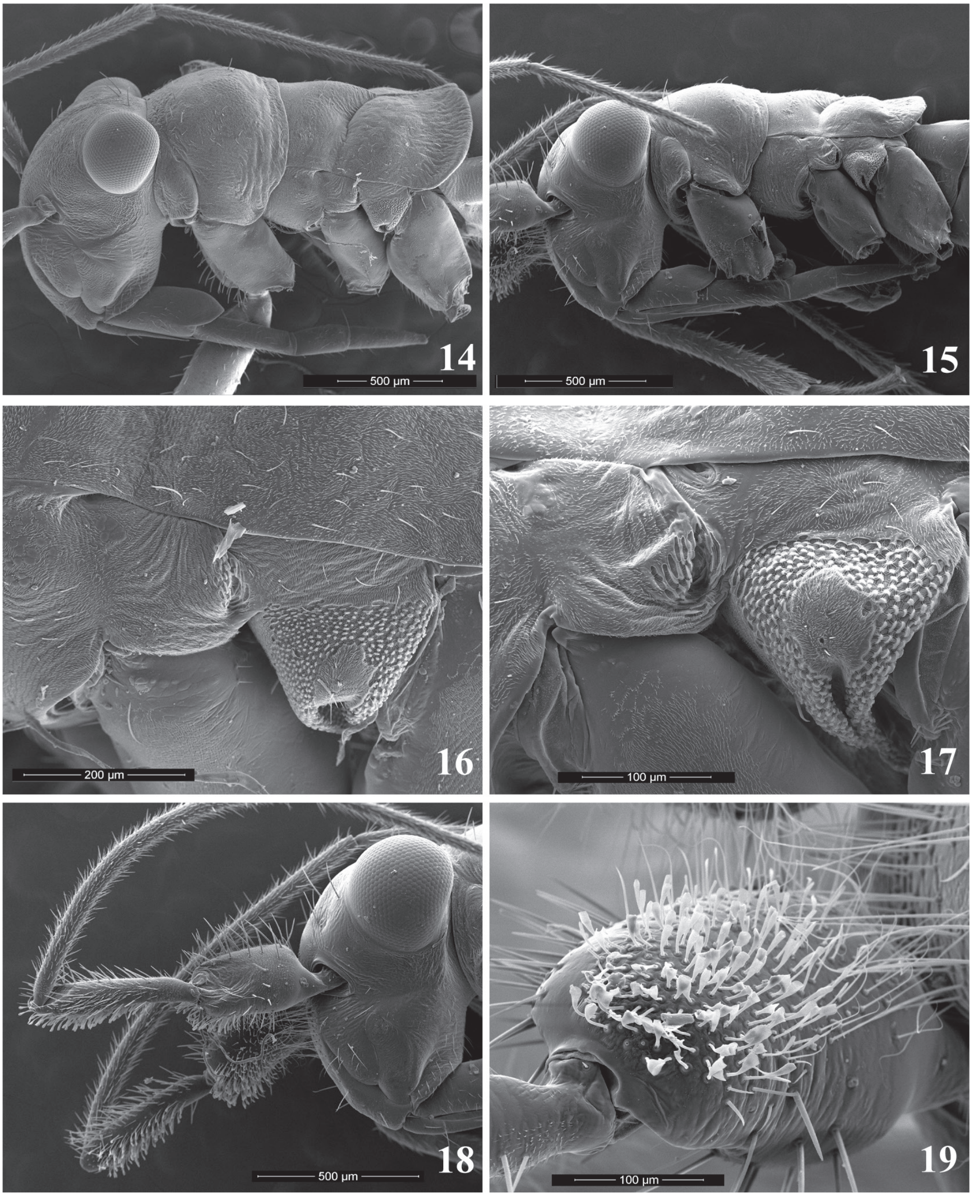
pale brown, tibiae and tarsi dark brown. *Surface and Vestiture*: Dorsum and venter rugose, pronotum with fine transverse wrinkles along anterior and posterior margin; abdomen smoother than thoracic dorsum, sometimes shining. Dorsum, venter and legs with very short and thin, reclining, pale simple setae, scarce on head, thorax and femora, more dense on abdomen and tibiae. Head with several spinelike setae on vertex posteriorly and on frons between eye and antennal fossa, apex of frons and base of clypeus with very dense, thin and exceptionally long straight whitish setae; antennal segments I and II with numerous black spinelike setae on dorsal surfaces and with dense spatulate white scales on ventral surfaces except basal one-fourth; segments III and IV with mixture of relatively scarce erect spinelike setae shorter than those on previous segments and dense semierect pale simple setae. Pronotum with two black spinelike setae on anterorlateral corners, sometimes with additional setae along anterior and posterior margins; fore coxa with row of black spinelike setae on anterior surface; femora typically with one or two incomplete rows of stiff spinelike setae along dorsal margin and several apical spines dorsally and ventrally; tibia with scattered black spines. Genital capsule with relatively long, thin, simple setae api-



Figures 5–13. Dorsal habitus of *Myrmecophyes* (*Plumiger*) species. **5, 8** *Myrmecophyes armeniacus* Drapolyuk, 1989 **5** male **8** female **6, 9** *Myrmecophyes heterocerus* Horváth, 1927 **6** male **9** female **7, 10** *Myrmecophyes tomi* sp. n. **7** male **10** female **11–13** *Myrmecophyes nasutus* Drapolyuk, 1989 **11** male **12** pale female **13** dark female.

cally and near parameres. *Structure*: Head: Large, distinctly vertical, twice as high as length or height of pronotum (Figure 15); frons flat; vertex broad and almost flat, in frontal view at about same level as dorsal margin of eyes; eyes relatively small, not stylate, projecting well beyond lateral margins of pronotum; antennal fossa below ventral margin of eye; antennal segment I distinctly swollen, barrel-shaped, 2.5–3.5 × as wide as segment II, 1.5–2.4 × as long as wide (Figure 18); segment II gradually curved and somewhat flattened at apex, segments III-IV thin, segment III distinctly or at least slightly longer than any other antennal segment; labium stout, always surpassing hind coxa and reaching basal abdominal segments. Thorax: Pronotum with anterior margin slightly convex, flattened and weakly reflexed, lateral margins strongly convex and smoothly rounded, posterior margin flattened, straight or slightly concave; calli not delimited; exposed part of mesonotum large, slightly shorter than pronotal length, distinctly convex, gibbous in lateral view; scutellum not delimited from mesonotum; hemelytron reduced to undifferentiated, broadly rounded wing pad reaching extreme base of abdomen, somewhat convex in basal two-thirds, with flat apical edging; veins and claval suture absent; pronotum about 2.5–2.8 × as long as wing commissure; metathoracic spiracle surrounded by distinct microsculpture; scent gland evaporatory area roughly triangular, with flat peritreme (Figure 17); hind femur enlarged and somewhat flattened, distinctly surpassing apex of abdomen, pretarsus as in Figs 22, 23, with smoothly curved claws and fleshy, apically convergent parempodia, pulvilli absent. Abdomen constricted at base in lateral view and greatly expanded posterior to basal segments. *Genitalia*: genital capsule wide, heavily sclerotized, partly retracted into pregenital segments, without distinctive ornamentation or processes (Figure 24), ventral wall with narrow cone-shaped extension caudally, genital opening wide, oval; parameres of typical halticine shape, left paramere sickle-shaped, gradually curving and terminating with oblique T-shaped (Figs 30, 34) or harpoon-shaped (Figs 41, 44) blade; right paramere larger than left one, with long basal process, apically flattened and concave, flag-shaped, subquadrate in lateral view, with apical denticle on inner margin (Figs 33, 36, 43, 46); phallotheca of aedeagus (Figs 38, 40, 48, 50) voluminous, with dorsal wall entirely sclerotized, upturned apically, ventral wall sclerotized apically, membranous at base, equipped with pair of sclerotized and rounded subapical outgrowths at sides; ductus seminis relatively short, basal half membranous, coiled, with distinct sclerotized rings, apical half somewhat wider, straight and heavily sclerotized, terminating in horseshoe-shaped, sculptured secondary gonopore; endosoma without sclerites, membranous, folded, with several eversible, finely dentate and sometimes slightly sclerotized lobes (Figs 37, 39, 47, 49).

Female. Similar to male in coloration, surface, and main structural details, but differing in structure and vestiture of antennal segments, abdomen strongly expanded at middle, and body proportions (Figs 8–10, 12, 13). Body larger on average, total length 2.9–4.5. *Coloration*: As in male but antennal segment I usually dirty yellow, rarely dark brown, segments III and IV black, sometimes partly or entirely dirty pale brown; femora entirely dirty yellow to dark brown with paler



Figures 14–19. Scanning electron micrographs. **14, 15** Head and thorax in lateral view **14** *Myrmecophyes armeniacus* Drapolyuk, 1989, female **15** *Myrmecophyes heterocerus* Horváth, 1927, male **16, 17** Metathoracic scent gland evaporative area and spiracle **16** *M. armeniacus* **17** *M. heterocerus* **18** Head of *M. heterocerus* male in lateral view **19** Antennal segment I of *M. heterocerus* male.

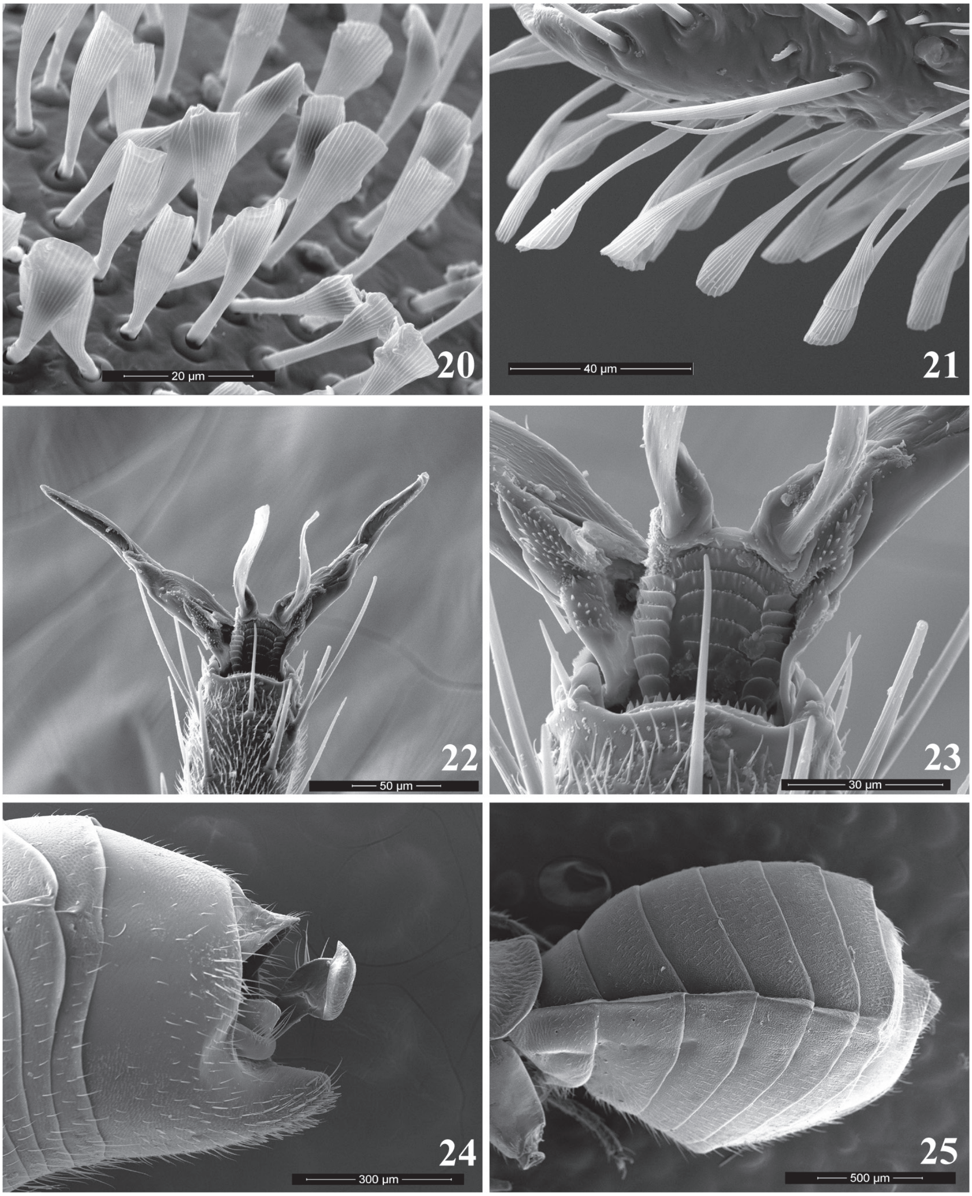
apices. *Surface and vestiture*: As in male, but frons and clypeus without long, thin, whitish setae and black spinelike setae; antennal segment I with regularly distributed, minute, black, adpressed simple setae and 6–12 spinelike setae on mesial surface; segments II-IV with mixture of relatively scarce erect black setae and dense, semierect, pale and thin simple setae. *Structure*: Similar to male, but antenna not modified, segment I short, slightly and uniformly swollen, at most twice as wide as second, segment II rod-shaped, straight; labium always reaching and usually surpassing hind coxa; abdomen more expanded at middle than in male, broadly oval in lateral and dorsal view. *Genitalia*: dorsal labiate plate of bursa copulatrix membranous, with inconspicuous anterior and posterior margins and medially recurved lateral margins, without additional sclerotization and microtrichia; sclerotized ring broadly oval to subtriangular, more or less strongly curved along longitudinal axis, sometimes with strongly and narrowly elongate apex (Figs 51–54); posterior wall membranous, with almost flat, minutely dentate or coarsely rugose interramal sclerites (Figs 55–58); inner margins of first gonapophyses vestibulum with simple and symmetrical, roughly triangular sclerites encircling vulva (Figure 63); first gonapophysis distinctly sagittate, second gonapophysis saber-shaped, gradually tapering.

Distribution. The subgenus is endemic to the Caucasus Mountains including Greater and Lesser Caucasus, and Armenian Highlands (Figure 64). Given the recent records of Caucasian halticines in the Pontic Mountains (Dursun and Kartal 2006), species of *Plumiger* eventually might be found there.

Discussion. The striking sexual dimorphism in *Plumiger* species and one of the main diagnostic features of the subgenus, is exhibited by the enlarged antennal segments I and II and their peculiar vestiture (Figs 18, 19). Males apparently use their antennae to grasp females during copulation in a manner similar to that of several other plant bug genera with sexually dimorphic antennae, e.g., *Harpocera* Curtis, 1838 (Kullenberg 1944, Stork 1981) and *Spanagonicus* Berg, 1883. The second antennal segment II of the latter genus is also equipped with spatulate setae that may have an adhesive function (Menard 2015).

Natural history. We swept specimens of *Plumiger* in large numbers between 1950 and 2450 m a.s.l. in different grasslands and steppe habitats, viz. Ponto–Caucasian hay meadows, grass meadow-steppes, feather-grass steppes, and acid subalpine grasslands (Figs 1–4). *Myrmecophyes armeniacus* and *M. heterocerus* studied were associated with Poaceae. Occasionally adults were found on species of Asteraceae. Although no host records are available for *M. nasutus* and *M. tomi* sp. n., the label data indicate that they are confined to highland grasslands. Nearly all species of *Myrmecophyes* s. str. with known host associations also utilize Poaceae, typically occur in large numbers and are considered pests of pastures across highlands of Central Asia (Bykov 1971). In contrast, *M. trispiculus* and *M. geniculatus* feed on *Artemisia* spp. (Drapolyuk and Kerzhner 2000).

Almost nothing is known about the phenology of *Plumiger* species. Based on the presence of eggs in females, the ratio of males to females, and available collection dates, we speculate that *M. armeniacus* and *M. heterocerus* have one and two generations, respectively. More interesting are our observations of diurnal activity of Armenian *Myrmecophyes*. Despite maximal efforts in suitable habitats, we had little success in collecting at noon. The insects became active and started to move up the culm and leaves of grasses approximately two and a half hours before sunset (just after 18:00 in



Figures 20–25. Scanning electron micrographs. **20, 21** Vestiture of male antennal segments in *Myrmecophyes heterocerus* Horváth, 1927 **20** segment I **21** segment II **22, 23** Pretarsus of *Myrmecophyes armeniacus* Drapolyuk, 1989 **24** Genital segment of *M. heterocerus* male **25** Abdomen of *M. armeniacus* female.

June). During the day, the bugs were close to the surface, hidden among lower parts of the grasses. This corresponds with our previous observations on other brachypterous halticines, viz. *Myrmecophyes* s. str., *Scirtetellus*, and *Dimorphocoris* spp. in the high mountains of the Balkans and Central Asia. Schuh and Lattin (1980) reported plausible midmorning and late-afternoon peaks of activity for *M. oregonensis* sampled southwest of Burns, Oregon.

Key to males

1 Clypeus distinctly bulging, rectangular in lateral view (Figs 27, 29). Antennal segment II longer than pronotal width at middle and 1.8–1.9 × as long as segment I. Left paramere harpoon-shaped, with one or two recurved denticles apically (Figs 41, 44). Endosoma of aedeagus with three folded and slightly sclerotized lobes (Figs 47, 49) **3**

– Clypeus not bulging, slightly convex in apical half (Figs 26, 28). Antennal segment II shorter than width of pronotum at middle and 1.2–1.4 × as long as segment I. Left paramere ending with oblique T-shaped blade (Figs 30, 34). Endosoma of aedeagus with entirely membranous lobes (Figs 37, 39) **2**

2 Larger, body length 3.4–3.7. Head and abdomen matt. Left paramere with rounded outgrowth at base of apical process (Figs 30, 31).......... ***armeniacus***

– Smaller, body length 2.8–3.2. Head and abdomen smooth and shiny. Left paramere without outgrowth at base of apical process (Figure 35) .... ***heterocerus***

3 Antennal segments longer, segment I 1.3–1.4 × as long as pronotum, segment II 1.2–1.3 × as long as head width and 1.8–1.9 × as long as width of pronotum at middle. Left paramere with two subapical recurved denticles (Figs 41, 42) .... ***nasutus***

– Antennal segments shorter, segment I 0.9 × as long as pronotum, segment II 0.9 × as long as head width and 1.2 × as long as width of pronotum at middle. Left paramere with single subapical recurved denticle (Figs 44, 45)........***tomi***

Key to females

1 Larger, body length 3.9–4.5. Head and abdomen matt (Figs 8, 12, 13) **2**

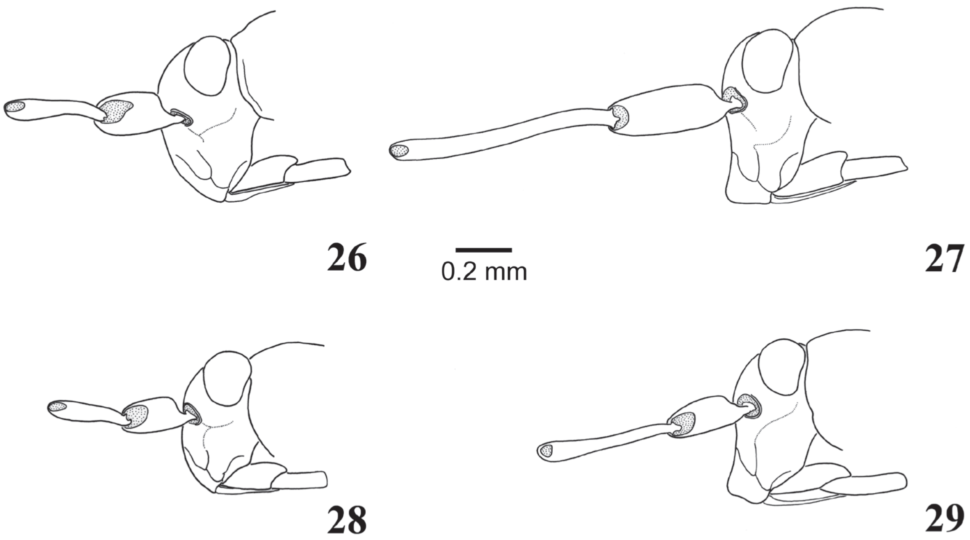
– Smaller, body length 2.8–3.2. Head and abdomen smooth and shiny (Figs 9, 10)..**3**

2 Body length 3.9–4.1. Sclerotized rings of dorsal labiate plate broadly oval (Figs 51, 59) .... ***armeniacus***

– Body length 4.2–4.5. Sclerotized rings of dorsal labiate plate subtriangular, long and narrow, with apices distinctly attenuated (Figs 54, 61) ....***nasutus***

3 Sclerotized rings of dorsal labiate plate subtriangular, long and narrow, with apices distinctly attenuated (Figs 53, 60)....................................***heterocerus***

– Sclerotized rings of dorsal labiate plate broadly oval (Figs 52, 62) ....***tomi***



Figures 26–29. Male head in lateral view: **26** *Myrmecophyes armeniacus* Drapolyuk, 1989 **27** *Myrmecophyes nasutus* Drapolyuk, 1989 **28** *Myrmecophyes heterocerus* Horváth, 1927 **29** *Myrmecophyes tomi* sp. n.

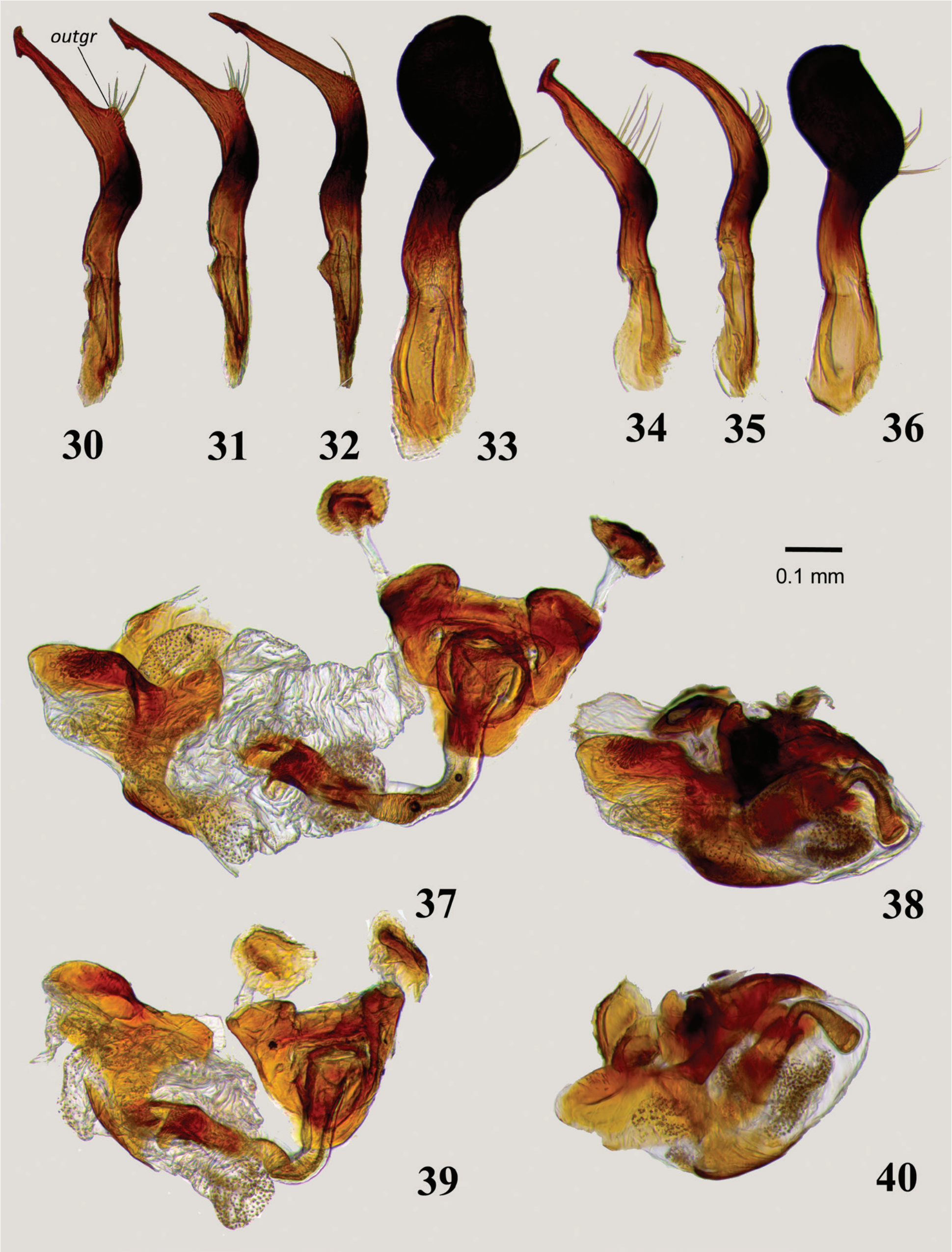
Myrmecophyes armeniacus Drapolyuk, 1989

Figs 5, 8, 14, 16, 22, 23, 25, 26, 30–33, 37,38, 51, 55, 59, 64

Myrmecophyes (*Plumiger*) *armeniacus* Dapolyuk, 1989: 125; figs 51, 55.

Material examined. Holotype: **TURKEY: Kars:** Kars, 40.58333°N, 43.06666°E, 04 Jun 1915, Olsufiev, 1♀ (AMNH_PBI 00261681) (ZISP). **Paratypes**: **ARMENIA: Shirak:** Gyumri [Leninakan], 40.78333°N, 43.83333°E, 16 Jul 1940, Esterberg, 1♀ (AMNH_PBI 00261680) (ZISP).

Other specimens examined: ARMENIA: Gegharkunik: N coast of Sevan Lake, Artanish – Shorzha Rd, 40.50109°N, 45.3282°E, 1962 m, 14 Jun 2017, F. Konstantinov & N. Simov, (Poaceae), 15♂ (AMNH_PBI 00343264-AMNH_PBI 00343277, AMNH_PBI 00343331), 70♀ (AMNH_PBI 00343249-AMNH_PBI 00343263, AMNH_PBI 00343232-AMNH_PBI 00343248, AMNH_PBI 00343196-AMNH_PBI 00343231, AMNH_PBI 00343330, AMNH_PBI 00343376) (ZISP); 16♂, 49♀ (SOFM). N coast of Sevan Lake, Karmir Pass, 4 km ENE of Aghberk, 40.56328°N, 45.29903°E, 2190 m, 15 Jun 2017, F. Konstantinov & N. Simov, (Poaceae), 2♂ (AMNH_PBI 00343351, AMNH_PBI 00343352), 1♀ (AMNH_PBI 00343327) (ZISP); 6♂, 9♀ (SOFM). W coast of Sevan Lake, 2 km ESE of Semyonovka, 40.65074°N, 44.92336°E, 2123 m, 15 Jun 2017, F. Konstantinov & N. Simov, (Poaceae), 24♂ (AMNH_PBI 00343278-AMNH_PBI 00343285, AMNH_PBI 00343288-AMNH_PBI 00343301, AMNH_PBI 00343332, AMNH_PBI 00343334), 25♀ (AMNH_PBI 00343302-AMNH_PBI 00343312, AMNH_PBI 00343314-AMNH_PBI 00343325, AMNH_PBI 00343333, AMNH_PBI 00343328) (ZISP); 25♂, 34♀ (SOFM).



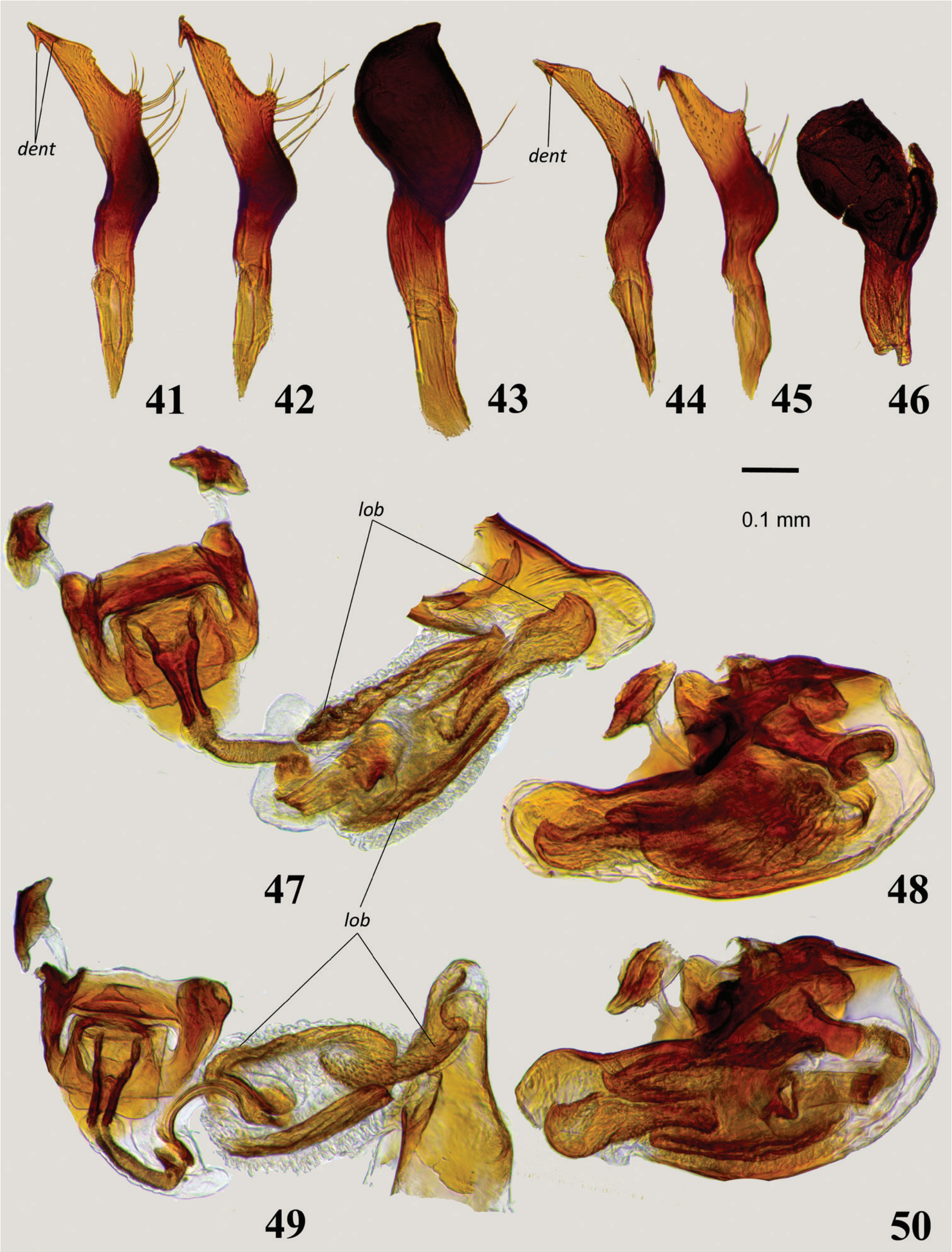
Figures 30–40. Male genitalia: **30–32, 34–35** Left paramere in lateral (**30, 34**) and dorsal (**31, 32, 35**) views **30–32** *Myrmecophyes armeniacus* Drapolyuk, 1989 **34, 35** *Myrmecophyes heterocerus* Horváth, 1927 **33, 36** Right paramere in dorsal view **33** *M. armeniacus* **36** *M. heterocerus* **37–40** Aedeagus in lateral view (**38, 40**) and with phallotheca detached from phallobase and partially expanded endosoma (**37, 39**) **37, 38** *M. armeniacus* **39, 40** *M. heterocerus*. Abbreviations: *outgr* – rounded outgrowth at base of apical process of the left paramere.

Diagnosis. Size large, clypeus straight, not bulging apically in either sex (Figs 14, 26), head and abdomen not shiny (Figs 5, 8), antennal segment II in male shorter than width of pronotum; shape of the left paramere as in Figs 30–32, lobes of aedeagus membranous (Figure 37), and sclerotized rings of dorsal labiate plate broadly oval (Figs 51, 55).

Remarks. Males of *M. armeniacus* are most similar to *M. heterocerus* in structure of the head and male genitalia, but the latter species can be distinguished by the smaller size, shiny head and abdomen, and structure of the left paramere with the apical process narrowing before the T-shaped blade and equipped with a prominent outgrowth at base (compare Figs 30, 34). Females of *M. armeniacus* and *M. nasutus* are roughly similar in size and vestiture, and the surface of the dorsum is not shiny; these species can be separated by their differently shaped sclerotized rings (compare Figs 51, 54).

Redescription. ***Male***. Total length 3.4–3.7. *Coloration*: (Figure 5): entirely black, with whitish transverse stripe along apex of wing pad; fore and middle femora usually, hind femur rarely with pale brown apices. *Surface and vestiture*: Dorsum matt, head and abdomen at most moderately shiny; vestiture as in subgeneric description. *Structure*: Body 3.9–4.2 × as long as width of pronotum at middle. Head: Clypeus not bulging (Figure 26), flat at base and slightly convex in apical part, with apical margin straight; vertex 1.8–2.0 × as wide as eye; antennal segment I strongly swollen, short, 0.8–0.9 × as long as length of pronotum, segment II slightly curved and widened apically, rather short, 1.4–1.5 × as long as I, 0.8 × as long as width of pronotum at middle, and 0.6 × as long as width of head; segment III more than 2.8–2.9 × as long as II and distinctly longer than I and II combined; segment IV about 1.5 × as long as II. Thorax: Pronotum at middle 1.3 × as wide as long, 0.7–0.8 × as wide as head; hind tibia 3.6–4.0 × as long as width of pronotum at middle. *Genitalia*: genital capsule comparatively small, about 0.3 of abdomen; left paramere sickle-shaped, thin, apical process of uniform width along entire length, long, somewhat sinuate, flattened, ending with characteristic oblique T-shaped blade; body of paramere with small but distinct rounded outgrowth at base of apical process with long setae (Figs 30–32); right paramere typically flag-shaped, somewhat larger than in *M. heterocerus* (Figure 33); endosoma of aedeagus voluminous, folded, entirely membranous, with several small, minutely dentate eversible lobes (Figs 37, 38).

Female. Body large, total length 3.9–4.1. *Coloration*: As in male, but antennal segment I and femora ranging from uniformly rust brown to totally black (Figure 8). *Surface and vestiture*: As in subgeneric description; dorsum matt, head and abdomen at most moderately shiny; frons and vertex with few erect spinelike setae; antennal segment I with 6–8 similar setae on mesial surface. *Structure*: Body 4.4–4.6 × as long as width of pronotum at middle. Head: Vertex 1.9–2.1 × as wide as eye; antennal segment I 0.8 × as long as length of pronotum, segment II 1.9–2.1 × as long as I, 1.1–1.2 × as long as width of pronotum at middle, and 0.8–0.9 × as long as width of head; segment III 1.5–1.6 × as long as II; segment IV equal to II in length. Thorax: Pronotum at middle 1.3–1.4 × as wide as long, 0.7–0.8 × as wide as head; hind tibia 3.3–3.5 × as long as width of pronotum at middle. *Genitalia*: Sclerotized rings of



Figures 41–50. Male genitalia: **41–42, 44–45** Left paramere in dorsal (**41, 44**) and lateral (**42, 45**) views **41, 42** *Myrmecophyes nasutus* Drapolyuk, 1989 **44, 45** *Myrmecophyes tomi* sp. n. **43, 46** Right paramere in dorsal view **43** *M. nasutus* **46** *M. tomi* sp. n. **47–50** Aedeagus in lateral view (**48, 50**) and with phallotheca detached from phallobase and partially expanded endosoma (**47, 49**) **47, 48** *M. nasutus*, **49, 50** *M. tomi* sp. n. Abbreviations: *dent* –recurved denticle(s) of the left paramere, *lob* – slightly sclerotized lobes of endosoma.

dorsal labiate plate broadly oval (Figs 51, 59), interramal sclerites of posterior wall almost flat, densely covered with minute denticles (Figure 55).

Distribution. The current distribution of *M. armeniacus* spans a distance of less than 200 km from northeastern Turkey in the west to northwestern Armenia in the east (Figure 64).

Myrmecophyes heterocerus **Horváth, 1927**

Figs 6, 9, 15, 17–21, 24, 28, 34–36, 39, 40, 53, 56, 60, 63, 64

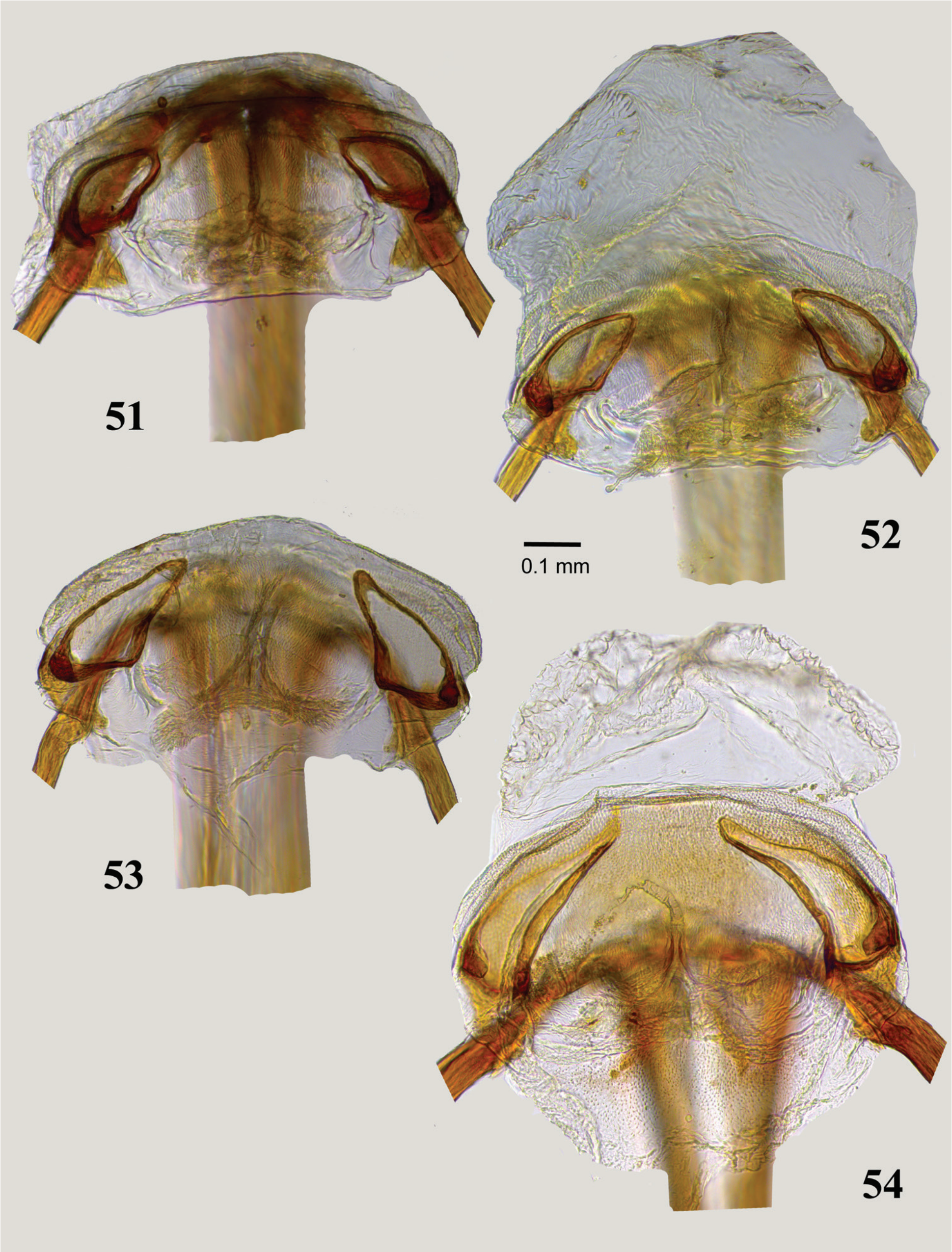
Myrmecophyes heterocerus Horváth, 1927: 189

Myrmecophyes (*Plumiger*) *heterocerus* Drapolyuk, 1989: 135, figs 46–50, 54 (figs, habitus, male and female genitalia)

Material examined. ARMENIA: Gegharkunik: 7 km S from Nshkhark, 39.95378°N, 45.23438°E, 2418 m, 13 Jun 2017, F. Konstantinov & N. Simov, (Poaceae), 56♀ (AMNH_PBI 00343163-AMNH_PBI 00343195, AMNH_PBI 00343338, AMNH_PBI 00343339, AMNH_PBI 00343156-AMNH_PBI 00343162, AMNH_PBI 00343149-AMNH_PBI 00343155, AMNH_PBI 00343142-AMNH_PBI 00343148), 70♂ (AMNH_PBI 00343378, AMNH_PBI 00343337, AMNH_PBI 00343329, AMNH_PBI 00343071-AMNH_PBI 00343074, AMNH_PBI 00343069, AMNH_PBI 00343067, AMNH_PBI 00343080-AMNH_PBI 00343136, AMNH_PBI 00343138-AMNH_PBI 00343141), 2 larvae (AMNH_PBI 00343075, AMNH_PBI 00343137) (ZISP); 45♂, 49♀ (SOFM). **AZERBAIJAN: Kalbajar:** Istisu nr Kalbacar [Kel'badzhary], 39.96972°N, 45.95°E, 03 Jul 1968 - 04 Jul 1968, Gidayatov, 3♂ (AMNH_PBI 00271255, AMNH_PBI 00261439, AMNH_PBI 00261440), 4♀ (AMNH_PBI 00261638, AMNH_PBI 00261637) (ZISP). **GEORGIA: Mtskheta-Mtianeti:** Kobi, Voenno-Gruzinskaya doroga [=Georgean Military Rd], 42.5583°N, 44.5122°E, 2144 m, 14 Jul 1925, Kiritshenko, 3♂ (AMNH_PBI 00261433-AMNH_PBI 00261435), 14♀ (AMNH_PBI 00261608-AMNH_PBI 00261621) (ZISP); 15 Jul 1925, A. N. Kiritshenko, 14♀ (AMNH_PBI 00271256-AMNH_PBI 00271259, AMNH_PBI 00261622-AMNH_PBI 00261631), 1♂ (AMNH_PBI 00261436) (ZISP). **RUSSIAN FEDERATION: North Ossetia Rep.:** Pass between Verkhnyaya Kora and Ardon Rivers, 42.82306°N, 43.91583°E, 01 Aug 1925, A. N. Kiritshenko, 6♀ (AMNH_PBI 00271254, AMNH_PBI 00261633-AMNH_PBI 00261636, AMNH_PBI 00261438), 1♂ (AMNH_PBI 00261437) (ZISP). Verkhniy Tsey, 42.80667°N, 43.94028°E, 04 Aug 1925, A. N. Kiritshenko, 1♀ (AMNH_PBI 00261632) (ZISP).

Diagnosis. Distinguished from *M. armeniacus* by the smaller size, shiny abdomen (Figs 6, 9), shape of left paramere (Figs 34, 35) and narrowly triangular sclerotized rings of dorsal labiate plate (Figs 53, 60). The diagnosis of *M. armeniacus* provides additional characters.

Redescription. *Male*. Total length 2.8–3.2. *Coloration*: As in *M. armeniacus*. *Surface and vestiture*: Pronotum and scutellum matt, head and abdomen smooth, distinct-



Figures 51–54. Dorsal labiate plate of bursa copulatrix: **51** *Myrmecophyes armeniacus* Drapolyuk, 1989, **52** *Myrmecophyes tomi* sp. n. **53** *Myrmecophyes heterocerus* Horváth, 1927 **54** *Myrmecophyes nasutus* Drapolyuk, 1989.

ly shiny (Figure 6); vestiture as in subgeneric description. *Structure*: Body 3.9–4.5 × as long as width of pronotum at middle. Head: Clypeus not bulging (Figure 28), slightly convex in apical half, with shallow depression at base and apical margin straight; vertex

1.6–1.9 × as wide as eye; antennal segment I strongly swollen, short, 0.8–0.9 × as long as length of pronotum, segment II slightly curved and widened apically, short, 1.2–1.3 × as long as I, 0.7–0.8 × as long as width of pronotum at middle, and 0.5–0.6 × as long as width of head; segment III more than 2.5 × as long as II and distinctly longer than I and II combined; segment IV about 1.5 × as long as II. Thorax: Pronotum at middle 1.3–1.4 × as wide as long, 0.7 × as wide as head; hind tibia 3.0–3.5 × as long as width of pronotum at middle. *Genitalia*: genital capsule comparatively small, about 0.3 of abdomen; left paramere sickle-shaped, thin, apical process straight, narrowed subapically, ending with characteristic oblique T-shaped blade; body of paramere without outgrowth at base of apical process (Figs 34, 35); right paramere typically flag-shaped, somewhat smaller than in *M. armeniacus* (Figure 36); endosoma of aedeagus voluminous, folded, entirely membranous, with several small, minutely dentate eversible lobes (Figs 39, 40).

Female. Similar to male but body larger on average, total length 2.9–3.8. *Coloration*: As in male, but with pale brown to dirty yellow antennal segment I (Figure 9). *Surface and vestiture*: As in subgeneric description; pronotum and scutellum matt, head and abdomen distinctly shiny; frons and vertex with few erect spinelike setae; antennal segment I with 6–8 similar setae on mesial surface. *Structure*: Body 3.6–4.3 × as long as width of pronotum at middle. Head: Vertex 1.9–2.1 × as wide as eye; antennal segment I 0.8–0.9 × as long as length of pronotum, segment II 1.7–2.0 × as long as I, 1.0–1.1 × as long as width of pronotum at middle, and 0.8–0.9 × as long as width of head; segment III 1.3–1.4 × as long as segment II; segment IV equal to II in length. Thorax: Pronotum at middle 1.4–1.5 × as wide as long, 0.7–0.8 × as wide as head; hind tibia 2.8–3.0 × as long as width of pronotum at middle. *Genitalia*: Sclerotized rings of dorsal labiate plate narrow, subtriangular, with apices narrowly elongate (Figs 53, 60); interramal sclerites flat, finely dentate at base (Figure 56).

Distribution. *Myrmecophyes heterocerus* appears to be the most wide-ranging species of the subgenus, occurring along the Greater Caucasus range from North Ossetia in the west across Georgia to southeastern Dagestan in the east, and along the Greater Caucasus range to central Armenia and western Azerbaijan in the south (Figure 64).

Myrmecophyes nasutus **Drapolyuk, 1989**

Figs 11–13, 27, 41–43, 47, 48, 54, 57, 61, 64

Myrmecophyes (*Plumiger*) *nasutus* Drapolyuk, 1989: 125; figs 40–45, 52, 53.

Material examined. Holotype: **GEORGIA**: **Racha-Lechkhumi and Kvemo Svaneti:** Korel'dash, 42.9183°N, 43.144°E, 26 Jul 1957, Akramovskaya, 1♂ (AMNH_PBI 00261441) (ZISP). **Paratypes**: **GEORGIA: Racha-Lechkhumi and Kvemo Svaneti:** Korel'dash, 42.9183°N, 43.144°E, 26 Jul 1957, Akramovskaya, 2♀ (AMNH_PBI 00271200, AMNH_PBI 00271201) (ZISP); 30 Jul 1957, Akramovskaya, 1♂

(AMNH_PBI 00261442), 23♀ (AMNH_PBI 00261639-AMNH_PBI 00261661) (ZISP). Lentekhi, Svanetia, 42.78333°N, 42.7°E, 10 Aug 1957, Akramovskaya, 3♀ (AMNH_PBI 00261674-AMNH_PBI 00261676) (ZISP). Tsena, Svanetia, 42.8789°N, 43.1519°E, 25 Jul 1957, Akramovskaya, 15♀ (AMNH_PBI 00271197-AMNH_PBI 00271199, AMNH_PBI 00261662-AMNH_PBI 00261673) (ZISP). Zarsky Pass, Lentekhi Distr., 42.91666°N, 43.16666°E, 27 Jul 1957, Akramovskaya, 3♀ (AMNH_PBI 00261677-AMNH_PBI 00261679) (ZISP). **Mtskheta-Mtianeti:** Kazbek Mt., 42.68333°N, 44.46666°E, 17 Jul 1910, Unknown collector, 1♀ (AMNH_PBI 00261685) (ZISP).

Diagnosis. Distinguished from other *Plumiger* spp. by the larger size (Figs 11–13), distinctly bulging clypeus (Figure 27), non-shiny head and abdomen, harpoon-shaped left paramere with two subapical recurved denticles (Figs 41, 42), and long, narrow, distinctly attenuate sclerotized rings of dorsal labiate plate (Figs 54, 57). The diagnosis and remarks for *M. tomi* include a discussion of the distinctive features.

Redescription. ***Male***. Total length 3.8–3.9. *Coloration* (Figure 11): Black, with pale brown apices of femora and dirty white transverse stripe along apex of wing pad. *Surface and vestiture*: As in generic diagnosis. *Structure*: Body 4.2–4.6 × as long as width of pronotum at middle. Head: Clypeus strongly bulging apically, concave and apically rectangular in lateral view (Figure 27), apically dilated, broadly rounded in frontal view; vertex 2.1–2.2 × as wide as eye; antennal segment I strongly swollen, relatively long, 1.3–1.4 × as long as length of pronotum, segment II gradually curved along entire length and somewhat flattened apically, long, 1.8–1.9 × as long as I, 1.8–1.9 × as long as width of pronotum at middle, and 1.2–1.3 × as long as width of head. Thorax: Pronotum at middle 1.3–1.5 × as wide as long, 0.7 × as wide as head; hind tibia 3.8–4.2 × as long as width of pronotum at middle. *Genitalia*: genital capsule about 0.4 of abdomen; left paramere as in *M. tomi* but slightly larger, with two subapical recurved denticles (Figs 41, 42); right paramere similar to that of *M. tomi* but larger and equipped with larger apical tooth on inner margin (Figure 43); endosoma of aedeagus voluminous, membranous, with three large, folded, minutely dentate and slightly sclerotized eversible lobes (Figs 47, 48).

Female. Body larger on average, total length 4.2–4.5. *Coloration*: Similar to male, but antennal segment I ranging from dirty orange to entirely black, coxae usually entirely or at least apically dirty orange, femora from entirely dirty orange to black, with apices dirty orange (Figs 12, 13). *Surface and vestiture*: As in *M. tomi* sp. n. *Structure*: Body 4.1–4.6 × as long as width of pronotum at middle. Head: Clypeus convex, not bulging apically; vertex 2.0–2.4 × as wide as eye; antennal segment I slightly and uniformly swollen, short, equal to length of pronotum, segment II thin, straight and rod-shaped, 2.2–2.4 × as long as I, 1.4–1.6 × as long as width of pronotum at middle, and 1.1–1.2 × as long as width of head. Thorax: Pronotum at middle 1.5 × as wide as long, 0.7-.0.8 × as wide as head; hind tibia 3.2–3.3 × as long as width of pronotum at middle. *Genitalia*: Sclerotized rings of dorsal labiate plate long and narrow, gradually curved, with apices gradually attenuated (Figs 54, 61); interramal sclerites flat, finely striated (Figure 57).

Distribution. Known from several localities in northern Georgia along the southern slopes of the Greater Caucasus Mountain range (Figure 64).

Discussion. Drapolyuk (1989) diagnosed *M. nasutus* as having the aedeagus with a single spicula, although her figure 45 shows a membranous and finely dentate lobe of the endosoma. We observed that the eversible lobes of the endosoma in *M. nasutus* and *M. tomi* sp. n. are faintly sclerotized but effectively devoid of spiculae.

Myrmecophyes tomi sp. n.

http://zoobank.org/A15DCD84-E454-4AE3-8B26-8021EF144F14
Figs 7, 10, 29, 44–46, 49, 50, 52, 58, 62

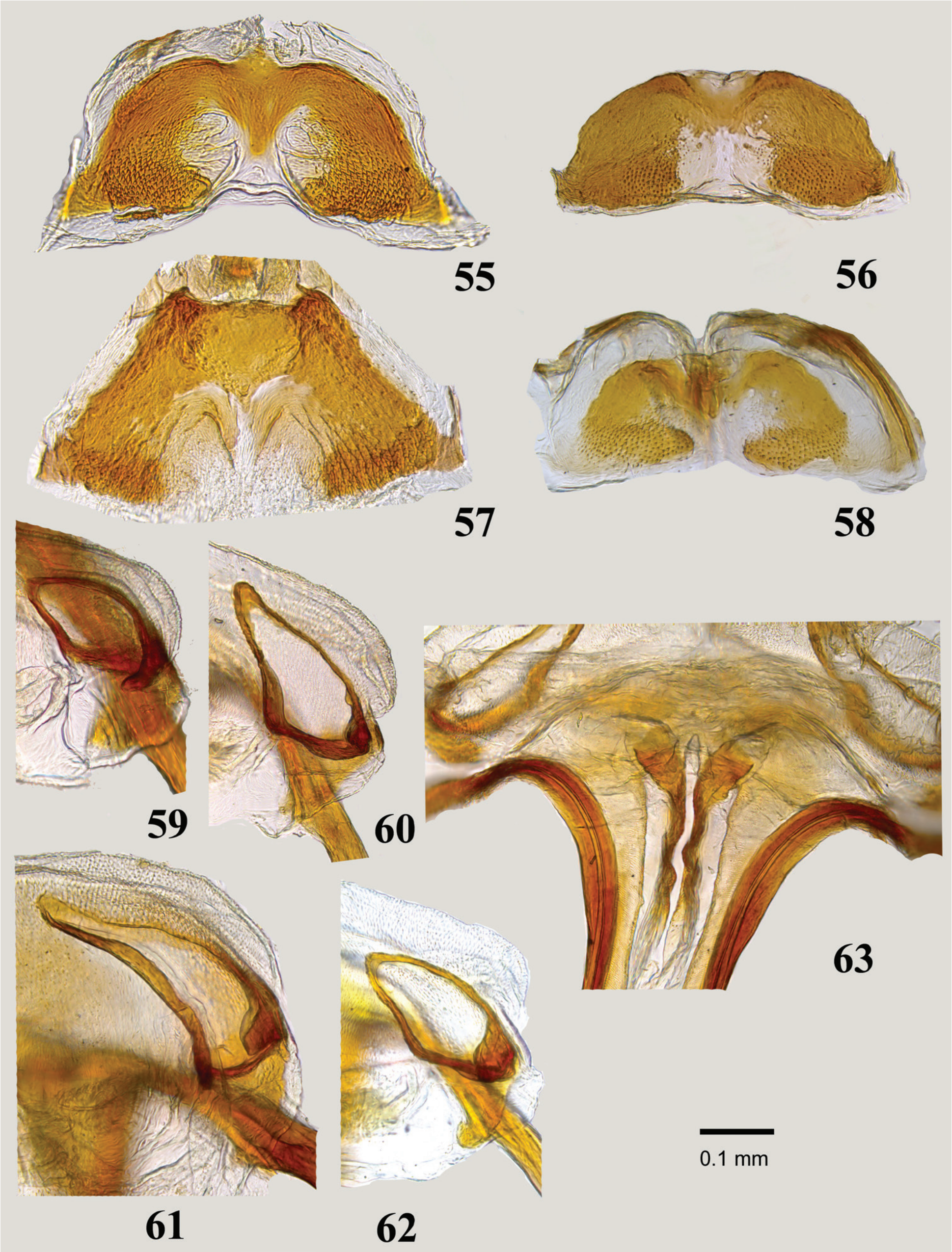
Type locality. Georgia, Kakheti, Sakhkhova Mts. Range, 42.36666°N, 45.61666°E

Type material. Holotype: **GEORGIA: Kakheti:** Sakhkhova Mts. Range, Tushetia, 42.36666°N, 45.61666°E, 28 Aug 1959, I. Zaytseva, 1♂ (AMNH_PBI 00261443) (ZISP). **Paratypes**: **GEORGIA: Kakheti:** Sakhkheva Mts. Range, Tushetia, 42.36666°N, 45.61666°E, 28 Aug 1959, I. Zaytseva, 1♀ (AMNH_PBI 00261682) (ZISP). **Shida Kartli (South Ossetia):** Tskaro, 22 Jun, Demokidov, 1♀ (AMNH_PBI 00261684) (ZISP). **RUSSIAN FEDERATION: Dagestan Rep.:** Khochaldag Mt., 42.73333°N, 46.26666°E, 18 Jul 1909, A. Mlokossiewich, 1♂ (AMNH_PBI 00261444), 3♀ (AMNH_PBI 00261686-AMNH_PBI 00261688) (ZISP); 12 Aug 1910, A. Mlokossiewich, 1♀ (AMNH_PBI 00261683) (ZISP).

Diagnosis. Distinguished from congeners by the small size (Figs 7, 10), distinctly bulging clypeus in male (Figure 29), antennal segments I and II in male not exceeding length and width of pronotum respectively, shiny head and abdomen, characteristically harpoon-shaped left paramere (Figs 44, 45), faintly sclerotized lobes of endosoma (Figure 49), and broadly oval, weakly attenuate sclerotized rings (Figs 52, 58).

Remarks. *Myrmecophyes tomi* is separated from the morphologically similar *M. nasutus* by the shiny head and abdomen, the smaller body size, the shorter first two antennal segments in the male, the single subapical, recurved denticle of the left paramere, and the broad sclerotized rings. The last-named character would allow females of *M. tomi* to be distinguished from those of *M. heterocerus*, which otherwise are similar in body size and proportions, and in having a shiny abdomen.

Description. ***Male***. Total body length 3.4. *Coloration*: Dorsum and venter uniformly black, with contrasting yellowish-white stripe along apical margin of wing pad; antennal segment I chestnut brown, remaining segments dark brown; coxae and femora dirty yellow, tibiae and tarsi dark brown (Figure 7). *Surface and vestiture*: Head, pronotum and hemelytron rugose, pronotum with fine transverse wrinkles along anterior and posterior margin; abdomen shiny, distinctly smoother than pronotum and scutellum. Dorsum, venter, and legs with very short and thin, reclining, pale brown simple setae, scarce on head, thorax and femora, more dense on abdomen and tibiae; head with several spinelike setae on vertex posteriorly and on frons between eye and antennal fossa, apex of frons and base of clypeus with very dense, thin and exceptionally long, straight whitish setae; antennal segments I and II with nu-



Figures 55–63. Female genitalia: **55–58** Posterior wall of bursa copulatrix **55** *Myrmecophyes armeniacus* Drapolyuk, 1989 **56** *Myrmecophyes heterocerus* Horváth, 1927 **57** *Myrmecophyes nasutus* Drapolyuk, 1989 **58** *Myrmecophyes tomi* sp. n. **59–62** Sclerotized rings of dorsal labiate plate **59** *M. armeniacus* **60** *M. heterocerus* **61** *Myrmecophyes nasutus* **62** *M. tomi* sp. n. **63** Vulva of *M. heterocerus.*

merous black spinelike setae on dorsal surfaces and dense, white, spatulate scales on ventral surfaces except basal one-fourth; segments III and IV with relatively scarce, erect, spinelike setae shorter than those on previous segments and dense, semierect, pale simple setae; femora with incomplete row of stiff spinelike setae along dorsal margin and several apical spines dorsally and ventrally; tibia with scattered black spines. *Structure*: Body 4.0 × as long as width of pronotum at middle. Head: Vertical, with slightly concave and apically bulging clypeus, rectangular in lateral view (Figure 29) and with somewhat dilated, broadly rounded apex in frontal view; vertex 2.0 × as wide as eye; antennal segment I distinctly swollen, 0.9 × as long as length of pronotum, segment II gradually curved along entire length, somewhat widened and flattened apically, relatively long, 1.8 × as long as I, 1.2 × as long as width of pronotum at middle, and 0.9 × as long as width of head; remaining segments thin, segment III twice as long as segments II and IV; labium stout, surpassing hind coxa and reaching basal abdominal segments. Thorax: Pronotum at middle 1.3 × as wide as long, 0.8 × as wide as head, metathoracic spiracle and scent efferent system as in *M. heterocerus* (Figure 17); hind tibia 3.8 × as long as width of pronotum at middle; tarsal segments II and III subequal in length, about 1.5 × as long as segment I, pretarsus as in *M. armeniacus* (Figs 22, 23). *Genitalia*: genital capsule about 0.4 of abdomen; left paramere sickle-shaped, comparatively robust, apical process harpoon-shaped, slightly curved, roughly triangular in cross section, tapering towards apex, with subapical recurved denticle; body of paramere with distinct rounded outgrowth at base of apical process with long setae (Figs 44, 45); right paramere typically flag-shaped, with minute apical tooth on inner margin (Figure 46); endosoma of aedeagus membranous, similar to that of *M. nasutus* but somewhat smaller, with three folded, minutely dentate and slightly sclerotized eversible lobes (Figs 49, 50).

Female. Larger than male on average, total body length 3.1–3.5, with antenna unmodified and abdomen broadly oval, strongly expanded at middle. *Coloration*: Similar to male, but antennal segment I dirty orange, coxae and femora black, with apices dirty orange (Figure 10). *Surface and vestiture*: Similar to male, but frons without dark erect spinelike setae and long whitish thin setae; antennal segments I and II without scales and long spinelike setae, segment I with only 8–12 relatively small spinelike erect setae on mesial surface. *Structure*: Body 3.8–4.5 × as long as width of pronotum at middle. Head: Clypeus convex, not bulging apically; vertex 1.9–2.1 × as wide as eye; antennal segment I slightly and uniformly swollen, short, 0.7–0.9 × as long as length of pronotum, segment II straight and thin, rod-shaped, 1.7–2.0 × as long as I, 1.0–1.1 × as long as width of pronotum at middle, and 0.7–0.8 × as long as width of head; remaining segments filiform, segment III about 1.5 × as long as segments II and IV. Thorax: Pronotum at middle 1.4–1.5 × as wide as long, 0.7–0.8 × as wide as head; labium always reaching and usually surpassing hind coxa; hind tibia 2.8–3.3 × as long as width of pronotum at middle. *Genitalia*: Sclerotized rings of dorsal labiate plate elongate-oval (Figs 52, 62); interramal sclerites convex and covered with dense minute denticles (Figure 58).

Etymology. The species is named for Thomas J. Henry in recognition of his unparalleled contributions to heteropterology.

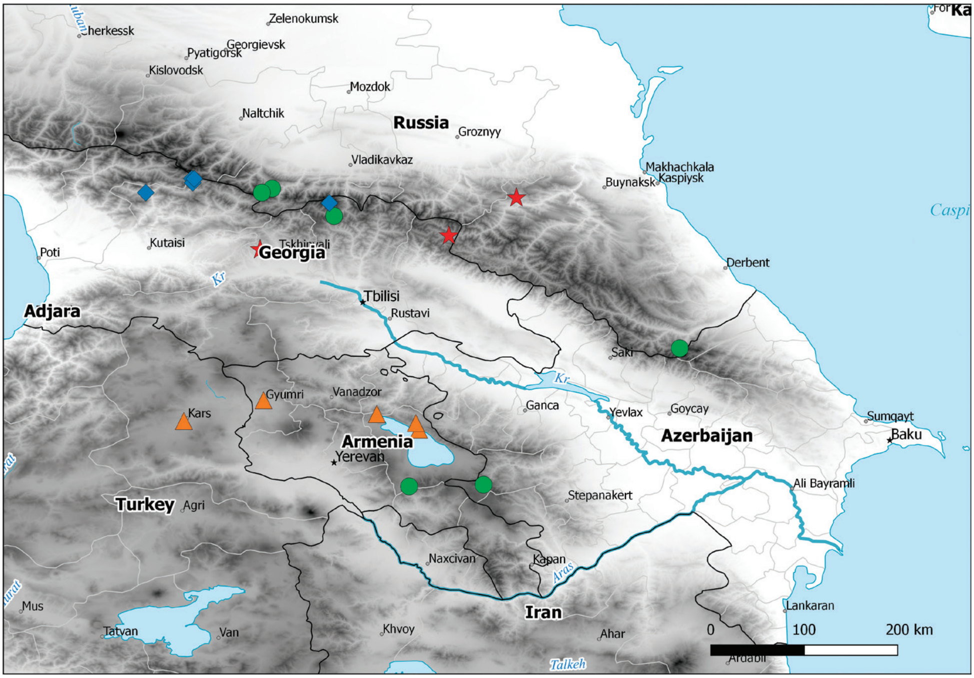


Figure 64. Distribution map of *Myrmecophyes* (*Plumiger*) species. Key: ▲ *Myrmecophyes armeniacus* Drapolyuk, 1989, ● *Myrmecophyes heterocerus* Horváth, 1927, ■ *Myrmecophyes nasutus* Drapolyuk, 1989, ★ *Myrmecophyes tomi* sp. n.

Distribution. Known from northeastern Georgia in the Transcaucasia to southwestern Dagestan in the North Caucasus (Figure 64).

Discussion. The new species is described from the specimens originally included in the paratype series of *M. nasutus* by Drapolyuk (1989), who discussed distinctions in the structure of antennal segment I in male and figured the dorsal labiate plate (Drapolyuk 1989: fig. 53), but refrained from describing a new taxon.

Acknowledgments

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Appendix 1

USI numbers of figured specimens.

Figure	Species	Sex	USI number
5	*Myrmecophyes armeniacus*	male	AMNH_PBI 00343298
6	*Myrmecophyes heterocerus*	male	AMNH_PBI 00343084
7	*Myrmecophyes tomi*	male	AMNH_PBI 00261443
8	*Myrmecophyes armeniacus*	female	AMNH_PBI 00343318
9	*Myrmecophyes heterocerus*	female	AMNH_PBI 00343142
10	*Myrmecophyes tomi*	female	AMNH_PBI 00261684
11	*Myrmecophyes nasutus*	male	AMNH_PBI 00261441
12	*Myrmecophyes nasutus*	female	AMNH_PBI 00261674
13	*Myrmecophyes nasutus*	female	AMNH_PBI 00261640
14, 16, 22, 23, 25	*Myrmecophyes armeniacus*	female	AMNH_PBI 00343376
15, 17–21, 24	*Myrmecophyes heterocerus*	male	AMNH_PBI 00343378
26	*Myrmecophyes armeniacus*	male	AMNH_PBI 00343291
27	*Myrmecophyes nasutus*	male	AMNH_PBI 00261441
28	*Myrmecophyes heterocerus*	male	AMNH_PBI 00343083
29	*Myrmecophyes tomi*	male	AMNH_PBI 00261443
30–31	*Myrmecophyes armeniacus*	male	AMNH_PBI 00343331
32–33	*Myrmecophyes armeniacus*	male	AMNH_PBI 00343334
34	*Myrmecophyes heterocerus*	male	AMNH_PBI 00343092
35–36	*Myrmecophyes heterocerus*	male	AMNH_PBI 00343129
37–38	*Myrmecophyes armeniacus*	male	AMNH_PBI 00343268
39	*Myrmecophyes heterocerus*	male	AMNH_PBI 00343329
40	*Myrmecophyes heterocerus*	male	AMNH_PBI 00343092
41–43	*Myrmecophyes nasutus*	male	AMNH_PBI 00261441
44–46	*Myrmecophyes tomi*	male	AMNH_PBI 00261443
47–48	*Myrmecophyes nasutus*	male	AMNH_PBI 00261441
49–50	*Myrmecophyes tomi*	male	AMNH_PBI 00261443
51	*Myrmecophyes armeniacus*	female	AMNH_PBI 00343333
52	*Myrmecophyes tomi*	female	AMNH_PBI 00261684
53	*Myrmecophyes heterocerus*	female	AMNH_PBI 00261637
54	*Myrmecophyes nasutus*	female	AMNH_PBI 00261646
55	*Myrmecophyes armeniacus*	female	AMNH_PBI 00343333
56	*Myrmecophyes heterocerus*	female	AMNH_PBI 00343339
57	*Myrmecophyes nasutus*	female	AMNH_PBI 00261646
58	*Myrmecophyes tomi*	female	AMNH_PBI 00261444
59	*Myrmecophyes armeniacus*	female	AMNH_PBI 00343333
60	*Myrmecophyes heterocerus*	female	AMNH_PBI 00261637
61	*Myrmecophyes nasutus*	female	AMNH_PBI 00261646
62	*Myrmecophyes tomi*	female	AMNH_PBI 00261684
63	*Myrmecophyes heterocerus*	female	AMNH_PBI 00261637

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RESEARCH ARTICLE

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Ilnacora henryi, a new species of plant bug from Mexico (Heteroptera, Miridae, Orthotylinae, Orthotylini)

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Abstract

A new species of the plant bug genus *Ilnacora*, tribe Orthotylini, is described from Mexico. This species, unlike any other in the genus, is characterized by a predominantly black coloration, the absence of black scale-like setae on the pronotal disk, and unique male genitalia.

Keywords

Ilnacora henryi, Mexico, taxonomy

Introduction

A group of North American Orthotylini genera share predominately black coloration, continuous and straight posterior margin of the eyes and head, left paramere with mitten-shaped apex, and one endosomal spicule with variable arrangement and number of spines (Schaffner and Schwartz 2008; Schwartz 2011). Among the black specimens assembled for these studies were some reminiscent of *Jornandes cruralis* Distant, 1893 and *J. genetivus* (Distant, 1884) but lacked the shagreen dorsal sculpturation of this genus (Fig. 1), possessed two endosomal spicules (Fig. 2), and large right paramere with long processes extending beyond the pygophore margins (Figs 2, 4D). The elaborate structure of the right paramere and presence of a tergal process is similar to that of some species of the North American genus *Ilnacora* Reuter, 1876, but the pronotum of this puzzling plant bug does not have the characteristic pair of black spots composed of black scale-like setae on the posterior pronotal disk as in *Ilnacora* (Fig. 3B, D). However, considering that the genitalia of both sexes are well within the variation encountered in the genus, I take this opportunity to describe it as a new plant bug species in this Festschrift celebrating the entomological career of Thomas J. Henry.

Materials and methods

Data for the 50 specimens examined for this study were captured using the Arthropod Easy Capture database. All specimens bear a unique specimen identifier (USI) in the form AMNH_PBI 08011948; this alphanumeric is included on the USI label also in the form of a matrix code. For clarity the prefix is included for the holotype only. Specimen data can be viewed on-line through Discoverlife.org (http://research.amnh.org/pbi/heteropteraspeciespage) and through the iDigBio web portal.

Habitus images were prepared using a Microptics/Visionary Digital photomicrographic system as developed by Roy Larimer. Multiple layers were stacked to produce the final high-depth-of-field image using Helicon Focus software. Genitalic illustrations were initially prepared as pencil drawings using a Nikon Optiphot compound microscope and camera lucida at magnifications of 100× or 200×, then scanned and rendered as graphics using Adobe Illustrator. Photographic images of female genitalic structures temporarily placed under a coverslip in shallow well-slides containing 85% lactic acid were taken with a 10× or 20× objective lens using a Nikon E800 compound microscope, photomicrographic attachment, and software. As many as 50 layers were stacked to produce a composite high-depth-of-field image. Scanning electron micrographs of gold-coated preparations were taken with a digital Philips XL30 ESEM. The distribution map was created using SimpleMappr (Shorthouse 2010).

Measurement data presented in Table 1 include numbers of specimens measured, means, standard deviations, and ratios; all data are in millimeters. The data were captured using an ocular micrometer. Terminology of the male genitalia follows Schaffner and Schwartz (2008) and Schwartz (2011).

Specimens examined during this study came from the following collections (preceded by an institutional abbreviation) or are deposited in them followed by the names of individuals who assisted with the loan of specimens.

AMNH	American Museum of Natural History, New York; Randall T. Schuh
CNC	Canadian National Collection of Insects, Ottawa; Robert G. Foottit
IBUNAM	Instituto de Biología, Universidad Nacional Autónoma de Mexico, Mexico City, D. F.; Harry Brailovsky A.

TAMU	Department of Entomology, Texas A&M University; College Station, Texas; Joseph C. Schaffner, Edward G. Riley
USNM	United States National Museum of Natural History, Smithsonian Institution, Washington, DC; Thomas J. Henry

Taxonomy

Ilnacora henryi sp. n.

http://zoobank.org/6FBBD9BA-EDBB-4C7E-867C-E8968DB9A7E6
Figs 1, 2, 3A, C, 4–6

Diagnosis. Distinguished from congeners by practically smooth, uniformly black body with yellow legs and antennal segments 3 and 4 (Fig. 1); absence of black scale-like setae on pronotal disk posteriad of calli (Fig. 3A); elongate somewhat narrow anteocular portion of head with weakly rounded frons (Fig. 3A), transversely concave vertex and carinate posterior margin (Fig. 3A, C); mesepimeron ventrally and

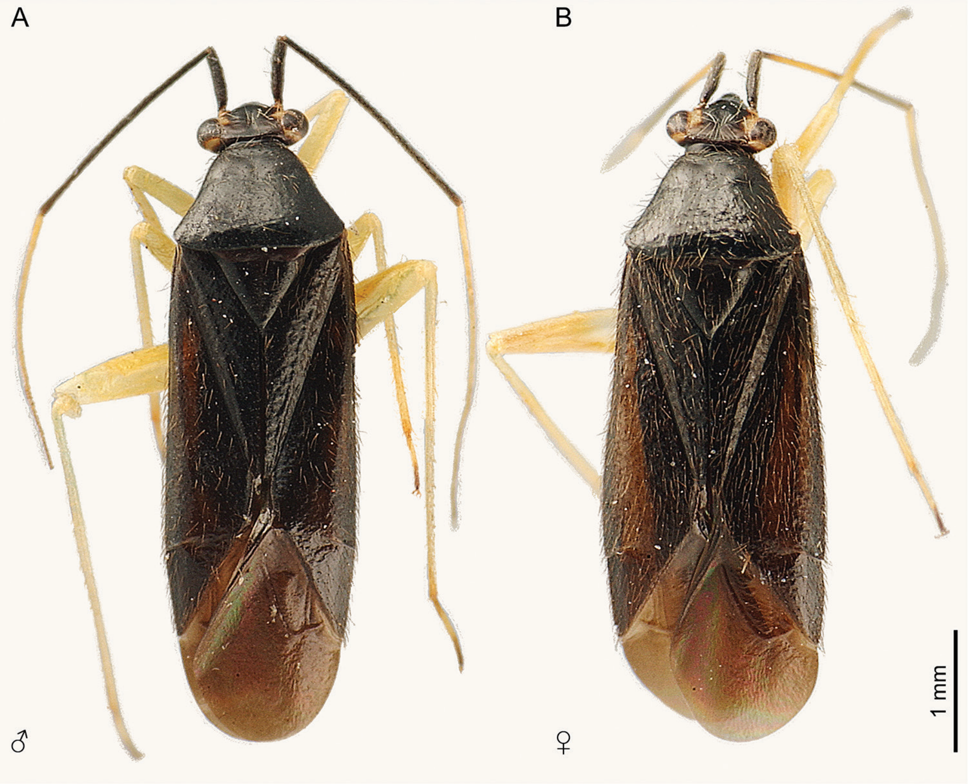

Figure 1. Dorsal habitus of *Ilnacora henryi*. **A** male, AMNH_PBI 00093267 **B** female, AMNH_PBI 00093269.

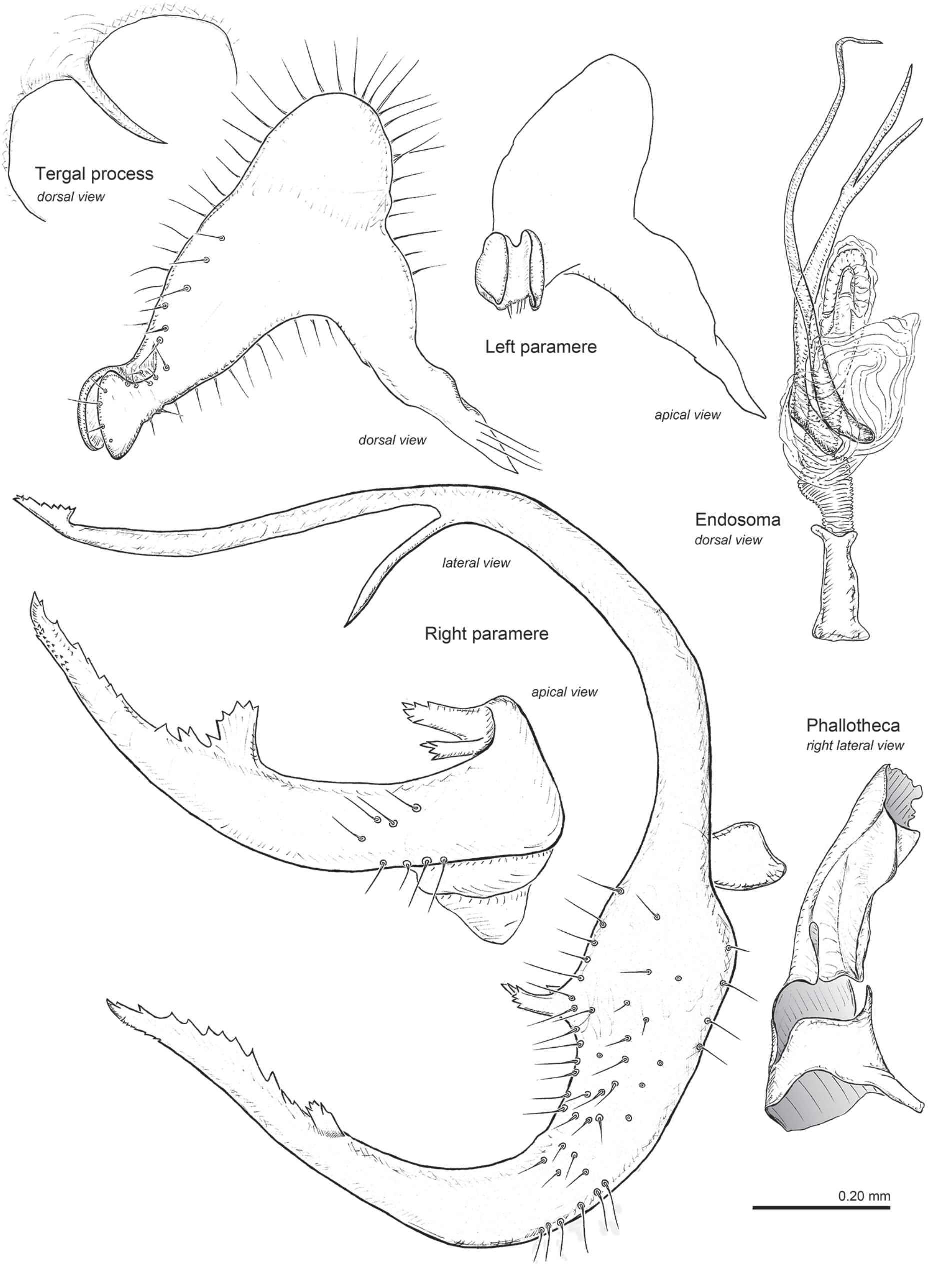

Figure 2. Male genitalia of *Ilnocora henryi*.

metepisternum with obvious microtrichia (Fig. 4B). Unequivocally recognized by unique structure of male genitalia especially narrow mostly straight tergal process, broad sensory lobe of left paramere, and three long apically serrate processes of right paramere (Figs 2, 4D).

Description. *Male:* Macropterous, length 4.30–5.00 mm, width 1.40–1.65 mm (see Table 1); body moderately large, elongate.

Coloration: Black, except yellow on frons adjacent to medial margin of eyes, posterior margin of eyes, antennal segment 3, labial segment 2–3, and legs; variably dusky yellow to black on antennal segment 4, labial segment 4, tarsomere 3, and claw (Fig. 1).

Vestiture and dorsal sculpture: Sparsely distributed, long erect or reclining dark brown to black simple setae (Figs 1, 3A, 4A). Faintly rugose, without punctures (Figs 1, 3A).

Structure: *Head* (Figs 1, 3A, C): Strongly projecting, narrow in frontal view, gena broadly exposed, bucculae short, one-half length of labial segment 1; in lateral view (Fig. 3C); eyes small, posterior margin in dorsal view, slanted anteriad, removed from anterior margin of pronotum by diameter of antennal segment 1 (Fig. 3A), in lateral view occupying two-fifth head height of head; interocular space slightly more than twice as wide as dorsal width of eye; posterior margin of head carinate; antenna inserted just below ventral margin of eye, eyes very weakly emarginate dorsad of fossa; antennal segment 2 long (1.72 mm), 2 times width of head; labium reaching apex of mesocoxa. *Thorax*: Mesothoracic spiracle and metathoracic scent-efferent system with obvious microstructure surrounding openings; mesepimeron and metepisternum with microspicules on ventral margins (Fig. 4B). Pronotum in dorsal view subtriangular practically campanulate, lateral margin slightly concave, posterior margin gently convex; calli clearly demarcated, posterior lobe flat, rounded laterally; mesoscutum moderately exposed (Fig. 3A, C). *Pretarsus*: Claws medium sized, sharply curved, thickened proximally; parempodia wide, lamelliform, with converging apices; pulvilli fleshy, attached proximally on ventral surface of claw (Fig. 4C). *Hemelytron*: Elongate, parallel-sided, paracuneus depressed, cuneus deflected.

Genitalia: *Pygophore*: Dorsal margin of aperture with single, long, thin, marginally smooth, slightly curved, pointed tergal process, located just left of midline; ventroposterior margin of pygophore subquadrate, entire (without cleft) (Fig. 4D); subgenital plate raised dorsal to ventroposterior margin of aperture, forming deep cavity, ventral surface deeply notched with prominent posterior lobes—right side twice as large as left—projecting beyond aperture of pygophore posteriorly. *Left paramere*: Approximately L-shaped in ventral view; sensory lobe large, gently rounded; paramere gradually narrowed to subapical constriction, expanded to mitten-like apex formed by lateral and medial lobes of approximately equal size (Figs 2, 4D). *Right paramere*: Large, U-shaped, greatly extending beyond aperture of pygophore; posterior process (sensory lobe) as long as remainder of paramere, with fine needle-like subapical spine and slightly expanded serrate apex; middle of paramere with pair of relatively short, apically serrate lobes; anterior process (apical portion) of paramere long, distal one-half of dorsal surface serrate, subtended by fan-shaped spine (Figs 2, 4D). *Phallotheca*: Small, tubular, dorsal surface gently convoluted; aperture open distally (Figs 2, 4D). *Endosoma*: Small; formed by two needle-like spicules attached to membrane dorsal to base of ductus seminis; dorsal spicule gently curved, ventral spicule bifurcate with long, narrow spines (Fig. 2).

Female: Coloration, vestiture, and structure as in male, except body moderately larger, widest across cuneal fracture, costal margin slightly more convex, vertex wider,

Table 1. Measurements for *Ilnacora henryi*.

		Length				Width				Antennal length				Ratio			
		Total Body	Pronotum	Cuneus	Labium	Body	Pronotum	Head	Vertex	I	II	III	IV	HW/AII	VW/HW	HW/PW	AIII/AII
Male (N = 10)	Mean	4.65	0.84	0.70	1.32	1.52	1.28	0.84	0.44	0.46	1.72	1.39	0.89	0.49	0.53	0.65	0.81
	SD	0.21	0.02	0.02	0.03	0.07	0.03	0.01	0.01	0.02	0.09	0.13	0.07	0.02	0.01	0.01	0.08
	Range	0.70	0.09	0.05	0.10	0.25	0.13	0.04	0.04	0.06	0.31	0.50	0.19	0.07	0.03	0.05	0.26
	Min	4.30	0.81	0.68	1.28	1.40	1.20	0.82	0.43	0.44	1.54	1.13	0.81	0.47	0.51	0.64	0.62
	Max	5.00	0.90	0.73	1.38	1.65	1.33	0.86	0.46	0.50	1.85	1.63	1.00	0.53	0.54	0.68	0.88
Female (N = 10)	Mean	4.72	0.87	0.68	1.35	1.66	1.33	0.87	0.46	0.47	1.70	1.44	0.87	0.51	0.53	0.65	0.85
	SD	0.17	0.02	0.02	0.05	0.08	0.03	0.02	0.01	0.01	0.04	0.06	0.02	0.01	0.01	0.01	0.04
	Range	0.55	0.08	0.05	0.13	0.23	0.10	0.06	0.03	0.01	0.15	0.15	0.09	0.04	0.04	0.04	0.12
	Min	4.50	0.84	0.65	1.28	1.58	1.30	0.84	0.45	0.46	1.65	1.38	0.81	0.49	0.51	0.63	0.81
	Max	5.05	0.91	0.70	1.41	1.80	1.40	0.90	0.48	0.48	1.80	1.53	0.91	0.53	0.56	0.67	0.92

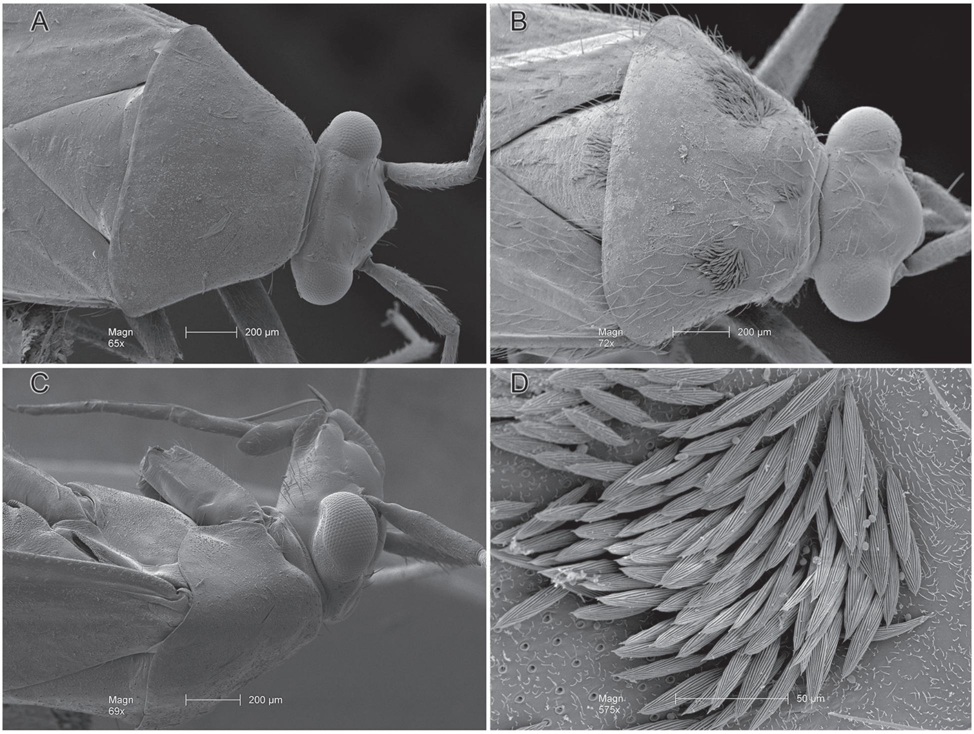

Figure 3. Scanning electron micrographs. **A** *Ilnacora henryi*, head and pronotum, dorsal view **B** *Ilnacora inusta*, head and pronotum, dorsal view **C** *Ilnacora henryi*, head and pronotum, lateral view **D** *Ilnacora inusta*, detail of pronotal scale-like setae, dorsal view.

and antennal segment 2 pale yellow medially, narrower proximally; length 4.50–5.05 mm, width 1.58–1.80 mm (Fig. 1).

Genitalia*: Posterior margin of sternite 7*: Broadly triangular posteriorly directed flap-like projection, either side of projection incised anteriad. *Vestibulum*: First gonocoxae and fused paratergites 8 adhered to anterior surface of first gonapophyses (Fig. 5B); first gonapophyses with obvious posterior (attached to base of rami) and anterior (forming interior of vestibulum) regions (Fig. 5B, D). *First gonapophyses: Right:* Posterior region with narrow tubercle projecting across aperture of vulva (Fig. 5B–D) and with condyle-like anterior surface adjoining anterior region of right gonapophysis and apex of left first gonapophyses (Fig. 5B); anterior region narrow, plate-like (Fig. 5A–B). *Left*: Posterior region simple, smaller than right (Fig. 5B); anterior region with large crescent-shaped process in horizontal plane (Fig. 5A–B) and ventrally projecting plate laterad (Fig. 5B–C) and flat tubercle mediad (Fig. 5B). *Ventral labiate plate*: Strongly sclerotized with microspiculate dorsal surface (Fig. 5A), ventral surface broadly projecting into vulva (Fig. 5C). *Dorsal labiate plate*: Subrectangular, twice as wide and long, weakly sclerotized; paramedial sclerites microspiculate, separated at midline by membranous shield-shaped depression; lateral margins strongly infolded; sclerotized rings placed within lateral fold of dorsal labiate plate, obscure (Fig. 5A–C).

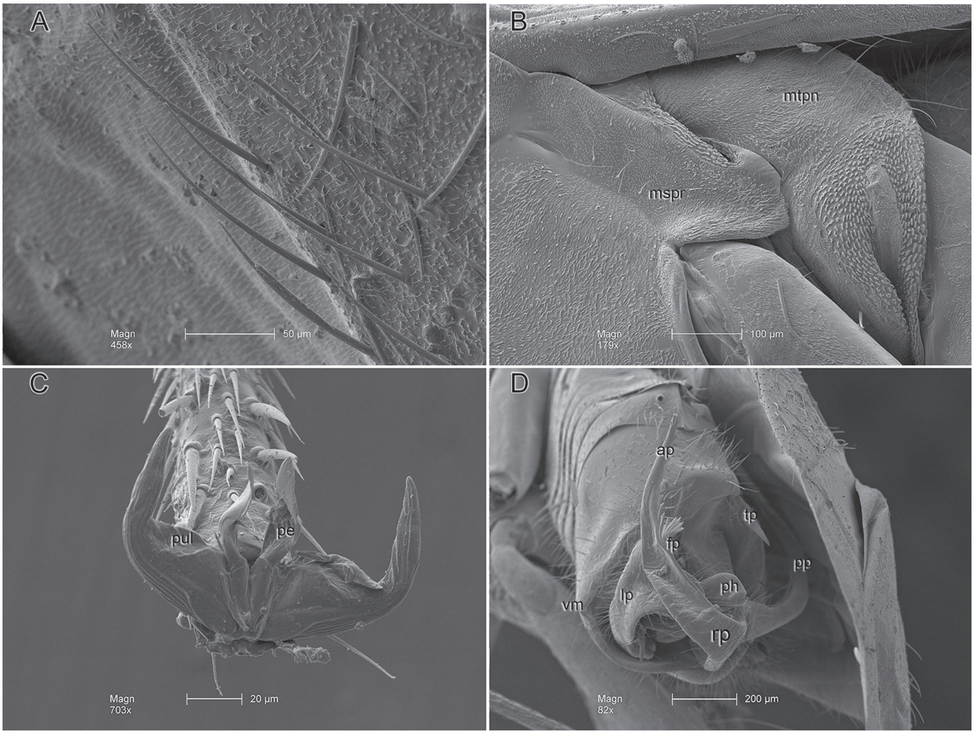

Figure 4. *Ilnacora henryi*, scanning electron micrographs. **A** simple setae on edge of cuneus, lateral view **B** mesothoracic spiracle and metathoracic scent-efferent system, lateral view **C** pretarsus, frontal view **D** male genitalia, caudal view. Abbreviations: tp, tergal process; lp, left paramere; mspr, mesepimeron; mtpn, metepisternum; pe, parempodium; pul, pulvillus; rp, right paramere (ap – anterior process, fp – fan-shaped spine, pp – posterior process); ph, phallotheca; vm, ventral margin of pygophore.

Second gonapophyses: Anteroproximal surface projecting ventrad at midline, flanked by small round paramedial projections (Fig. 5E–F). *Posterior Wall: Interramal sclerite*: Thinly membranous, dorsomedial margin flat. *Medial region*: Strongly sclerotized, plate-like, broadly projecting posteriad abutting ovipositor bulb (Fig. 5F). *Interramal lobes*: Weakly sclerotized, broadly V-shaped, lateral surface of ventral projections and dorsal margins strongly microspiculate, middle projections sparsely microspiculate, practically meeting on midline (Fig. 5E–F).

Etymology. Named to honor Dr. Thomas J. Henry for his considerable contributions to hemipteran systematics over a long, active career.

Hosts. Unknown.

Distribution. Known from seven widely scattered localities spanning the southern foothills of the Sierra Madre Occidental in southern Sinaloa to the western Sierra Nevada in Michoacan and east across the Sierra Madre del Sur from Colima to Oaxaca (Fig. 6).

Discussion. Several congeners of *I. henryi* in the U.S. and Mexico have male genitalia of similar form. All are easily denoted by the very elongate sensory lobe of the right paramere (Knight 1963, figs 1–4, 11, 13; Knight and Schaffner 1976, figs 1, 3; Carvalho and Costa 1992, figs 4, 8). All these species also share nongenitalic characters not found in *I. henryi*: generally yellowish to green coloration with major portions of the head, pronotum and hemelytron black; pronotal disk, and sometimes scutellum and hemelytron with tufts of black scale-like setae; and head with strongly convex or tumid frons. As presented in the diagnosis and description above, the overall black body with legs yellow, absence of setal patches on the pronotal disk, and only moderate curvature of the frons make *I. henryi* unique among the species of *Ilnacora*. The new species brings to 25 the number of species composing *Ilnacora*.

Only four species, *I. inusta* (Distant, 1884), *I. mexicana* Knight & Schaffner, 1976, *I. schaffneri* Knight, 1963, and *I. tepicensis* Carvalho & Costa, 1992, are distributed within the range of *I. henryi*. The coloration of all these sympatric species is generally greenish with various small or large areas of diffuse dark color and discrete patches of black scale-like setae on scattered regions of the dorsum; the almost entirely black *I. henryi* would not be mistaken for any of these other taxa.

The majority of host associations for other species of *Ilnacora* are in Asteraceae. The following probable asteraceous hosts are recorded in the Arthropod Easy Capture database: *Ambrosia* sp., *A. trifida* L., *Artemisia* sp., *Chrysopsis villosa* var. *hispida* (Hook.) A. Gray ex D.C. Eaton, *Coreocarpus* sp., *Dyssodia papposa* (Vent.) Hitchc., *Ericameria nauseosa* (Pall. ex Pursh) G.L. Nesom & G.I. Baird, *Grindelia* sp., *G. hirsutula* Hook. & Arn., *G. perennis* A. Nelson, *Helianthus* sp., *Helianthus salicifolius* A. Dietr., *H. tuberosus* L., *Heterotheca canescens* (DC.) Shinners, *H. villosa* (Pursh) Shinners, *Iva axillaris* Pursh, *Parthenium* sp., *Solidago* sp., *S. rugosa* Mill.

Type material. Holotype ♂: **MEXICO: Sinaloa:** “Santa Lucia [23.49755°N, 105.92295°W], Sin. MEX. 4000' [1219 m] 4 Aug. 1964 L.A. Kelton”, (AMNH_PBI 00112931). Holotype *Ilnacora henryi* n. sp. det. M. D. Schwartz, 2010 [red label]. Deposited in the collection of the Instituto de Biologia, Universidad Nacional Autonoma de Mexico, Mexico City, D.F. Paratypes: **MEXICO: Colima:** 9 mi NE of Comala, 19.40916°N, 103.65196°W, 18 Jul 1983, Kovarik, Harrison, and Schaffner, 1♀ (00093269) (TAMU). **Guerrero:** Acahuizotla, 17.3833°N, 99.45°W, 944 m, 22 Jun 1982, L. Torres, 1♀ (00093270) (TAMU). **Jalisco:** El Molino, 20.12625°N, 103.14738°W, 1774 m, 10 Jul 1956, R. and K. Dreisbach, 1♀ (00070075) (USNM). **Michoacan:** 10.6 mi S of Uruapan, 18.96534°N, 102.10035°W, 24 Jul 1983, Kovarik, Harrison, and Schaffner, 1♂ (00093267) (TAMU). El Salitre, 20.16667°N, 102.66666°W, 1595 m, 29 Jul 1985, R. Barba, 1♂ (00094241), 1♀ (00094242) (IBUNAM). **Oaxaca:** 20 mi N of Putla, 17.40206°N, 97.60865°W, 2320 m, 03 Aug 1976, Peigler, Gruetzmacher, R. and M. Murray, Schaffner, 1♀ (00093268) (TAMU). **Sinaloa:** Santa Lucia, 23.49755°N, 105.92295°W, 1219 m, 16 Jul 1964, L.A. Kelton, 1♂ (00112960) (CNC); 04 Aug 1964, L.A. Kelton, 1♂ (00112934), 1♀ (00112953) (AMNH), 14♂ (00112917, 00112915, 00112921, 00112923–00112930, 00112932, 00112933, 00111000), 23♀ (00112922, 00112936–00112952, 00112955–00112959) (CNC), 1♂ (00112935), 1♀ (00112954) (USNM).

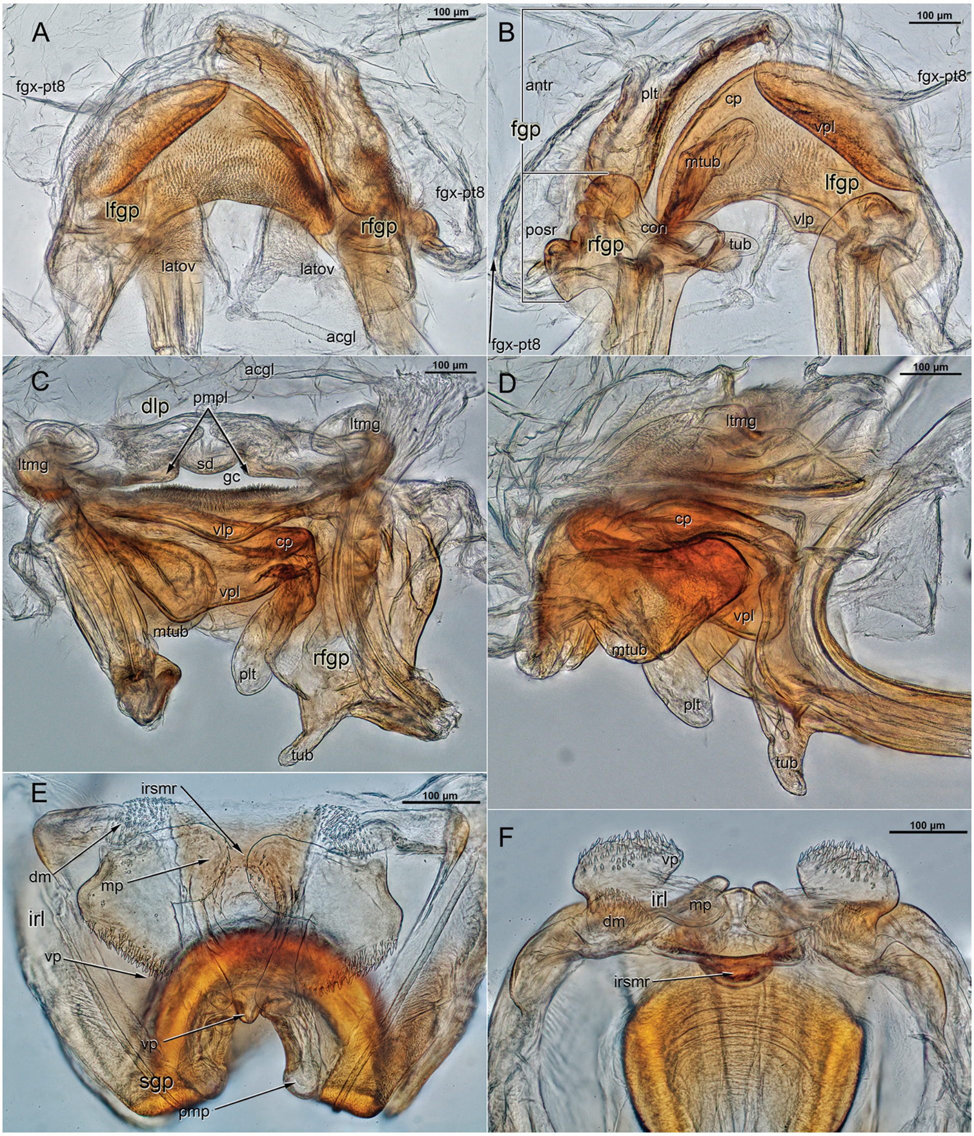

Figure 5. Digital female genitalic images of *Ilnacora henryi*. **A** bursa copulatrix, dorsal view **B** bursa copulatrix, ventral view **C** bursa copulatrix, anterior view **D** bursa copulatrix, left lateral view **E** posterior wall, anterior view **F** posterior wall dorsal view. Abbreviations: acgl, accessory (vermiform) gland; dlp, dorsal labiate plate (pmpl - paramedial plate, sd – shield shaped depression; ltmg – lateral margin); fgp, first gonapophysis (antr – anterior region, posr – posterior region); fgx-pt8, membrane from first gonocoxae and fused paratergites 8; irl, interramal sclerite (dm - dorsal margin, mp - medial portion, vp - ventral portion); irsmr, interramal sclerite medial region; latov, lateral oviduct; lfgp, left first gonaphophysis (cp – crescent-shaped process, vpl – ventral plate, mtub – medial tubercle); rfgp, right first gonaphophysis (tub – tubercle, con – condyle, plt – plate-like sclerite); sgp, second gonapophysis (pmp – paramedial projection, vp – ventral projection); vlp, ventral labiate plate.

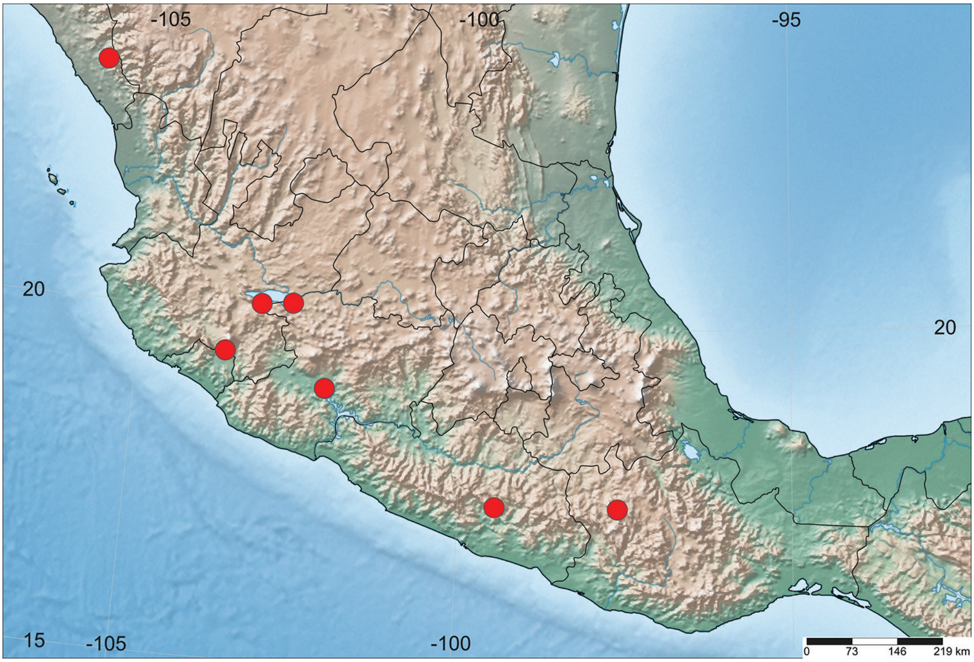

Figure 6. Distribution of *Ilnacora henryi*.

Acknowledgements

Thanks and gratitude are due Joe Schaffner for providing loans of Orthotylini collected during his many trips to Mexico, initially recognizing the vast number of new species in need of taxonomic study, and discussing organization of these taxa; Harry Brailovsky for providing specimens from the National Museum of Mexico; Keith Hubbard (AAFC) for expert assistance with the scanning electron microscope; Vazrick Nazari (AAFC) assisted with the photomicrographs of the female genitalia; Steve Thurston (AMNH) for providing the tools needed to allow me to format and arrange the graphics for this manuscript in a timely manner; Jessica Hsiung (AAFC) kindly provided advice with Photoshop technique.

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RESEARCH ARTICLE

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Psallus thomashenryi sp. n. and *Psallus lucanicus* from Turkey (Hemiptera, Heteroptera, Miridae)

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Abstract

Psallus (*Psallus*) *thomashenryi* **sp. n.** (Hemiptera: Heteroptera: Miridae: Phylinae: Phylini: Phylina) is described from southern Anatolia, Turkey. Illustrations of the dorsal habitus and male genitalia are provided. Its habitus is similar to other uniformly orange species of the subgenus *Psallus* Fieber, 1858, particularly *P. asthenicus* Seidenstücker, 1966 from which it can be easily distinguished by the combination of extremely small size (2.3 mm in both sexes) and different morphology of the vesica. *Psallus* (*Psallus*) *lucanicus* Wagner, 1968 is recorded for the first time from Turkey. *Psallus* (*Psallus*) *aurora* (Mulsant & Rey, 1852) is removed from the list of Turkish fauna based on a reevaluation of the voucher specimen. An updated checklist of the species of *Psallus* known to occur in Turkey is provided. The relevance of Anatolia and the Syro-anatolian-transcaucasian region in the Palearctic distribution of *Psallus* is discussed. The westernmost record of another mirid, *Plagiognathus marivanensis* Linnavuori, 2010, is provided.

Keywords

Hemiptera, Heteroptera, Miridae, new record, new species, Palearctic region, Phylinae, Phylini, *Psallus*, Turkey

Introduction

The predominantly Palearctic genus *Psallus* Fieber, 1858, including 160 valid species-group taxa, is one of the most speciose in the subfamily Phylinae (Schuh 1995, 2013; Kerzhner and Josifov 1999; Yasunaga 2010; Matocq 2011; Duwal et al. 2012; Vinokurov and Luo 2012; Aukema et al. 2013; Li and Liu 2013; Schuh et al. 2014; Simon and Strauss 2014; Konstantinov 2016; Pagola-Carte 2017). *Psallus* is currently subdivided into eight subgenera based on similarities in habitus and male genitalia: *Apocremnus* Fieber, 1858, *Calopsallus* Yasunaga & Vinokurov, 2000, *Hylopsallus* Wagner, 1952, *Mesopsallus* Wagner, 1970, *Psallus* Fieber, 1858, *Phylidea* Reuter, 1899, *Pityopsallus* Wagner, 1952, and *Supsallus* Linnavuori, 1993 (Kerzhner and Josifov 1999, Yasunaga and Vinokurov 2000, Yasunaga 2010). Some authors have regarded this division into subgenera and the definition of the genus itself far from satisfactory and in need of revision; the genus is generally considered polyphyletic and several proposals have been made to combine some subgenera, elevate some subgenera to genus level, and/or transfer some species to other genera (Yasunaga and Vinokurov 2000, Wyniger 2004, Mróz 2012, Aukema et al. 2013, Schuh and Menard 2013, Pluot-Sigwalt and Matocq 2017). Probably a better understanding of the systematics of *Psallus* will be reached only by dealing with it on a world basis and extending the use of female genitalia, whose relevant value in aiding the recognition of related and unrelated species was recently demonstrated by Pluot-Sigwalt and Matocq (2017).

Prior to this study, 34 species of *Psallus* were known to occur in Turkey. Our study documents two additional species; the first of them, *Psallus* (*Psallus*) *thomashenryi* sp. n., is described from Southern Anatolia, and the second, *Psallus* (*Psallus*) *lucanicus* Wagner, 1968, is recorded for the first time from Turkey. The West-Mediterranean *Psallus* (*Psallus*) *aurora* (Mulsant & Rey, 1852) is removed from the list of Turkish fauna based on a reevaluation of the voucher specimen.

Material and methods

Images of the adults were taken using a Canon D40 camera equipped with a MP-E65 macro lens mounted on a photographic stand; stacked images were combined using Zerene Stacker. Drawings of 10 % KOH-macerated genitalia were made using a Leitz Laborlux S microscope equipped with camera lucida. Measurements were made using an eyepiece micrometer mounted on a Wild M5S binocular microscope. All measurements are in millimeters. Morphological terminology follows Schuh and Slater (1995); terminology of male genitalia follows Konstantinov (2003).

In the transcription of locality labels of types a slash (/) is used to indicate data in different rows of a single label; a double slash (//) is used to separate different labels; data on the labels are given verbatim.

All specimens mentioned in the text are deposited in the National Museum, Prague, Czech Republic (**NMPC**).

Taxonomy

Psallus thomashenryi sp. n.

http://zoobank.org/EDE2EE97-C112-4896-9AC1-A805CF5A9AB4

Figs 1–7

Type locality. Turkey, southern Anatolia, Mersin Province, Göksu Nehri river canyon, Evkafçiftliği, 36°27'23.6"N, 33°38'12.3"E.

Type material. Holotype: ♂, glued on a pointed cardboard with genitalia glued on the same cardboard with labels as follows: 36°27'23.6"N, 33°38'12.3"E / AS. TURKEY, İÇEL prov. / Evkafçiftliği, Göksu Nehri canyon / valley of drying brook, sweep / 5.v.2007, lgt. P. Kment [white printed label] // HOLOTYPUS / *PSALLUS (PSALLUS)* / *THOMASHENRYI* / sp. n. / det. Carapezza & Kment 2017 [red printed label]' (NMPC).

Paratype: ♀, glued on a pointed cardboard with labels as follows: 36°27'23.6"N, 33°38'12.3"E / AS. TURKEY, İÇEL prov. / Evkafçiftliği, Göksu Nehri canyon / valley of drying brook, sweep / 5.v.2007, lgt. P. Kment [white printed label] // PARATYPUS / *PSALLUS (PSALLUS)* / *THOMASHENRYI* / sp. n. / det. Carapezza & Kment 2017 [red printed label]' (NMPC).

Description. ***Male***. *Coloration* (Fig. 1). Dorsal coloration almost uniformly orange. Head orange, vertex basally with four small reddish dots arranged in line, frons with five whitish lateral arcs; apex of clypeus whitish. Antennae pale yellowish, scape with faint basal annulation and with two preapical dark dots; labium pale yellowish, apical half of last segment darkened. Pronotum orange with traces of reddish dotting in anterior half; scutellum and hemelytra orange, cuneus basally and apically whitish; membrane pale, hyaline, veins concolorous. Thoracic sterna orange with reddish tinge, legs pale yellowish, femora with irregular orange to reddish-brown dots, more numerous on hind femora; tibial spines black, arising from small dark spots; tarsi uniformly pale.

Structure. Body elongate-ovoid (Fig. 1), about 2.8 times longer than basal width of pronotum. Head moderately projecting, in dorsal view 2.1 times wider than long, in frontal view 1.5 times wider than high, in lateral view 1.5 times longer than high; ocular index (ratio vertex/eye in dorsal view) 1.6. Antennae with segment II 0.8 times as long as basal width of pronotum. Labium slightly surpassing metacoxae. Hind femora elongate, 3.6 times longer than maximum width; tibial spines long, about twice longer than tibial diameter. Genital segment ventrally unkeeled; phallotheca (Fig. 2) robust, with a preapical lateral ridge, apex rounded; left paramere (Fig. 4) broad, apical process straight and thin, sensory lobe short, apically rounded; right paramere (Fig. 3) elongate, apical process straight; vesica (Figs 5–7) short, C-shaped, provided with robust postbasal lateral spicule extending apically to middle of vesica, terminating in elongate, apically recurved blade, armed with rows of denticles along inner side, and three fingerlike, apically bent blades, almost equal in size, originating near subapical secondary gonopore.

Figure 1. Habitus of *Psallus thomashenryi* sp. n., holotype, male (2.29 mm).

Pubescence. Dorsum with reclining pale and semierect blackish setae; the latter few, mostly on head and lateral margins of pronotum.

Female. Coloration similar to males but paler. Structure and pubescence as in males, but body more ovoid, 2.8 times longer than basal width of pronotum; ocular

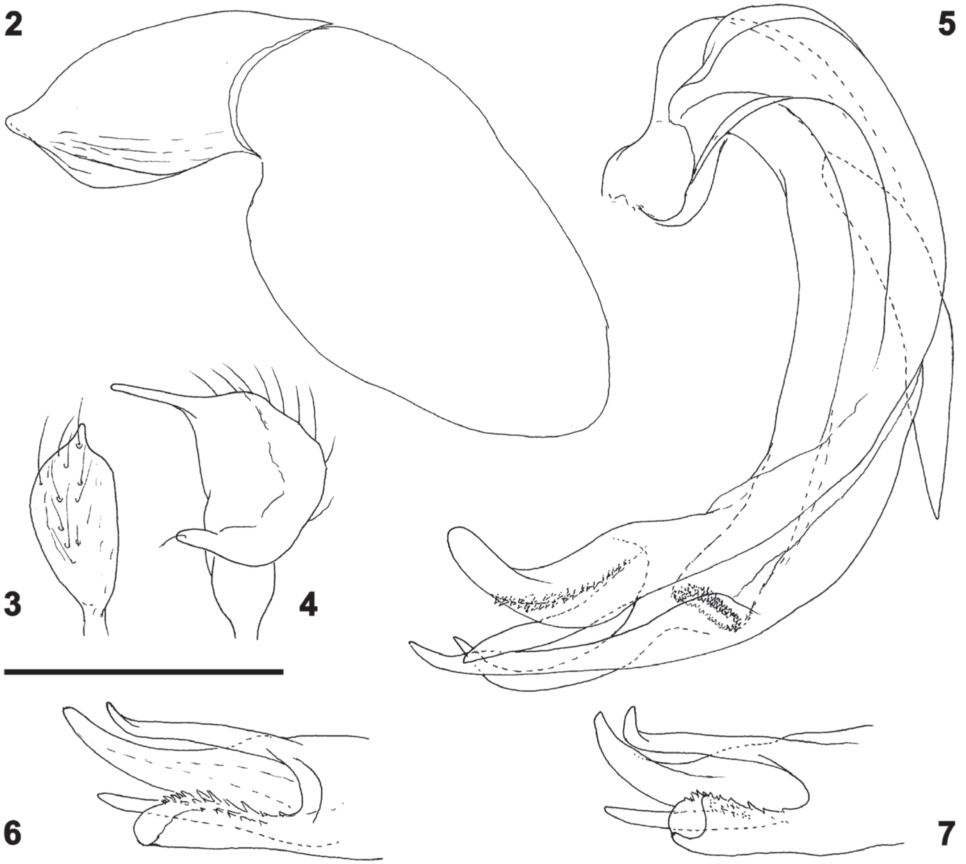

Figure 2–7. Male genitalia of *Psallus thomashenryi* sp. n.: **2** phallotheca **3** left paramere **4** right paramere **5** vesica in lateral view **6–7** apex of vesica in different views. Scale bar: 0.2 mm.

index 2.2. Female genitalia could not be examined due to the imperfectly sclerotized single specimen.

Measurements (in mm). *Male.* Body length: 2.29; head width: 0.61; interocular distance: 0.27; pronotum width: 0.82; length of antennal segments: I – 0.13, II – 0.63, III – 0.29, IV – 0.24; length of tarsomeres: I – 0.11, II – 0.13, III – 0.15. *Female*. Body length: 2.38; head width: 0.61; interocular distance: 0.32; pronotum width: 0.89; length of antennal segments: I – 0.14, II – 0.58, III and IV missing.

Differential diagnosis. The dorsal coloration almost uniformly orange and the C-shaped vesica with elongate apical processes show clearly that the new species belongs to the subgenus *Psallus* s. str. Its total length, 2.3 mm in both sexes, makes it one of the smallest species in the subgenus; only a few species have a body length less than or equal to 2.5 mm, namely *P. corsicus* Puton, 1875 and *P. jeitensis* Wagner, 1963, but their coloration and male genitalia differ from those of the new species. By its habitus, *Psallus thomashenryi* is very close to the East-Mediterranean *P. asthenicus* Seidenstücker, 1966, from which, as from any other species of its genus, it can be distinguished by the characteristic male genitalia, especially the unique apical blades of the vesica. In particular, *P. asthenicus* is larger (body length 2.8–3.1 mm), the postbasal lateral spicule of the vesica is membranous and its apical blades are horn-like, gradually tapering, apically pointed, and the central one is shaped like the head of a bird (see Seidenstücker 1966, figs 25a, 25b).

Etymology. The new species is named in honor of our colleague Thomas J. Henry on his 70th birthday in recognition of his great contribution to the advancement of heteropterology and as a token of personal friendship and gratitude. The specific epithet is a noun in the genitive case.

Habitat. The specimens were beaten from shrubs and trees growing around a small drying-up brook at the village margin. In the same habitat, the new species was collected with the following other species of Miridae: *Amblytylus concolor* Jakovlev, 1877, *Closterotomus annulus* (Brullé, 1832), *C. norwegicus* (Gmelin, 1790), *Globiceps* (*Paraglobiceps*) *syriacus* Wagner, 1969, *Heterocordylus* (*Bothrocranum*) *carbonellus* Seidenstücker, 1956, *Lepidargyrus syriacus* (Wagner, 1956), *Paredrocoris pectoralis* Reuter, 1878, *Phytocoris* (*Exophytocoris*) *parvulus* Reuter, 1880, and *Plagiognathus marivanensis* Linnavuori, 2010.

Distribution. Endemic to southern Anatolia.

Faunistic records and corrections

Atomoscelis onusta (Fieber, 1861)

= *Psallus aurora* (misidentification): Hoberlandt (1956): 54 (record).

Material examined. TURKEY: Anatolia: Adana Province: Toros Mts., Kozan, 8.–9. viii.1947, 1 ♂, Exp. N. Mus. ČSR lgt., L. Hoberlandt 1954 det. as *Psallus aurora* (NMPC).

Comment. *Psallus aurora* is a West-Mediterranean species known from France, Italy, Portugal, Spain, Algeria, Libya, Morocco and Tunisia (Kerzhner and Josifov 1999). The record from Turkey was considered doubtful by Kerzhner and Josifov (1999: 412). Our recent reexamination of the voucher specimen confirmed that it was misidentified and belongs to the widely distributed Palearctic species *Atomoscelis onusta*. We therefore exclude *P. aurora* from the list of Turkish fauna.

Plagiognathus (*Plagiognathus*) *marivanensis* Linnavuori, 2010

Plagiognathus (*Plagiognathus*) *marivanensis* Linnavuori, 2010: 388 (original description).

Material examined. TURKEY: Anatolia: Mersin Province: Göksu Nehri river canyon, Evkafçiftliği, 36°27'23.6"N, 33°38'12.3"E, valley of drying brook, sweeping, 5.v.2007, 1 ♀., P. Kment lgt. (NMPC).

Distribution. The species was described recently from western Iran (provinces Kohgiluyeh and Boyerahmad, Kurdestan, and West Azerbaijan) by Linnavuori (2010). It was later recorded from Turkey, eastern Anatolia (provinces Elazığ and Dıarbakır; Matocq et al. 2014). Here the westernmost record of this poorly known species is presented, extending its distribution to southern Anatolia.

Psallus (*Psallus*) *lucanicus* Wagner, 1968

Psallus lucanicus Wagner, 1968: 273 (original description).
Psallus balcanicus Josifov, 1969: 29 (original description). Synonymized by Carapezza (1988: 118, suspected) and Kerzhner and Josifov (1999: 416, confirmed).

Material examined. TURKEY: Anatolia: Mersin Province: Yeniköy env., slope above road to Gözne, 36°59'18.5"N 34°30'19"E, on *Quercus* cf. *cerris*, 6.v.2007, 2 ♂♂ 3 ♀♀, P. Kment lgt. (NMPC).

Host plant. It is generally collected on *Quercus cerris* (Carapezza 1988, Bryja and Kment 2002, Rabitsch 2003, Anonymus 2016, Denton 2016), but it also is known from *Q. pubescens* (Carapezza 1988) and *Q. macrolepis* (Rieger 2007).

Distribution. The species was described from Lucania, a region in Southern Italy whence its name is derived. It was later found in other Italian regions including Sicily (Wagner 1968, Carapezza 1988, Wyniger 2004), and in Austria (Rabitsch 2003), Bulgaria (Josifov 1969, as *P. balcanicus*; Wyniger 2004), Czech Republic (Bryja and Kment 2002, Wyniger 2004), Greece (Rieger 2007), Hungary (Kondorosy 2005), Slovakia (Günther 2000, Wyniger 2004), Slovenia (Gogala and Gogala 1986, Gogala 2006), and United Kingdom (Anonymus 2016, Denton 2016). This is the first record for Turkey and its easternmost occurrence.

Conclusions

As a result of this study, a total of 36 species of *Psallus* are confirmed to occur in Turkey, as detailed in the following updated checklist (see Kerzhner and Josifov 1999, Lodos et al. 2003, Önder et al. 2006, Konstantinov and Namyatova 2008, Matocq and Pluot-Sigwalt 2011, Aukema et al. 2013, Matocq et al. 2014, Dursun and Fent 2017, Çerçi and Koçak 2017). An E* indicates the species endemic for the country; non-endemic species are followed by a reference for Turkey.

Checklist of *Psallus* from Turkey

Psallus (*Apocremnus*) *anatolicus* Wagner, 1963 E* (Wagner 1963)
Psallus (*Apocremnus*) *anticus* (Reuter, 1876) (Hoberlandt 1956)

Psallus (*Apocremnus*) *betuleti* (Fallén, 1826) (Önder et al. 2006)
Psallus (*Apocremnus*) *skylla* Linnavuori, 1994 (Matocq et al. 2014)
Psallus (*Hylopsallus*) *perrisi* (Mulsant & Rey, 1852) (Wagner 1975a, Lodos et al. 2003)
Psallus (*Hylopsallus*) *variabilis* (Fallén, 1807) (Wagner 1975a)
Psallus (*Mesopsallus*) *ambiguus* (Fallén, 1807) (Kerzhner and Josifov 1999)
Psallus (*Phylidea*) *cerridis* Wagner, 1971 E* (Wagner 1971a)
Psallus (*Phylidea*) *collaris* (Wagner, 1975) E* (Wagner 1975b)
Psallus (*Phylidea*) *henschii* Reuter, 1888 (Seidenstücker 1962)
Psallus (*Phylidea*) *karakardes* Seidenstücker, 1959 E* (Seidenstücker 1959)
Psallus (*Phylidea*) *nigripilis* Reuter, 1888 (Kerzhner and Josifov 1999, Matocq et al. 2014)
Psallus (*Phylidea*) *quercicola* (Reuter, 1904) E* (Reuter 1904)
Psallus (*Phylidea*) *quercus* (Kirschbaum, 1856) (Seidenstücker 1959)
Psallus (*Phylidea*) *syriacus* (Reuter, 1883) (Lodos et al. 2003)
Psallus (*Pityopsallus*) *piceae* Reuter, 1878 (Hoberlandt 1956)
Psallus (*Pityopsallus*) *pinicola* Reuter, 1875 (Önder 1976)
Psallus (*Psallus*) *anaemicus* Seidenstücker, 1966 (Seidenstücker 1966a)
Psallus (*Psallus*) *apoplecticus* Seidenstücker, 1966 E* (Seidenstücker 1966a)
Psallus (*Psallus*) *asthenicus* Seidenstücker, 1966 (Seidenstücker 1966a)
Psallus (*Psallus*) *brachycerus* Reuter, 1904 (Reuter 1904, Hoberlandt 1956)
Psallus (*Psallus*) *corsicus* Puton, 1875 (Konstantinov and Namyatova 2008)
Psallus (*Psallus*) *cruentatus* (Mulsant & Rey, 1852)
Psallus (?*Psallus*) *inancozgeni* Matocq & Pluot-Sigwalt, 2011 E* (Matocq and Pluot-Sigwalt 2011)
Psallus (*Psallus*) *lentigo* Seidenstücker, 1972 (Seidenstücker 1972)
Psallus (*Psallus*) *lepidus* Fieber, 1858 (Önder 1976)
Psallus (*Psallus*) *milenae* Josifov, 1974 (Josifov 1974)
Psallus (*Psallus*) *mollis* (Mulsant & Rey, 1852) (Kerzhner and Josifov 1999)
Psallus (*Psallus*) *oenderi* Wagner, 1976 E* (Wagner 1976)
Psallus (*Psallus*) *oleae* Wagner, 1963 E* (Wagner 1963b)
Psallus (*Psallus*) *pardalis* Seidenstücker, 1966 (Seidenstücker 1966b)
Psallus (*Psallus*) *pseudopunctulatus* Linnavuori, 1984 (Matocq et al. 2014)
Psallus (*Psallus*) *rubinicterus* Seidenstücker, 1966 E* (Seidenstücker 1966a)
Psallus (*Psallus*) *turcicus* Wagner, 1971 E* (Wagner 1971b)
Psallus (*Psallus*) *thomashenryi* sp. n. E*
Psallus (*Psallus*) *varians varians* (Herrich-Schaeffer, 1841) (Hoberlandt 1956)

The total number of 36 species is comparable to the number of species of *Psallus* occurring in other northern Mediterranean countries such as France (31) or Italy (34), but with an important difference in the percentage of endemic species. France has no endemic species and Italy has only two endemics, both restricted to Southern Italy and/or Sicily, which make 5.9 % of the total number (Wagner 1975a, Kerzhner and Josifov 1999, Schuh 2013). In Turkey, 12 of a total of 36 species are endemic, with a percentage of 33.3 %. With the exception of *Psallus* (*Phylidea*) *quercicola* (Reuter, 1904), known also from the European part of Turkey, all Turkish endemic species of *Psallus* are known only from Anatolia (Seidenstücker 1959, 1962, 1966a,b, 1972; Linnavuori 1994; Lodos et al. 2003; Önder et al. 2006; Konstantinov and Namyatova 2008; Matocq and Pluot-Sigwalt 2011; Matocq et al. 2014; Dursun and Fent 2017). Moreover, one species, *Psallus dionysos* Simon & Strauss, 2014, is endemic to the Greek island of Lesbos, divided only by a narrow strait from the western coast of Anatolia (Simon and Strauss 2014) and another, *Psallus* (*Apocremnus*) *cyprius* Wagner, 1977, is endemic to Cyprus, not far from the southern coast of Anatolia (Linnavuori 1994). A similar high level of endemism occurs in two areas adjoining Anatolia, the Transcaucasian and the Syrian regions. In the three countries of Transcaucasia (Armenia, Azerbaijan and Georgia) 23 species of *Psallus* are known, 9 of which are endemic, with a percentage of 36 % (Zaitzeva 1968, Drapolyuk 1991, Kerzhner and Josifov 1999, Konstantinov and Namyatova 2008, Schuh 2013). In the countries of the Syrian region (Jordan, Iraq, Israel, Lebanon, Syria) 11 species of *Psallus* are known to occur, 9 of which are endemic, with a high percentage of 72.7 % (Wagner 1975a, Linnavuori 1984, Kerzhner and Josifov 1999, Carapezza 2002, Schuh 2013). In addition to the area considered above, the Palearctic region has two more centers of endemism for the genus *Psallus*: a minor one in the western Mediterranean (four endemic species in Spain, two in Italy, and one in Algeria) (Wagner 1975a, Kerzhner and Josifov 1999, Konstantinov and Namyatova 2008, Schuh 2013, Pagola-Carte 2017) and a major one in the Palearctic Far East of Asia (seven endemic species in the Far East of Russia, seven in the Korean Peninsula, seven in China, and nine in Japan) (Josifov 1983, Zheng and Li 1990, Li and Zheng 1991, Vinokurov 1998, Kerzhner and Josifov 1999, Yasunaga and Vinokurov 2000, Duwal et al. 2012, Schuh 2013, Duwal and Lee 2015). These data show the high relevance of the Syro-anatolian-transcaucasian region as center of origin of the speciation process of the genus *Psallus* for the Western Palearctic.

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RESEARCH ARTICLE

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Macrotylus henryi, a new species of *Pelargonium*-feeding Cremnorrhinina from South Africa (Hemiptera, Miridae, Phylinae, Cremnorrhinini)

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Abstract

Macrotylus henryi is described as a new species from South Africa. This new taxon is recorded as feeding on species of *Pelargonium* (Geraniaceae) in the Western Cape. Documentation is provided in the form of diagnosis, description, habitus photographs, scanning electron micrographs, illustrations and images of genitalic structures, detailed distributional data, host plant information, and images of hosts and habitats. Morphological traits are similar to species of *Macrotylus* Fieber from the Northern Hemisphere, but coloration is substantially variable, and the structure of the male genitalia is distinctive.

Keywords

Geraniaceae, Heteroptera, host plant, long free pulvilli, plant bug, Western Cape

Introduction

Macrotylus Fieber, 1858 is now placed in Cremnorrhinini: Cremnorrhinina based on phylogenetic analysis that includes morphology and DNA sequence data (Schuh and Menard 2013, Menard et al. 2014). The genus is widely distributed in the Palearctic and Nearctic regions, with approximately three quarters of the total of 70 species described from the Palearctic (Schuh 2002–2013). Only two species have been recorded and described from the Ethiopian region (Schuh 1974).

Schuh (1974) described *Macrotylus hemizygiae* and *M. niger* from Limpopo, Mpumalanga, and KwaZulu-Natal, South Africa. He indicated that *Macrotylus* can be recognized in South Africa by the strongly anteriorly projecting clypeus, the long free pulvilli, and the absence of heavy setiform setae on the dorsum. Schuh (1974) also reported only one host plant, *Hemizygia thorncroftii* Ashby (Lamiaceae), for this genus in South Africa. No additional taxa have since been recorded from the Ethiopian region.

Collecting of Miridae in South Africa produced new specimens of *Macrotylus* as well as host and localities documentation. Fieldwork focused on Namaqualand, the Little Karoo, and the *fynbos* vegetation of the Western Cape, because of the extreme botanical diversity of the area and the very limited sampling of Miridae for the area during the eight-month expedition of J.A. Slater and colleagues during 1967–1968, which had been the only concerted effort to collect phytophagous Heteroptera in South Africa.

In the present paper a new species, *Macrotylus henryi*, is described which feeds on plant species in the family Geraniaceae endemic to South Africa. This new taxon is dedicated to Thomas J. Henry in recognition of his contributions to our knowledge and understanding of true bug taxonomy and host associations.

Materials and methods

Unique matrix code labels were affixed to each of 360 specimens examined; these codes are therefore referred to as "unique specimen identifiers" (USIs). The USI codes are composed of an institution and project code (AMNH_PBI) and a unique number (00393079). The AMNH_PBI prefix was removed from the Specimens Examined sections of the paper to save space and make these sections more readable, but was retained for the holotype and figures. Data for these specimens were captured using the American Museum of Natural History instance of the Arthropod Easy Capture specimen database, formerly known as Planetary Biodiversity Inventories database. Specimen data can be viewed on line through research.amnh.org/pbi/heteropteraspeciespage/ and discoverlife.org, and through the iDigBio web portal (idigbio.org/portal).

Color digital habitus images of the bugs were prepared using a Microptics-USA/Visionary Digital photomicrographic system as developed by Roy Larimer; multiple layers were stacked using Helicon Focus. Habitus photos are proportional to the size of the actual specimens so that relative sizes can be deduced from comparison of the specimen images.

Details on specimen measurements are provided in Table 1. All measurements are in millimeters, and were made using a micrometer driven stage, micrometer output being written directly to a spreadsheet. Summarized measurements were prepared with Excel for Windows (Microsoft Office 2013 Professional).

Table 1. Measurements of *Macrotylus henryi*.

	Length							Width				Ratio				
	Body	**CunClyp**	**Head**	**Prono**	**Scut**	**Cun**	**AntSeg2**	**Head**	**Prono**	**Scut**	**IntOcDi**	**WH/ LH**	**WH/ WP**	**IOD/ WH**	**AS2/ WH**	**WP/ LP**
♂ (N=23) Mean	**5.49**	**3.89**	**0.57**	**0.60**	**0.52**	**0.96**	**1.67**	**0.80**	**1.37**	**0.71**	**0.35**	**1.43**	**0.59**	**0.44**	**2.09**	**2.28**
SD	0.46	0.41	0.09	0.06	0.05	0.07	0.14	0.04	0.12	0.07	0.02	0.17	0.03	0.02	0.07	0.12
Range	1.41	1.13	0.30	0.20	0.16	0.26	0.46	0.15	0.36	0.21	0.06	0.67	0.09	0.09	0.31	0.50
Min	4.85	3.43	0.43	0.51	0.46	0.82	1.46	0.74	1.20	0.63	0.32	1.15	0.54	0.39	1.93	2.04
Max	6.26	4.56	0.73	0.71	0.61	1.08	1.92	0.88	1.56	0.84	0.39	1.82	0.63	0.48	2.24	2.54
♀ (N=23) Mean	**5.47**	**3.96**	**0.59**	**0.63**	**0.53**	**0.89**	**1.62**	**0.79**	**1.45**	**0.74**	**0.41**	**1.35**	**0.54**	**0.52**	**2.06**	**2.32**
SD	0.48	0.37	0.07	0.05	0.05	0.08	0.11	0.05	0.11	0.06	0.02	0.12	0.02	0.02	0.06	0.09
Range	1.45	1.13	0.28	0.18	0.17	0.25	0.43	0.15	0.33	0.19	0.06	0.48	0.06	0.07	0.27	0.32
Min	4.74	3.44	0.45	0.54	0.45	0.76	1.37	0.73	1.30	0.66	0.38	1.17	0.51	0.48	1.88	2.21
Max	6.19	4.57	0.72	0.72	0.62	1.01	1.80	0.88	1.63	0.85	0.44	1.65	0.57	0.55	2.16	2.52

Host samples were collected and pressed in the field in conjunction with each collecting event. These specimens were subsequently identified by botanical specialists; the botanical names were then associated with the individual bug specimens through a specimen database and during the labeling process. *Macrotylus* specimens were collected on plants in flower. Thus, the identification of the host plants is to the level of species. Host field photos were made using a Nikon D1 SLR digital camera.

Scanning electron micrographs were prepared using a Hitachi S-4700 digital SEM. Male genitalic illustrations were prepared as pencil drawings using a Nikon Eclipse 80i compound microscope, then scanned and rendered as graphics using Adobe Illustrator. All such illustrations were drawn with a 20× or 40× objective lens. Female genitalic images were taken with a 10× or 20× objective lens using a Nikon E800 compound microscope, photomicrographic attachment, and software.

The insect specimens examined in this study were provided by the following institutions, or material is deposited in them; institutional abbreviations used in the specimens examined sections and names of individuals who assisted handling the specimens are also listed:

AM	Australian Museum, Sydney, Australia; G. Cassis, D. Britton, D. Smith
AMNH	American Museum of Natural History, New York
CNC	Canadian National Insect Collection, Agriculture Canada, Ottawa; M.D. Schwartz, R.G. Foottit
PPRI	Plant Protection Research Institute, Pretoria, South Africa; I.M. Millar
SAMC	Iziko (South African) Museum, Cape Town, South Africa; S. van Noort
UNSW	University of New South Wales, Australia; G. Cassis
USNM	United States National Museum of Natural History, Smithsonian Institution, Washington, D.C.; T.J. Henry
ZISP	Zoological Institute, Russian Academy of Sciences, St. Petersburg; F. Konstantinov, D. Gapon

Taxonomy

Macrotylus henryi sp. n.

http://zoobank.org/0EBCA72F-0686-4894-B777-2179891A4754
Figures 1–6, Tables 1, 2

Diagnosis. Placed in *Macrotylus* Fieber based on the following characteristics: The projecting clypeus, the sparsely distributed, reclining dark common setae on the dorsum (Figs 1, 2A), the pretarsus with deep tarsal claw base and long, apically free pulvillus (Fig. 2F), and the male genitalia with an elongate right paramere, deep left paramere, and the structure of endosoma (Fig. 3). Recognized among *Macrotylus* spp. by relatively large size; coloration variable, ranging from completely reddish or brownish, to a combination of brownish and reddish or yellow green and reddish, to completely yellow green; moderately projecting face; relatively narrow head, wide pronotum, long second antennal segment, and large eyes (Table 1, Figs 1, 2A); C-shaped endosoma with two sclerotized straps along margins, apical denticles, and subapical secondary gonopore (Fig. 3A–B).

Distinguished from other South African *Macrotylus* species by its larger size, vestiture type, and the structure of endosoma. *Macrotylus niger* mostly black; *M. hemizygiae*, although often yellow green as in some *M. henryi* specimens, with shining woolly setae as well as densely placed dark setae on dorsum. These two previously described South African species apparently lacking denticles seen on apex of endosoma in *M. henryi* (Fig. 3A–B, Schuh 1974: figs 264, 266). Similar to *Denticulophallus* Schuh, the other genus of Cremnorrhinina known from South Africa, based on the prominent clypeus, the enlarged free pulvilli, and the structure of endosoma (twisted, sclerotized straps, and apex with several teeth). However, *Denticulophallus* with a U-shaped endosoma with longer attenuated teeth, medial secondary gonopore, almost totally black coloration, and use of Rutaceae species as hosts (Schuh 1974, Salas in prep.).

Description. ***Male***. Relatively large, total length 4.85–6.26, pronotum width 1.20–1.56 (Table 1). *Coloration* (Fig. 1): Overall coloration mostly reddish, brownish, or yellow green, including appendages, or a combination of yellow green and reddish or brownish and reddish; antennae and legs similar in coloration to dorsum; membrane smoky brown.

Surface and vestiture (Figs 1, 2): Body surface generally with reclining common setae, broadly distributed, scattered on pronotum and scutellum, dark on hemelytra; head, pronotum, scutellum, and clavus anteriorly with sericeous woolly setae; legs also with some erect spine-like setae and tibial spines.

Structure (Figs 1, 2A–D, Table 1): *Head*: Moderately elongate and projecting anteriorly, relatively narrow; eyes brownish and relatively large; second antennal segment relatively long, about twice width of head; frons slightly protruding; clypeus relatively elongate and visible from above; labium surpassing hind coxae, but never reaching pygophore.

Thorax: Pronotum wider than long, slightly campanulate, posterior lobe weakly elevated; thoracic pleuron with sericeous setae and scattered common setae, metathoracic scent-gland evaporatory area triangular (Fig. 2D).

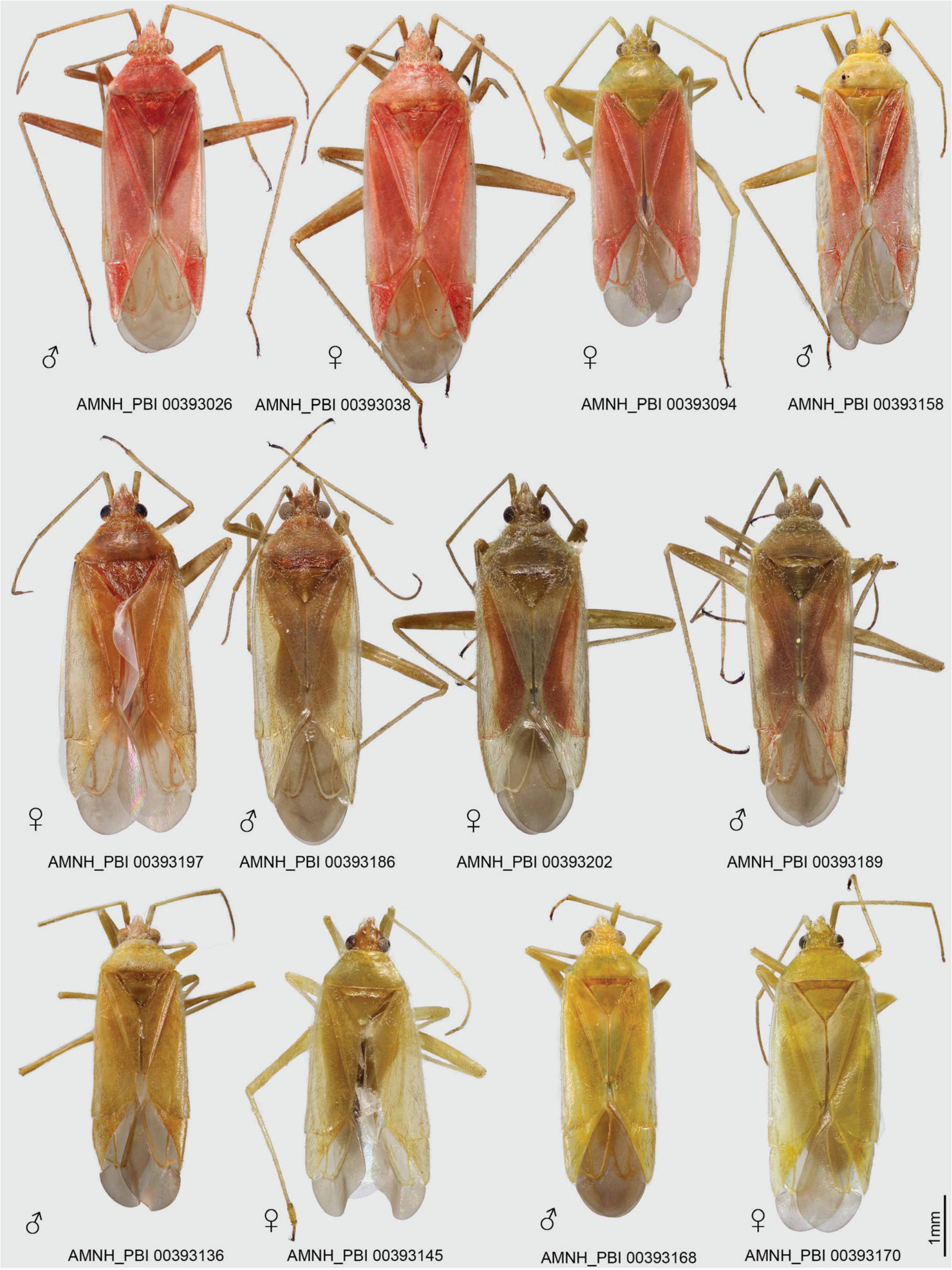

Figure 1. Digital habitus photographs of *Macrotylus henryi*, showing color variation.

Genitalia: *Pygophore* (Fig. 2E): Occupying about 30% of abdominal length, conical, with ventral and dorsal simple and sericeous setae. *Endosoma* (Fig. 3A–B): C-shaped, with dorsal and ventral sclerotized straps seemingly adherent terminally, ventral strap wider than dorsal one; secondary gonopore subapical, moderately large relative to size

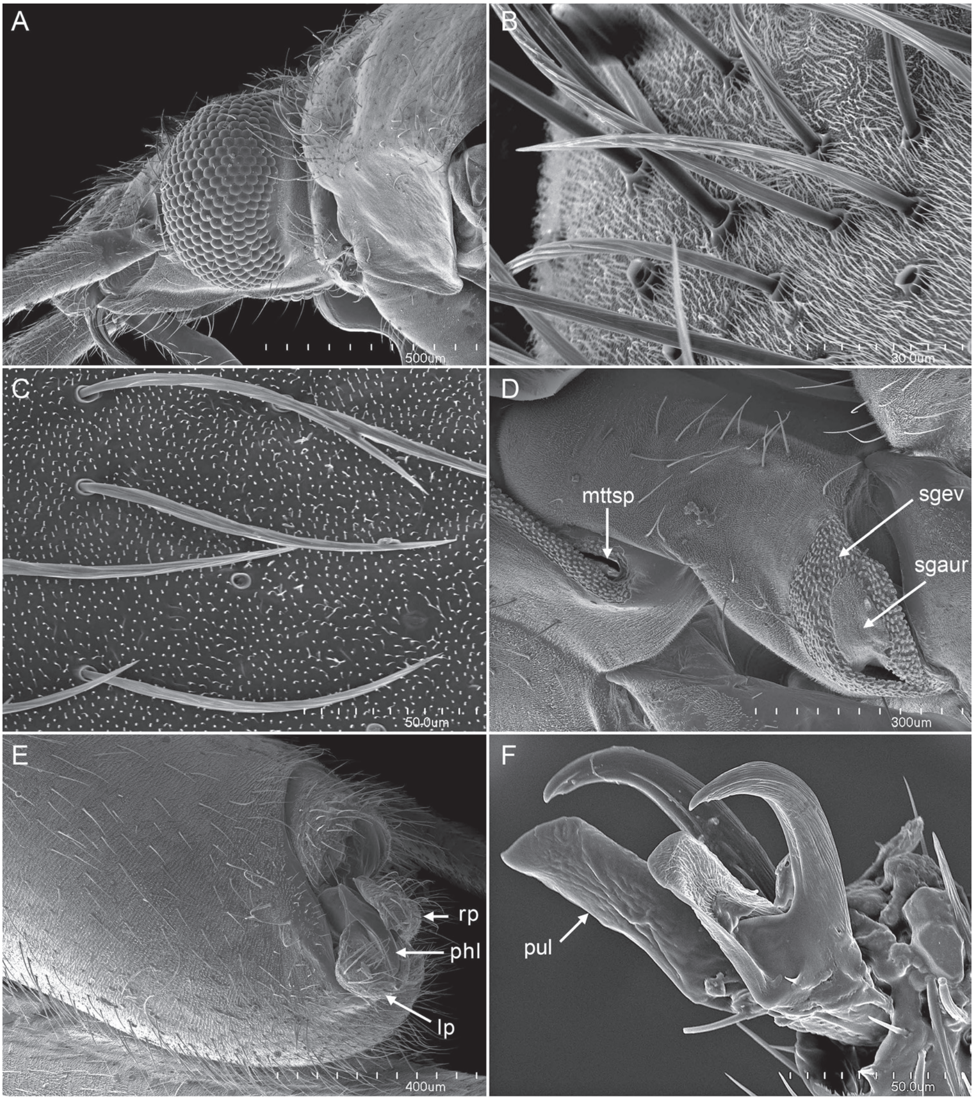

Figure 2. Scanning micrographs of *Macrotylus henryi* (AMNH_PBI 00393017). **A** Lateral view of head and pronotum **B** Detail of pronotal setae **C** Vestiture on hemelytron **D** Thoracic pleuron, showing metathoracic spiracle (**mttsp**), metathoracic scent-gland auricle (**sgaur**), and scent-gland evaporatory area (**sgev**) **E** Lateral view of pygophore, left paramere (**lp**), phallotheca (**phl**), and right paramere (**rp**) **F** Lateral view of pretarsus (**pul**, pulvillus).

of endosoma; dorsal strap with 6–9 denticles between midpoint of secondary gonopore and apex of strap; apex of ventral strap serrate and bifid, wider and extending beyond apex of dorsal one. *Phallotheca* (Figs 2E, 3C): Apical portion conical, dorsal crest well developed. *Parameres* (Figs 2E, 3D–E): Relatively large, protruding from genital aperture, with prominent setae; left paramere with posterior process long, apicoventrally serrate, and anterior process short and conical; right paramere elongate, apex blunt.

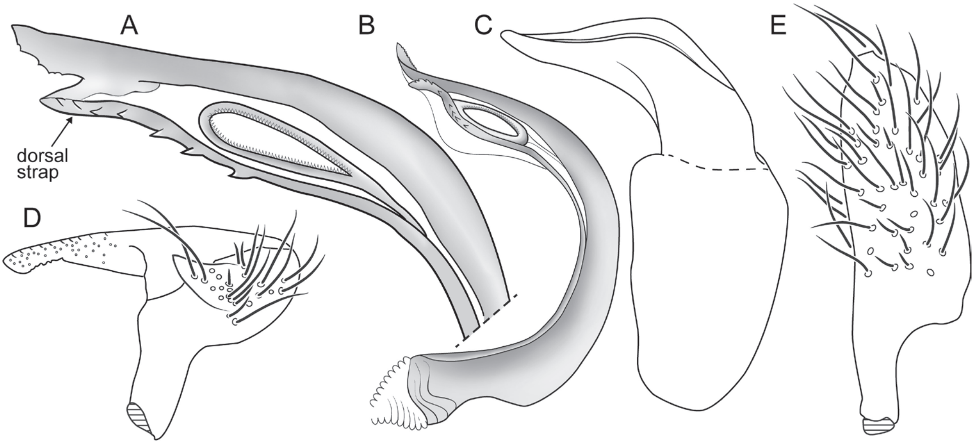

Figure 3. *Macrotylus henryi*, male genitalia. **A–B** Lateral view of endosoma (AMNH_PBI 00393030, AMNH_PBI 00393089) **C** Phallotheca (AMNH_PBI 00393031) **D** Lateral view of left paramere (AMNH_PBI 00393031) **E** Dorsal view of right paramere (AMNH_PBI 00393031).

Female. *Coloration, surface, and vestiture* (Fig. 1): As in male, but with darker eyes. *Structure* (Fig. 1, Table 1): As in male, with similar size and body proportions. *Genitalia*: As in Fig. 4.

Etymology. Named for Thomas J. Henry.

Hosts. Recorded from species of *Pelargonium* L'Hér. (Geraniaceae) (Fig. 5, Table 2).

Distribution. Western Cape, from near Clanwilliam to south Cape Peninsula, and east to near Mossel Bay; from sea level to ~650 m elevation (Fig. 6, Table 2).

Type material examined. Holotype: SOUTH AFRICA: Western Cape: 3.2 km E of Hermanus, 34.40536S, 19.32737E, 33 m, 10 Nov 2003, Schuh, Cassis, Weirauch, *Pelargonium cucullatum* (L.) L'Hér. × *betulinum* (L.) L'Hér. ex Aiton (Geraniaceae), det. K. Roux NYBG VOUCHER, 1♂ (AMNH_PBI 00393026) (PPRI).

Paratypes: SOUTH AFRICA: Western Cape: 3.2 km E of Hermanus, 34.40536S, 19.32737E, 33 m, 10 Nov 2003, Schuh, Cassis, Weirauch, *Pelargonium cucullatum* (L.) L'Hér. × *betulinum* (L.) L'Hér. ex Aiton (Geraniaceae), det. K. Roux NYBG VOUCHER, 16♂ (00388606–00388621), 28♀ (00388622–00388649) (AM), 25♂ (00393000–00393021, 00393030, 00393031, 00393076), 35♀ (00393038, 00393045–00393075, 00393077–00393079) (AMNH), 1♂ (00393027), 2♀ (00393039, 00393040) (CNC), 2♂ (00393024, 00393025), 2♀ (00393036, 00393037) (PPRI), 2♂ (00393022, 00393023), 2♀ (00393034, 00393035) (SAMC), 2♂ (00388604, 00388605), 3♀ (00388650–00388652) (UNSW), 1♂ (00393028), 2♀ (00393041, 00393042) (USNM), 1♂ (00393029), 2♀ (00393043, 00393044) (ZISP). 5.6 km W of Clanwilliam on Rt 364 to Lambert's Bay, 32.16419S, 18.83542E, 329 m, 28 Oct 2007, Schuh, Cassis, Massie, *Pelargonium scabrum* (L.) L'Her. (Geraniaceae), det. Field ID, 8♂ (00393155–00393159, 00393167, 00393168, 00393174), 8♀ (00393160–00393164, 00393169–00393171) (AMNH), 10♂ (00387329–

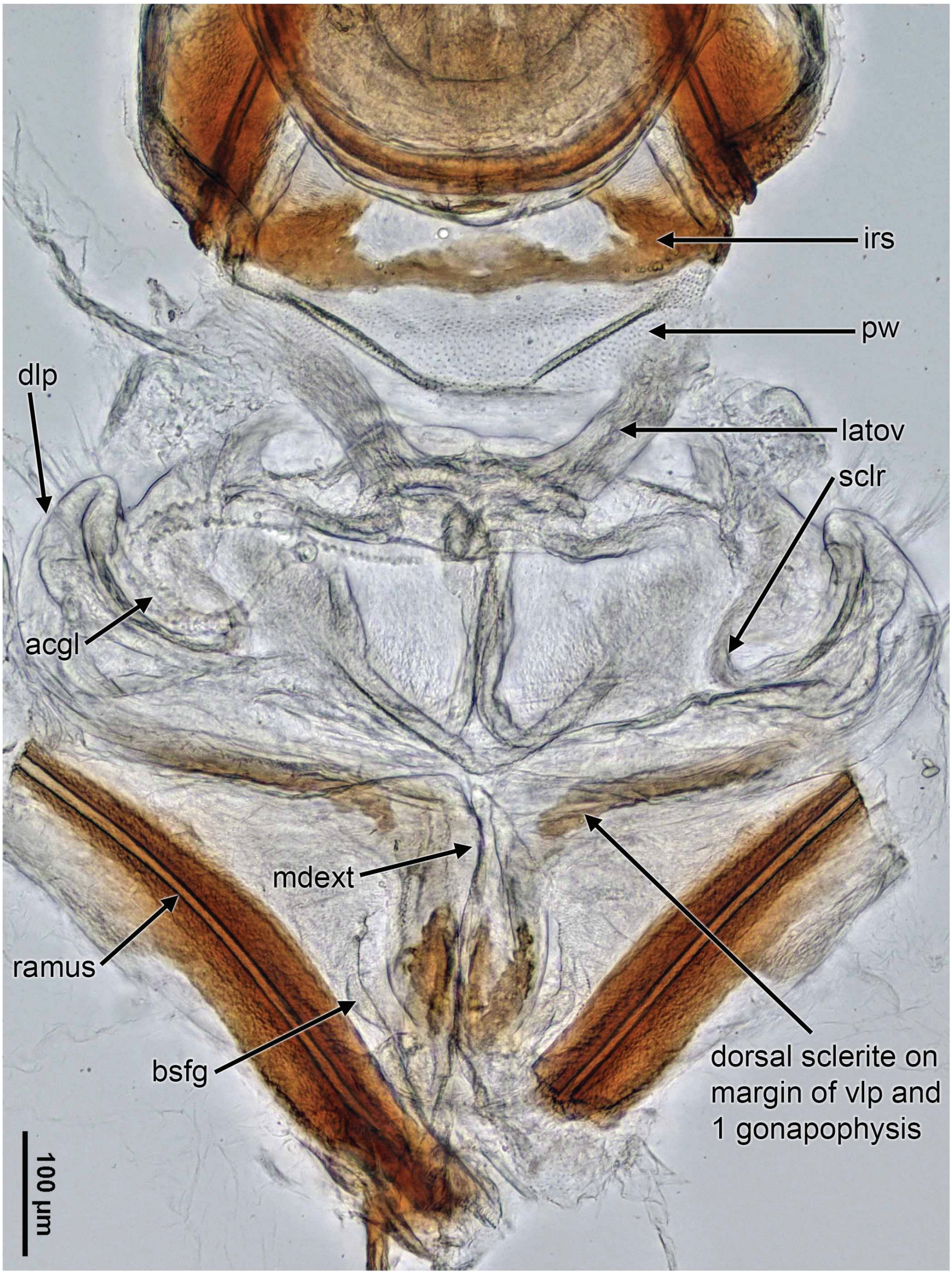

Figure 4. *Macrotylus henryi*, digital female genitalic images (AMNH_PBI 00393199) showing the bursa copulatrix and the bursa copulatix. Abbreviations: **acgl**, accessory gland; **bsfg**, basal sclerite of first gonapophyses; **dlp**, dorsal labiate plate; **irs**, interramal sclerites; **latov**, lateral oviduct; **mdext**, medioventral extension of ventral labiate plate; **mdscl**, medial interramal sclerite; **pw**, posterior wall; **sclr**, sclerotized ring; **vlp**, ventral labiate plate.

00387334, 00387344, 00387347–00387349), 11♀ (00387335–00387341, 00387345, 00387350–00387352) (UNSW). 10.5 km E of Clanwilliam, Cedarberg Range, 32.14699S, 18.94695E, 568 m, 29 Oct 2003, Schuh, Cassis, Weirauch, *Pelargonium radens* H.E. Moore (Geraniaceae), det. K. Roux NYBG VOUCHER, 3♂ (00415069–00415071), 7♀ (00415078–00415084) (AMNH), 1♀ (00415086) (PPRI), 1♀ (00415085) (SAMC). 57.5 km NW of N2 on R327 beyond Herbertsdale, 33.91808S, 21.73641E, 277 m, 06 Nov 2003, Schuh, Cassis, Weirauch, *Pelargonium scabrum* (L.) L'Her. (Geraniaceae), det. K Roux NYBG VOUCHER, 2♂ (00393129, 00393130), 1♀ (00393131) (AMNH). Nieuwoudts Pass, ~30 km N of Citrusdal on road to Algeria, 32.34585S, 18.99948E, 429 m, 27 Oct 2007, Schuh, Cassis, Massie, *Pelargonium scabrum* (L.) L'Her. (Geraniaceae), det. K. Roux NYBG VOUCHER, 9♂ (00393135–00393141, 00393152, 00393153), 6♀ (00393144–00393148, 00393154) (AMNH), 1♂ (00393133), 1♀ (00393150) (PPRI), 1♂ (00393132), 1♀ (00393149) (SAMC), 1♂ (00393134), 1♀ (00393151) (ZISP). Table Mountain National Park, Cape Peninsula, 34.29783S, 18.44473E, 15 m, 29 Oct 2007, Schuh, Cassis, Massie, *Pelargonium cucullatum* (L.) L'Hér. subsp. *tabulare* Volschenk (Geraniaceae), det. K. Roux NYBG VOUCHER, 17♂ (00393175–00393179, 00393185–00393193, 00393203–00393205), 8♀ (00393196–00393202, 00393206) (AMNH), 1♂ (00393182) (CNC), 1♂ (00393181), 1♀ (00393195) (PPRI), 1♂ (00393180), 1♀ (00393194) (SAMC), 4♂ (00387285–00387288), 4♀ (00387289–00387292) (UNSW), 1♂ (00393183) (USNM), 1♂ (00393184) (ZISP). Table Mountain National Park, Cape Peninsula, Circular Drive Viewpoint, 34.31722S, 18.42015E, 95 m, 29 Oct 2007, Schuh, Cassis, Massie, *Pelargonium cucullatum* (L.) L'Hér. subsp. *tabulare* Volschenk (Geraniaceae), det. Field ID, 2♂ (00387315, 00387316) (AM), 4♂ (00387317–00387320), 2♀ (00387321, 00387322) (UNSW). ca 5 km E of de Doorns S of N1, 33.46484S, 19.72046E, 652 m, 31 Oct 2003, Schuh, Cassis, Weirauch, *Pelargonium alternans* Wendl. (Geraniaceae), det. K. Roux NYBG VOUCHER, 1♂ (00414238), 2♀ (00414239, 00414240) (AMNH). ca 25 km E of Clanwilliam, on plains below Pakhuispas, 32.10577S, 19.0575E, 534 m, 29 Oct 2003, Schuh, Cassis, Weirauch, *Pelargonium radens* H.E. Moore (Geraniaceae), det. K. Roux NYBG VOUCHER, 5♂ (00388653–00388656, 00388658), 4♀ (00388659–00388662) (AM), 12♂ (00393086–00393090, 00393110–00393113, 00393117, 00393118, 00415087), 19♀ (00393092–00393104, 00393120–00393125) (AMNH), 2♂ (00393083, 00393115), 2♀ (00393107, 00393127) (CNC), 1♂ (00393082), 1♀ (00393106) (PPRI), 1♂ (00393081), 1♀ (00393105) (SAMC), 2♂ (00393084, 00393116), 2♀ (00393108, 00393128) (USNM), 1♂ (00393085), 2♀ (00393109, 00393126) (ZISP).

Other specimens examined. SOUTH AFRICA: Western Cape: 3.2 km E of Hermanus, 34.40536S, 19.32737E, 33 m, 10 Nov 2003, Schuh, Cassis, Weirauch, *Pelargonium cucullatum* (L.) L'Hér. × *betulinum* L'Hér. ex Aiton (Geraniaceae), det. K. Roux NYBG VOUCHER, 2 nymphs (00393032, 00393033) (AMNH). 5.6 km W of Clanwilliam on Rt 364 to Lambert's Bay, 32.16419S, 18.83542E, 329 m, 28

Figure 5. Digital photographs of living and pressed *Pelargonium* spp that are hosts of *Macrotylus henryi*, from Western Cape, South Africa **A–C** *Pelargonium cucullatum* × *betulinum* (3.2 km E of Hermanus) **D** Randall T. Schuh collecting on *P. cucullatum* × *betulinum* (Koeel Bay, 20 km S of Strand on R44) **E–G** *Pelargonium radens* (10.5 km E of Clanwilliam, Cedarberg Range) **H** Christiane Weirauch collecting (3.2 km E of Hermanus).

Figure 6. Distributions of *Macrotylus henryi* in the Western Cape province of South Africa. Dot size illustrates the relative number of specimens collected in each locality (see Table 2 for details).

Table 2. Host plants and localities of *Macrotylus henryi* in Western Cape, South Africa.

Host taxon	Locality	Insect specs.
GERANIACEAE		
Pelargonium alternans	Western Cape: ca. 5 km E of de Doorns S of N1	4
Pelargonium cucullatum × *betulinum*	Western Cape: 3.2 km E of Hermanus	129
	Western Cape: Koeel Bay, 20 km S of Strand on R44	1
Pelargonium cucullatum subsp. *tabulare*	Western Cape: Table Mountain National Park, Cape Peninsula	62
	Western Cape: Table Mountain National Park, Cape Peninsula, Circular Drive	14
Pelargonium radens	Western Cape: ca. 25 km E of Clanwilliam, on plains below Pakhuispas	60
	Western Cape: 10.5 km E of Clanwilliam, Cedarberg Range	18
Pelargonium scabrum	Western Cape: 5.6 km W of Clanwilliam on Rt 364 to Lambert's Bay	45
	Western Cape: Nieuwoudts Pass, ~30 km N of Citrusdal on road to Algeria	23
	Western Cape: 57.5 km NW of N2 on R327 beyond Herbertsdale	3
Unknown	Western Cape: Farm Dwars rivier, Cedarberg	1
TOTAL		**360**

Oct 2007, Schuh, Cassis, Massie, *Pelargonium scabrum* (L.) L'Her. (Geraniaceae), det. Field ID, 4 nymphs (00393165, 00393166, 00393172, 00393173) (AMNH), 4 nymphs (00387342, 00387343, 00387346, 00387353) (UNSW). 10.5 km E of Clanwilliam, Cedarberg Range, 32.14699S, 18.94695E, 568 m, 29 Oct 2003, Schuh, Cassis, Weirauch, *Pelargonium radens* H.E. Moore (Geraniaceae), det. K. Roux NYBG VOUCHER, 6 nymps (00415072–00415077) (AMNH). Farm Dwarsrivier, Cedarberg, 32.48333S, 19.26667E, 10 Oct 2002–15 Oct 2002, D. Jacobs and M. Stillar, 1♂ (00415088) (AMNH). Koeel Bay, 20 km S of Strand on R44, 34.25187S, 18.85597E, 5 m, 11 Nov 2003, Schuh, Cassis, Weirauch, *Pelargonium cucullatum* (L.) L'Hér. *betulinum* L'Hér. ex Aiton (Geraniaceae), det. K. Roux NYBG VOUCHER, 1♀ (00393080) (AMNH). Nieuwoudts Pass, ~30 km N of Citrusdal on road to Algeria, 32.34585S, 18.99948E, 429 m, 27 Oct 2007, Schuh, Cassis, Massie, *Pelargonium scabrum* (L.) L'Her. (Geraniaceae), det. K. Roux NYBG VOUCHER, 2 nymphs (00393142, 00393143) (AMNH). Table Mountain National Park, Cape Peninsula, 34.29783S, 18.44473E, 15 m, 29 Oct 2007, Schuh, Cassis, Massie, *Pelargonium cucullatum* (L.) L'Hér. subsp. *tabulare* Volschenk (Geraniaceae), det. K. Roux NYBG VOUCHER, 22 nymphs (00387293–00387314) (UNSW). Table Mountain National Park, Cape Peninsula, Circular Drive Viewpoint, 34.31722S, 18.42015E, 95 m, 29 Oct 2007, Schuh, Cassis, Massie, *Pelargonium cucullatum* (L.) L'Hér. subsp. *tabulare* Volschenk (Geraniaceae), det. Field ID, 6 nymphs (00387323–00387328) (UNSW). ca 5 km E of de Doorns S of N1, 33.46484S, 19.72046E, 652 m, 31 Oct 2003, Schuh, Cassis, Weirauch, *Pelargonium alternans* Wendl. (Geraniaceae), det. K. Roux NYBG VOUCHER, 1 nymph (00414241) (AMNH). ca 25 km E of Clanwilliam, on plains below Pakhuispas, 32.10577S, 19.0575E, 534 m, 29 Oct 2003, Schuh, Cassis, Weirauch, *Pelargonium radens* H.E. Moore (Geraniaceae), det. K. Roux NYBG VOUCHER, 2 nymphs (00388657, 00388663) (AM), 3 nymphs (00393091, 00393114, 00393119) (AMNH).

Discussion

The structure of the male genitalia shows essentially no variation across the range of specimens we include in *M. henryi*; we therefore treat all specimens under a single species in spite of the substantial variation in color and size. The endosoma is similar to that seen in many species of *Macrotylus* from the Northern Hemisphere, as well as the Cremnorrhinina more broadly, including particularly the genera *Halophylus* Schuh and Schwartz and *Pulvillophylus* Schuh and Schwartz from Australia.

Among members of the South African Phylinae, the habit of feeding on Geraniaceae is not shared with any other species, although species of Dicyphini are frequently encountered on that plant group. Schuh (1974) reported only one host plant, *Hemizygia thorncroftii* (Lamiaceae), for *Macrotylus* in South Africa. We now have documented that species of South African *Macrotylus* also feed on Geraniaceae, and that *Macrotylus henryi* feeds on five taxa of *Pelargonium* (Table 2, Fig. 5). The data also indicate that *M. henryi* shows at least generic-level host specificity.

Most species of *Macrotylus* from the Northern Hemisphere have been reported to feed on Lamiaceae, with some taxa on Rosaceae and Asteraceae (Schuh 2002–2013). The Palearctic *Macrotylus cruciatus* (Sahlberg) is the only other species of this genus that has been reported to be associated with Geraniaceae (Kerzhner 1973), but it feeds on *Geranium* L., which has worldwide distribution, whereas *Pelargonium* is native to southern Africa and Australia (van der Walt and Vorster 1983). No Cremnorrhinina known from Australia have been recorded from *Pelargonium* or from the Geraniaceae more broadly (see Schuh and Schwartz 2016).

In the Balkan Peninsula, *Cremnorrhinus basalis* Reuter is strictly associated with ephemeral *Geranium rotundifolium* L. (Josifov and Simov 2006) and *G. molle* L. (Simov pers. comm.), adding an additional association with Geraniaceae for the Cremnorrhinini. Schuh and Schwartz (2016) were unaware of these host associations as documented by Josifov and Simov.

Macrotylus henryi seems to be restricted geographically to the Western Cape (Fig. 6, Table 2). This pattern could be explained by its possible host specificity, and by the distribution of its host plant, *Pelargonium*. Nearly 90% of *Pelargonium* spp. are restricted to southern Africa, including the Republic of South Africa and adjacent parts of Namibia, with the highest species diversity found in the south-western part of South Africa (van der Walt and Vorster 1983). Nonetheless, some details of the distribution of *M. henryi* may be obscured by the specialized geographic focus of our own collecting efforts.

The distribution of *M. henryi* is similar to that seen in the well-collected *Pseudosthenarus ater* Poppius and *P. brendae* Schuh and Salas (Schuh and Salas 2011).

With regard to the distribution of *Macrotylus* more broadly, there appears to be a broad disjunction on the African continent between the larger and much better known Palearctic fauna and the *Macrotylus* species from southern Africa.

Acknowledgements

Fieldwork for this project was supported by a National Science Foundation (NSF) Planetary Biodiversity Inventories award (DEB-0316495) to Randall T. Schuh and Gerasimos Cassis for the study of the Miridae subfamilies Orthotylinae and Phylinae. We thank Timothy Crowe, Chris Tobler, and Mike Picker of the University of Cape Town, Gerhard Prinsloo, Plant Protection Research Institute, Pretoria, and Lorenzo Prendini, American Museum of Natural History for logistical assistance in the conduct of field work in South Africa. We also thank the relevant authorities in the Western Cape Province for the issuance of collecting permits. Host plants were identified by the staff at the Compton Herbarium, Kirstenbosch Gardens, Cape Town, South Africa. We especially thank Edwina Marinus for her assistance in coordinating the acquisition of these data, and Koos Roux for the actual identifications. We thank Stephen Thurston, American Museum of Natural History, for assembling the figures in digital form for publication; he also prepared the digital rendering of the male genitalic illustrations and some of the habitus photos. Michael D. Schwartz, Canadian National Insect Collection, dissected the female genitalia and made the digital images. Many thanks to the editor Alfred G. Wheeler Jr., Clemson University, and reviewer Fedor V. Konstantinov, St. Petersburg State University, for their comments and suggestions on the manuscript.

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RESEARCH ARTICLE

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Henryognathus thomasi, a new genus and new species of *Arctostaphylos*-feeding plant bug from western North America (Miridae, Phylinae, Phylini)

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Abstract

Henryognathus, new genus, with the single included new species *H. thomasi*, is described from western North America. The taxon is recorded as feeding on species of *Arctostaphylos* (Ericaceae) in California and Arizona. Coloration and many morphological attributes are similar to species of *Plagiognathus* Fieber, but the structure of the male genitalia is distinctive.

Keywords

Arizona, California, Ericaceae, host plant, Oncotylina

Introduction

Among the North American members of the subtribe Phylini: Oncotylina (Schuh and Menard 2013, Menard et al. 2014), the genus *Plagiognathus* Fieber is the most speciose, while having structurally rather homogeneous male genitalia and great similarity in many somatic features. Certain other taxa, however, are somatically similar to *Plagiognathus*, but possess distinctive male genitalia, including *Americodema* Henry, *Occidentodema* Henry, and *Lineatopsallus* Henry. In the present paper we describe an additional new taxon, *Henryognathus thomasi*, whose male genitalia are also distinct from the nearly 100 North American species placed in *Plagiognathus* by Schuh (2001), but which we also place in the Oncotylina.

Dedication

This paper, and the new taxa described in it, are dedicated to Thomas J. Henry in recognition of his contributions to our knowledge of Miridae and Lygaeoidea. Through a combination of extensive fieldwork, coupled with faunistic, revisionary, and phylogenetic studies, Tom has advanced our understanding of true bug taxonomy and host associations. On behalf of all heteropterists who have had occasion to use the collections of the United States National Museum of Natural History, we recognize the contributions Tom has made to the organization, presentation, and content of the collections of that institution, bringing to light its status as one of the world's truly great resources for the study of true bugs.

Materials and methods

In total, 338 specimens were examined during the present study. "Unique specimen identifiers" (USIs), composed of an institution and project code (AMNH_PBI) and a unique number (00414919), were affixed to each specimen. Specimen data can be viewed on line through: research.amnh.org/pbi/heteropteraspeciespage/, discoverlife.org, and idigbio.org/portal. Measurements were prepared using a digital micrometer attached to a movable stage, the data being recorded directly to a spreadsheet; all measurements are in millimeters. Habitus images were prepared using a Microptics-USA/Visionary Digital photomicrographic system as developed by Roy Larimer; multiple layers were stacked using Helicon Focus software. Illustrations of the male genitalia were prepared as pencil drawings by using a Nikon Eclipse 80i microscope, then scanned and rendered using Adobe Illustrator.

The following institutional acronyms are used in the specimens examined section for specimen deposition:

CNC	Canadian National Collection of Insects, Ottawa
KU	Snow Entomological Museum, University of Kansas, Lawrence
UCB	Essig Entomological Museum, University of California, Berkeley
UCD	Bohart Entomological Museum, University of California, Davis
UCR	University of California Entomological Research Museum, Riverside
USNM	United States National Museum of Natural History, Washington, DC
ZISP	Zoological Institute, Russian Academy of Sciences, St. Petersburg

Taxonomy

***Henryognathus*, gen. n.**

http://zoobank.org/9A9F24C3-2E13-4225-9BBE-51862158DF78

Type species. *Henryognathus thomasi*, new species.

Diagnosis. Recognized by the elongate ovoid body, the moderately prognathous head, the pale tibiae with contrasting dark spots at the bases of the dark spines (Fig. 1A, B), the tarsal claws of moderate length, broad at base, bent medially, with a small, flaplike pulvillus just proximad of bend in claw, and the structure of the male genitalia, with elongate, slender, curving apical endosomal spines, the ventral spine conspicuously bifurcating at a point significantly proximal to the secondary gonopore (Fig. 2A). Body form, head shape, and tibial coloration similar to most *Plagiognathus* species, but proximal bifurcation of "ventral" strap of endosoma unlike the condition seen in *Plagiognathus*, as are the longer, more slender, curving apical spines (Schuh 2001: figs 20–33).

Description. Size moderate (Table 1). COLORATION (Fig. 1A, B): Pale in known species.

Surface and vestiture: Dorsum weakly granular, smooth, weakly shining. Vestiture of dorsum composed of reclining pale, golden-shining, simple setae.

Structure: Hemelytra sloping laterally, corial margins very weakly convex; frons tumid, clypeus visible from above. Tarsal claws similar to those in *Plagiognathus* (Schuh, 2001: figs 37C, 38D), of moderate length, broad at base, bent medially, with a small, flaplike pulvillus just proximad of bend in claw.

Genitalia (Fig. 2): Endosoma strongly twisted and bent medially, basal portion of moderate and uniform width; apical spines long, slender; ventral spine conspicuously bifurcating at a point significantly proximal to the secondary gonopore; endosoma with a broad rectangular flange proximal to secondary gonopore; secondary gonopore moderately large and strongly sclerotized, with a projecting sclerite proximally.

Phallotheca: L-shaped, with a broad posterolateral opening on distal portion. Left paramere short, anterior process with a strong subapical seta; right paramere elongate, parallel sided over most of length, with a fingerlike apex.

Female: Very similar in shape and proportions to male (Fig. 1B). Coloration as in male. Female genitalia: Not examined.

Etymology. A combination of Henry (Thomas J. Henry) and -gnathus, from the Greek gnathos, jaw, in reference to the similarity with species of *Plagiognathus*.

Discussion. *Henryognathus* falls within the diagnosis of *Plagiognathus* Fieber, as rendered by Schuh (2001), with the exception of the structure of the male genitalia.

Henryognathus thomasi **sp. n.**

http://zoobank.org/1B8709C8-6708-4951-B2F2-E621FD40789F
Figures 1, 2, Table 1

Diagnosis. Recognized by the moderate size, pale, yellow to yellow-orange coloration in preserved specimens (Fig. 1A, B.), the antennae black in male except segment 1 pale on basal half and with pale apical annulus (Fig. 1A, B), sometimes with central 2/3 of segment 2 pale; and by the structure of the male genitalia (Fig. 2). Among North American taxa most easily confused with species of *Americodema* and *Occidentodema* based on pale coloration and head shape, but lacking the black stripe on

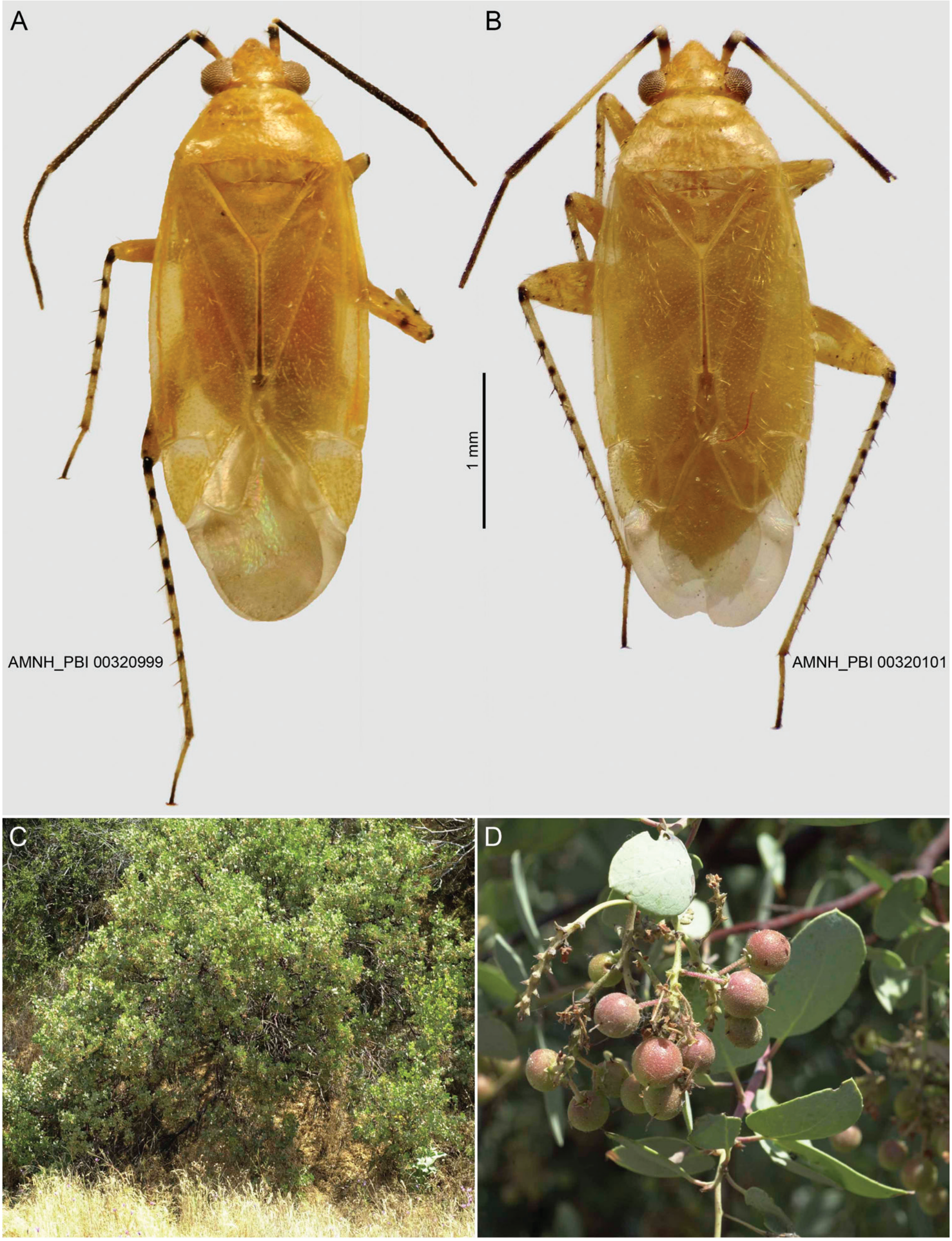

Figure 1. Habitus and hosts of *Henryognathus thomasi*. **A** Male **B** Female **C–D** *Arctostaphylos viscida*, California: Tulare Co.: NE of Springville on Bear Creek Rd near Scicon, 36.21394°N, 118.7716°W.

the dorsal surface of metafemur as found in those taxa, and pale *Plagiognathus* species (e.g., *P. luteus* Knight), but easily distinguished by its longer, slender, curving apical spines on endosoma, as opposed to the bladelike apical spines in *Plagiognathus* (Schuh 2001: figs 20–33).

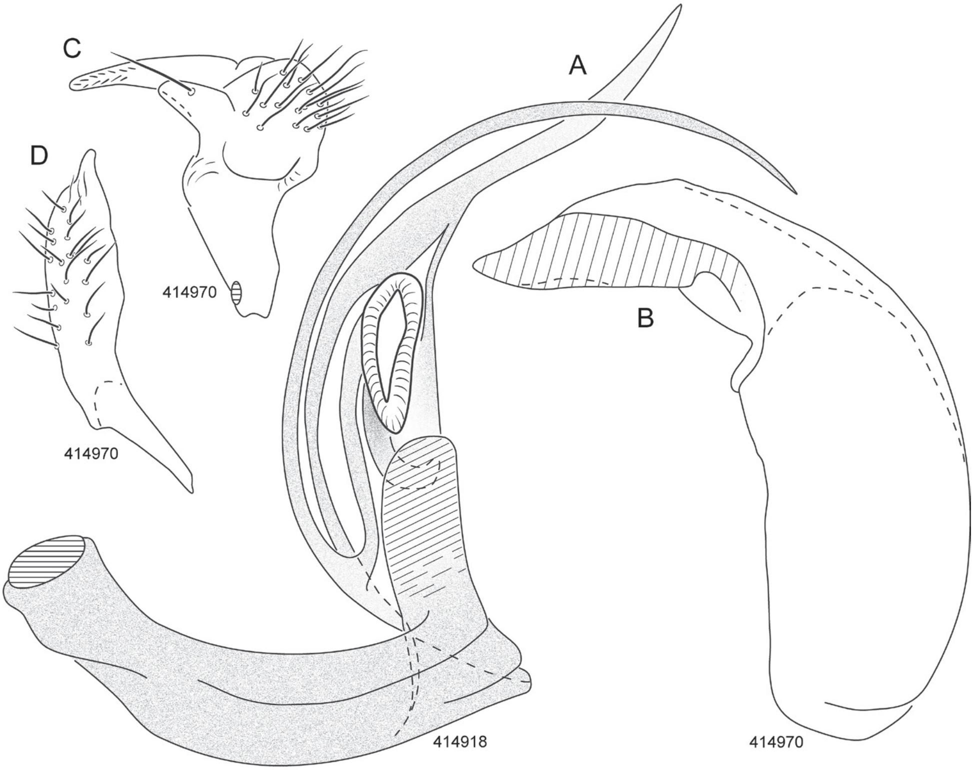

Figure 2. Male genitalia, *Henryognathus thomasi*. **A** Endosoma **B** Phallotheca **C** Left paramere **D** Right paramere.

Description. ***Male***: Very elongate ovoid, of moderate size; mean total length 3.73, mean length apex clypeus-cuneal fracture 2.56, mean width across pronotum 1.04 (Table 1).

Coloration (Fig. 1A, B): General coloration pale, yellowish or yellow orange, translucent; membrane pale, veins of cells white; antennal segment 1 pale on basal two-thirds, nearly black on distal third with a pale apical annulus with subapical black spine on interior surface, remaining antennal segments entirely black, or segment 2 sometimes pale medially; labium infuscate at apex; legs generally pale, hind femur with weak dark spots distally; tibiae with dark spines on dorsal surface at bases of black spines, hind femur black at femoral articulation.

Surface and vestiture (Fig. 1A, B): Dorsum weakly granular, smooth, weakly shining. Vestiture of dorsum with reclining pale, golden-shining, simple setae.

Structure: Hemelytra sloping laterally, corial margins very weakly convex; frons tumid, clypeus visible from above; head projecting below eye by diameter of antennal segment 1; labium reaching to at least posterior margin of abdominal sternum 4. Tarsal claws as in generic description.

Genitalia (Fig. 2): In addition to attributes in generic description, ventral spine smoothly curving over an arc of nearly 180 degrees, dorsal spine bent but not uniformly curving. Phallotheca L-shaped, with a broad posterolateral opening on distal

Table 1. Measurements of *Henryognathus thomasi*.

Species		Length						Width				
		Body	CunClyp	Head	Pron	Scut	Cun	Head	Pron	Scut	InterOc	AntSeg2
♂ (N = 12)	**Mean**	**3.73**	**2.56**	**0.30**	**0.45**	**0.45**	**0.55**	**0.73**	**1.04**	**0.53**	**0.34**	**1.27**
	SD	0.23	0.16	0.04	0.03	0.03	0.03	0.02	0.05	0.04	0.01	0.09
	Range	0.83	0.56	0.13	0.11	0.11	0.11	0.09	0.18	0.12	0.03	0.27
	Min	3.41	2.34	0.23	0.41	0.41	0.51	0.68	0.95	0.48	0.32	1.15
	Max	4.24	2.90	0.36	0.52	0.52	0.62	0.76	1.13	0.60	0.36	1.41
♀ (N = 6)	**Mean**	**3.93**	**2.77**	**0.39**	**0.51**	**0.48**	**0.51**	**0.75**	**1.11**	**0.57**	**0.38**	**1.28**
	SD	0.09	0.07	0.03	0.03	0.02	0.02	0.02	0.05	0.03	0.02	0.09
	Range	0.21	0.17	0.08	0.08	0.06	0.05	0.04	0.14	0.06	0.04	0.25
	Min	3.83	2.66	0.35	0.47	0.45	0.49	0.73	1.05	0.54	0.36	1.16
	Max	4.04	2.84	0.43	0.55	0.51	0.54	0.77	1.19	0.60	0.41	1.41

portion. Left paramere short, anterior process with a strong subapical seta. Right paramere elongate, parallel sided over most of length, with a fingerlike apex.

Female: Very similar in shape and proportions to male. Mean total length 3.93, mean length apex clypeus-cuneal fracture 2.77, mean width across pronotum 1.11 (Table 1). Coloration as in male (Fig. 1A, B). Female genitalia: Not examined.

Etymology. Named for Thomas J. Henry.

Hosts. *Arctostaphylos pungens* Kunth, *A. viscida* Parry (fig. 1C, D), and *A.* sp. (Ericaceae). We regard the very few specimens labeled as occurring on *Mimosa biuncifera* Benth. (Fabaceae), *Quercus turbinella* Greene (Fagaceae), and *Rhamnus californica* Eschsch. (Rhamnaceae) to represent either sitting records or the result of commingling of specimens in the field. A total of 54 specimens was collected at light or host information was not recorded by the collector.

The habit of feeding on *Arctostaphylos* is shared with other Phylinae such as *Arctostaphylocoris arizonensis* Schuh and Schwartz, *A. manzanitae* (Knight), *Atractotomus schwartzi* Stonedahl, four species of *Ceratopsallus* Schuh (Schuh 2006), the two known species of the orthotyline genus *Melymacra* Schwartz, four species of the mirine genus *Phytocoris* Hahn, and the dicyphine *Tupiocoris killamae* Schwartz and Scudder. In all of these cases the distribution of the bugs on their hosts can be extremely patchy.

Distribution (Fig. 3): Known from Gila, Graham, Mohave, and Pima counties in Arizona and from Los Angeles, Kern, Mariposa, Riverside, Sonoma, and Tulare counties in California.

HOLOTYPE: **USA: California: Tulare Co.**: NE of Springville on Bear Creek Rd near Scicon, 36.21394°N, 118.7716°W, 700 m, 23 May 2004, R.T. Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Arctostaphylos viscida* Parry (Ericaceae), det. A. Sanders UCR140624, 1♂ (AMNH_PBI 00321005) (AMNH).

PARATYPES: **USA: Arizona: Gila Co.**: 8 mi SW jct Rts 87 and 188 (off Rt 87), Tonto National Forest, 33.55989°N, 111.21341°W, 1219 m, 27 May 1983 - 28 May 1983, R. T. Schuh and G. M. Stonedahl, 1♂ (AMNH_PBI 00414940) *Arctostaphylos pungens* Kunth (Ericaceae), 3♂ (00414935-00414937), 2♀

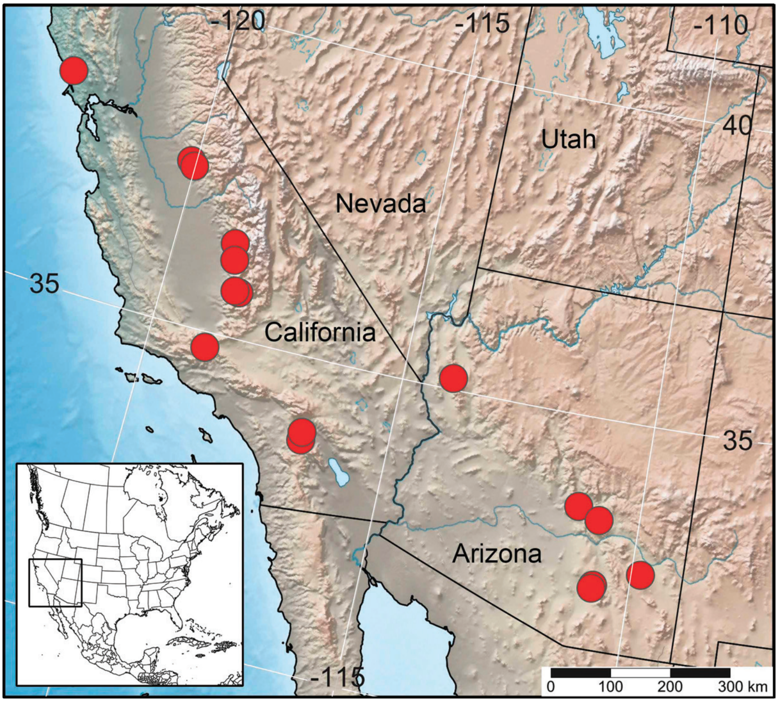

Figure 3. Distribution of *Henryognathus thomasi* in the American southwest.

(00414938, 00414939) (AMNH). Old CCC Campground S of Globe on Pioneer Pass Rd, 33.39417°N, 110.78583°W, 1433 m, 30 May 1983 - 31 May 1983, R.T. Schuh, G.M. Stonedahl and B.M. Massie, 21♂ (00414898-00414918), 10♀ (00414925-00414934) (AMNH), 1♂ (00414892), 1♀ (00414919) (CAS), 1♂ (00414893), 1♀ (00414920) (CNC), 1♂ (00414894), 1♀ (00414921) (UCB), 1♂ (00414895), 1♀ (00414922) (UCR), 1♂ (00414896), 1♀ (00414923) (USNM), 1♂ (00414897), 1♀ (00414924) (ZISP). **Graham Co.:** Pinaleno Mountains, Stockton Pass, 32.64083°N, 109.84306°W, 1631 m, 01 Jun 1983 - 02 Jun 1983, R. T. Schuh and G. M. Stonedahl, 1♀ (00414944) (AMNH). **Mohave Co.:** Hualapai Mountains, SE of Kingman, T20N R15W, 35.18944°N, 114.05222°W, 1585 m, 09 Jun 1983 - 10 Jun 1983, R. T. Schuh, M. D. Schwartz, G. M. Stonedahl, *Quercus turbinella* Greene (Fagaceae), 1♀ (00414943) (AMNH). **Pima Co.:** 4 mi N of Coronado Natl. Forest boundary on Mount Lemmon Rd, 32.36°N, 110.7°W, 1219 m, 11 Jun 1983, R.T. Schuh, Schwartz, and Stonedahl, *Mimosa biuncifera* Benth. (Fabaceae), 1♂ (00414942) (AMNH). 7.5 mi S of Coronado Natl. Forest boundary on Mount Lemmon Rd, 32.31°N, 110.72°W, 1433 m, 11 Jun 1983, R.T. Schuh, Schwartz, and Stonedahl, 1♂ (00414941) (AMNH). **California: Kern Co.:** 7 km W of Wofford Heights on Rt 155, 35.725°N, 118.52555°W, 1520 m, 26 Jul 1999, M.D. Schwartz, *Arctostaphylos* sp. (Ericaceae), 5♂ (00414945-00414949), 10♀ (00414956-00414965) (AMNH), 1♂

(00414950), 1♀ (00414953) (CNC), 1♂ (00414951), 1♀ (00414954) (UCR), 1♂ (00414952), 1♀ (00414955) (USNM). Cedar Creek Campground on Rt 115, 35.73726°N, 118.61183°W, 1500 m, 26 Jul 1999, M.D. Schwartz, *Arctostaphylos* sp. (Ericaceae), 5♂ (00414966-00414970), 4♀ (00414971-00414974) (AMNH). **Los Angeles Co.:** Tanbark Flats, 33.69111°N, 116.67056°W, 25 Jun 1952, A. A. Grigarick, 1♂ (00125674) (UCD). **Mariposa Co.:** NW of Mariposa off Rt 140 on Bear Valley Rd, 37.57111°N, 120.13243°W, 663 m, 25 May 2004, R.T. Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Arctostaphylos viscida* Parry (Ericaceae), det. A. Sanders UCR140623, 3♂ (00321062-00321064), 1♀ (00321065), 2♂ (00321066, 00321067), 2♀ (00321068, 00321069) (AMNH). W of Mariposa near Mt. Bullion, 37.49936°N, 120.0435°W, 675 m, 25 May 2004, R.T. Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Arctostaphylos viscida* Parry (Ericaceae), det. Field ID, 88♂ (00320031- 00320093, 00414993-00415017), 41♀ (00320094-00320103, 00415036-00415065, 00415067) (AMNH), 3♂ (00414975-00414977), 3♀ (00415018-00415020) (CAS), 3♂ (00414978-00414980), 3♀ (00415021-00415023) (CNC), 3♂ (00414981-00414983), 3♀ (00415024-00415026) (UCB), 3♂ (00414984-00414986), 3♀ (00415027-00415029) (UCR), 3♂ (00414987-00414989), 3♀ (00415030-00415032) (USNM), 3♂ (00414990- 00414992), 3♀ (00415033-00415035) (ZISP). **Riverside Co.:** San Jacinto Mountains, 33.81446°N, 116.67918°W, 21 Jul 1929, R. H. Beamer, 2♂ (00292384, 00292385) (KU). San Jacinto Mountains, Pinon Flat, 34.74417°N, 118.89722°W, 28 May 1940, C. D. Michener, *Arctostaphylos* sp. (Ericaceae), 2♂ (00081128, 00081132) (AMNH), 3♂ (00081129-00081131) (UCB). **Sonoma Co.:** Occidental, 38.4075°N, 122.94722°W, 16 Aug 1938, R. I. Sailer, 1♂ (00292386) (KU). **Tulare Co.:** Mineral King Rd E of Three Rivers, 36.47356°N, 118.8465°W, 492 m, 24 May 2004, R.T. Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Arctostaphylos viscida* Parry (Ericaceae), det. Field ID, 1♂ (00321049), 12♀ (00321050-00321061) (AMNH). NE of Springville on Bear Creek Rd near Scicon, 36.21394°N, 118.7716°W, 700 m, 23 May 2004, R.T. Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Arctostaphylos viscida* Parry (Ericaceae), det. A. Sanders UCR140624, 11♂ (00320996-00321004, 00321006, 00321007), 29♀ (00321014-00321042) *Rhamnus californica* Eschsch. (Rhamnaceae), det. A. Sanders UCR140642, 2♂ (00321043, 00321044), 4♀ (00321045-00321048) (AMNH), *Arctostaphylos viscida* Parry (Ericaceae), det. A. Sanders UCR140624, 1♂ (00320990), 1♀ (00321008) (CAS), 1♂ (00320991), 1♀ (00321009) (CNC), 1♂ (00320992), 1♀ (00321010) (UCB), 1♂ (00320993), 1♀ (00321011) (UCR), 1♂ (00320994), 1♀ (00321012) (USNM), 1♂ (00320995), 1♀ (00321013) (ZISP).

Other specimens examined. USA: California: Mariposa Co.: W of Mariposa near Mt. Bullion, 37.49936°N, 120.0435°W, 675 m, 25 May 2004, R.T. Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Arctostaphylos viscida* Parry (Ericaceae), det. Field ID, 1 nymph (00415068) (AMNH).

Discussion

See diagnosis.

Acknowledgements

Our thanks to Steve Thurston, American Museum of Natural History, for preparing the digital specimens images and digitizing the male genitalic figures and Michael D. Schwartz, Canadian National Insect Collection, Ottawa, for preparing the distribution map. We thank the following curators and their respective institutions for the loan of specimens examined during the course of this project: Canadian National Collection of Insects (Ottawa), Zachary Falin (Snow Entomological Museum, University of Kansas), Cheryl Barr (Essig Entomological Museum, University of California, Berkeley), Steve Heydon (Bohart Entomological Museum, University of California, Davis), University of California Entomological Research Museum (Riverside), United States National Museum of Natural History (Washington, DC), and Zoological Institute, Russian Academy of Sciences (St. Petersburg).

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A new species of *Zetekella* Drake from Ecuador with comments on *Zetekella* and *Minitingis* Barber (Heteroptera, Tingidae)

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Abstract

Zetekella and *Minitingis* (Heteroptera, Tingidae) are morphologically similar genera, each comprising two species. The latter was already considered a junior synonym of the former, but was revalidated on the basis of the number of cephalic spines, projections on the paranotal edge, length of the rostrum, presence of an abdominal groove and distributional pattern. Here, a new species of *Zetekella* is described from Ecuador, the diagnoses for both genera reassessed, new records for *Z. pulla* and *Z. zeteki* reported, and a key to the species of both genera provided.

Keywords

Zetekella Drake, Heteroptera, Tingidae, Ecuador, *Minitingis* Barber

Introduction

Zetekella Drake is composed of two species, *Z. zeteki* Drake, 1944 and *Z. pulla* Drake & Plaumann, 1956. After *Z. pulla* was described, the generic diagnosis was redefined, as follows: head moderately long to long, armed with five spines, bucculae open in front and slightly projected forward, and "rostrum extremely long, extending on venter" (Drake and Plaumann 1956). No macropterous forms are known for this genus, but other characters, such as the proportions of the antennal segments, often have been used in taxonomic studies of the Tingidae (excluding Vianadinae).

Zetekella was considered the senior synonym of *Minitingis* Barber by Drake and Ruhoff (1960) without further consideration of morphological characters or generic diagnoses. This genus was originally proposed to hold *Minitingis minusculus* Barber, 1954 on the basis of the number of pronotal carinae and the lateral acute processes of the paranota. However, the genus was compared with *Phatnoma*, rather than *Zetekella*, and the remarkable paranotal acute processes were found to vary by the same author (Barber 1954). Froeschner (1968) reinstated *Minitingis*, described a new species of the genus, and reaffirmed the generic status based on morphological characters and distributional patterns. According to Froeschner (1968), *Minitingis* could be distinguished by the presence of seven cephalic spines, the occipital pair being short and obliquely elevated, and the rostrum reaching the second abdominal segment. The paranotal development and the abdominal groove were also mentioned as diagnostic features of the genus (Froeschner 1968). Both *M. minusculus* and *M. elsae* Froeschner, 1968 are from the West Indies, whereas the known species of *Zetekella* are from Panama and Brazil. This distribution represents different zoogeographical zones and, therefore, corroborates the hypothesis of two genera (Froeschner 1968).

In this paper, we describe a new species of *Zetekella* from Ecuador, report two new records for *Z. pulla* and a new country record for *Z. zeteki*, and re-evaluate the diagnostic characters of both genera.

Material and methods

Material studied

The specimen here described was collected in a Berlese trap and had its abdomen removed for DNA extraction. The fixation method of the specimen is unknown, and it was preserved in 75% alcohol before the abdomen was removed and the specimen mounted. The specimen was point-mounted on the left side instead of the right side, to preserve two of its legs that accidentally had come in contact with the glue during the mounting process.

Holotypes of all species (except *M. minusculus*) were studied. For *M. minusculus*, a six-specimen series of paratypes was analyzed. All type material was examined at the National Museum of Natural History (**USNM**), in Washington, D.C., USA. Fifteen specimens of *Z. pulla* from the Museu de Zoologia da Universidade de São Paulo, Brazil, were also studied. The remaining specimens are housed in the first author's personal collection.

Species descriptions

Measurements of the holotype were taken from photos using ImageJ and are given in millimeters. Terminology follows the specialized literature (Drake and Davis 1960, Drake and Ruhoff 1965). The taxonomic act here treated was registered in Zoobank (Pyle and Michel 2008).

Images

Photos were taken with a camera attached to a stereoscope and treated in GIMP. Plates were composed in Inkscape. The holotype photos of *Z. pulla*, *Z. zeteki,* and *M. minusculus* were kindly provided by Thomas Henry. Dorsal habitus and labels of the holotypes, voucher specimens for the new records, the two paratypes, and lateral and ventral views of the holotype of the new species were photographed and made available at Figshare.

Keys

The keys to *Minitingis* and *Zetekella* species provided by Froeschner (1996) were merged, adapted and updated to include new species and new findings.

Occurrence data

Geographic coordinates, when not available on the specimen labels, were obtained using Google Earth. The map was built using SimpleMappr (Shorthouse 2010). This map includes a layer with the Biodiversity Hotspots (sensu Conservation International; Mittermeier et al. 2004). Additionally, a spreadsheet containing occurrence data extracted from specimen labels was made available at Zenodo; the spreadsheet is organized by specimens and their unique identifiers, when available.

Results

Zetekella henryi sp. n.

http://zoobank.org/733C8787-B04D-431F-B440-2EC04C13247B
Figs 1a, 2a

Material examined. Holotype: ECUADOR, Orellana: Yasuni Research Station, 228m, 0.67°S, 76.40°W; 1–5 Dec 2009, D. Forero, EC09_L5, Berlese. MGPhD-E369. Male, Brachypterous.

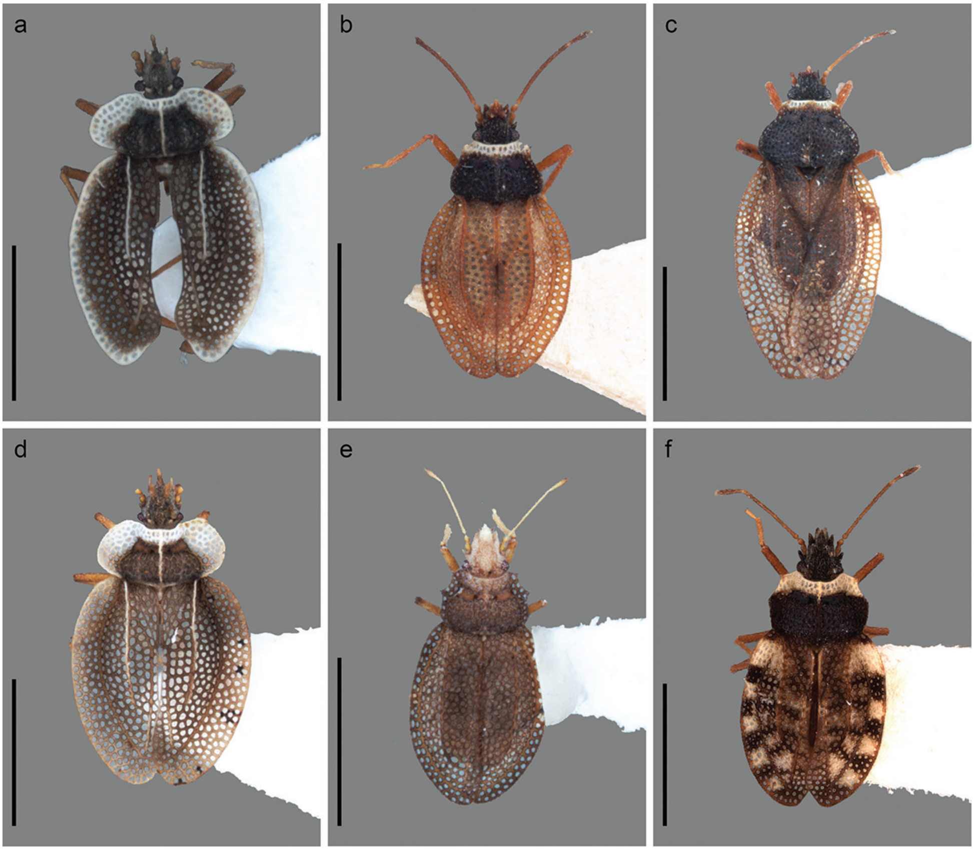

Figure 1. Dorsal habitus of *Zetekella* and *Minitingis* species. **a** *Zetekella henryi* sp. n. **b** *Z. pulla*, brachypterous specimen **c** *Z. pulla*, macropterous specimen **d** *Z. zeteki* **e** *Minitingis minusculus* **f** *Minitingis elsae*. Scale bar: 1 mm.

Diagnosis. Body dark brown to blackish; cephalic spines long and thin; anterior edge of paranota not reaching the eyes; discoidal area biseriate and subcostal area irregularly quadriseriate.

Description. *Body* oval; mostly dark brown, or blackish; collar, paranota, and lateral edge of costal area and hemelytral membrane white; tip of cephalic spines, scape and pedicel light brown (basi- and distiflagellomere missing); occipital spines lighter in color.

Head with numerous, small, curved hairs and seven spines: clypeal pair non-erect; jugal spine slightly erect; frontal pair divergent; occipital pair short, strongly divergent; frontal and occipital pairs erect. Antenniferous processes spine-like, projected forward, subequal to scape in size. Scape slightly longer than pedicel, basi- and distiflagellomere missing. Interocular distance almost three times width of eye. Rostrum light brown, surpassing posterior margin of metanotum. Bucculae white, areolate; open in front, with an acutely projected antero-inferior edge; widely open posteriorly, width same as anterior region.

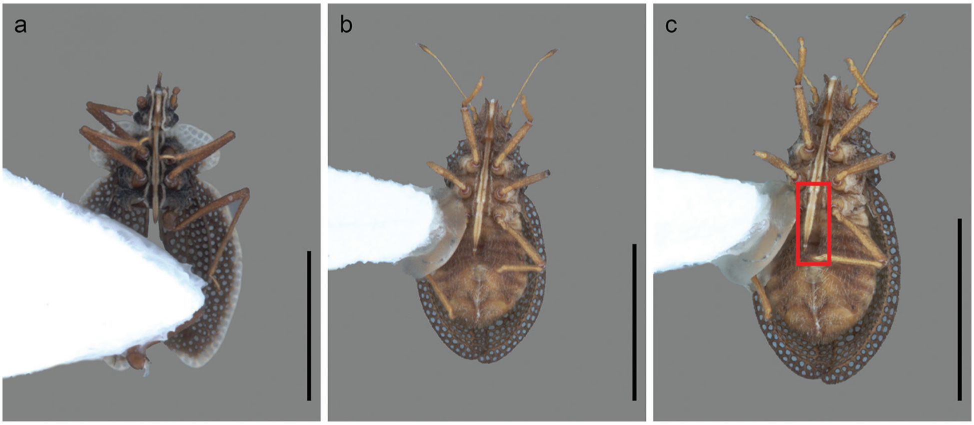

Figure 2. Rostral reach of *Zetekella* and *Minitingis* species. **a** *Z. henryi* sp. n. **b** *M. minusculus* **c** *M. minusculus* abdominal groove highlighted with a red square. Scale bar: 1 mm.

Pronotum mostly flat, posterior projection absent, leaving small portion of scutellum exposed. Median carinae whitish, uniseriate, composed of small cells, extending throughout pronotum. Collar biseriate and slightly elevated. Paranota slightly reflexed, broad, with four cells at widest part; anterior edge not reaching eyes. Sternal membranes whitish, areolate, uniseriate, and concave. Hemelytra ovate, inner border conspicuously concave posteriorly; clavus large, 2-seriate at widest part, inner vein straight, outer edge convex; discoidal area biseriate; cubitus whitish posteriorly after R+M junction; radius-media (R+M) white for most of length, raised, stout; subcostal area mostly 3-seriate, four rows of areolae at widest part; costal area wide, with as many as six rows of areolae, widening posteriorly; membrane shortened (specimen brachypterous); hypocosta dark brown, areolate anteriorly, but light brown, rim-like for most of length, ending at membrane. Scent-gland opening round, auricular-like, dark. Legs light brown, coxae and trochanters stout; longer, spine-like setae at posterior edge of tibiae; second tarsi long and slender. Claws long, slender, well developed.

Pygophore conspicuously narrower than abdomen; dorsal rim strongly curved, almost sinuous, forming small depressions laterally and dorsally. Paramere stout at base, abruptly but consistently narrowing to very slender tip, pronounced elbow at base.

Measurements: body length, 2.01; body width, 1.19; head length, 0.39; head width, 0.31; interocular width, 0.18; pronotum length, 0.35; pronotum width, 0.86; scape length, 0.06; pedicel length, 0.05.

Remarks. Of the three known species of *Zetekella*, *Z. henryi* sp. n. is more morphologically similar to *Z. zeteki* because of the broader paranota and hemelytra, and the long clypeal, jugal and frontal cephalic spines. It differs from *Z. zeteki* by the thinner cephalic spines, the anterior edge of paranota not reaching the eyes, the narrower discoidal and subcostal area, and by its color pattern.

Etymology. This species is named after the outstanding heteropterist and dear friend Thomas Henry, on the occasion of his 70th birthday and his remarkable career and countless contributions to the study of Heteroptera.

Key to *Zetekella* and *Minitingis*

1	Rostrum conspicuously surpassing posterior edge of metathorax, reaching second or third abdominal segment, abdominal groove present **2**
–	Rostrum surpassing posterior edge of metathorax, or not; not reaching second abdominal segment, abdominal groove absent **3**
2	Costal area with alternate, conspicuous black and white quadrate marks, and 4 rows of areolae .... ***M. elsae*** (Fig. 1f)
–	Costal area without alternate black and white marks, and with 2 rows of areolae .... ***M. minusculus*** (Figs 1e, 2b, c, 3)
3	Paranota wide, with 4 to 5 rows of cells; costal area with at least 4 rows of cells.. **4**
–	Paranota narrow, about half as wide as head, with 2 rows and a few cells irregularly placed; costal area with 2 rows of cells .... ***Z. pulla*** (Fig. 1b, 1c)
4	Body brownish, anterior edge of paranota reaching eyes, discoidal area mostly 3-seriate, subcostal mostly 4-seriate.................................. ***Z. zeteki*** (Fig. 1d)
–	Body dark brown or blackish, with collar, paranota, radius-media and lateral part of costal area and elytral membrane white, discoidal area mostly biseriate, subcostal irregularly quadriseriate .... ***Z. henryi* sp. n.** (Figs 1a, 2a)

New records (Figure 4)

Zetekella pulla: BRAZIL. Santa Catarina: Ibicaré, 27°09, 51°18, 600m, F. Plaumann, Set. 1960. DZUP 387511-387515. **New record**. BRAZIL. São Paulo: Barueri, 23/VII/1967, K. Lenko - col. **New state record**.

Zetekella zeteki: COSTA RICA: Heredia: La Selva Biological Station, nr Puerto Viejo, clearing, 59m, 10.426946°N, 84.001449°W, 9–15 Aug 2010, OTS Heteroptera course [Berlese]. MGPhD-E290. **New country record** (Figure 1d).

Data resources

SimpleMappr	http://www.simplemappr.net/map/8595
KML	http://www.simplemappr.net/map/8595.kml
Zoobank	*Zetekella henryi* sp. n.: 9480B3E7-E726-4718-8EBF-69C58A867887
Figshare	Photographs of the dorsal habitus and labels of all holotypes (except *M. minusculus*), two paratypes of *M. minusculus* and of the new records vouchers
Zenodo	Spreadsheet containing label information of all studied specimens and their respective unique identifiers

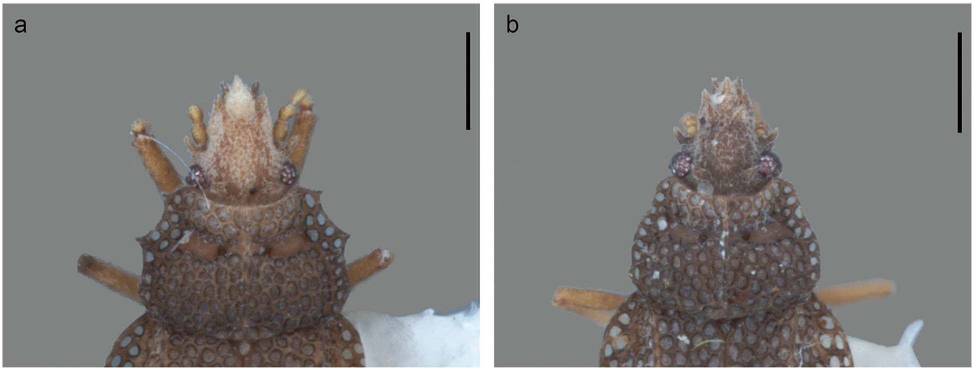

Figure 3. Variation observed in paranota of paratypes of *Minitingis minusculus*. Scale bar: 0.25 mm.

Discussion

Zetekella henryi sp. n. is described based on morphological differences in characters that have been commonly used to delimit species within Tingidae. The new species resembles *Z. zeteki*, but differs from it by the color pattern, paranota, and discoidal and subcostal areas of the hemelytra. Additionally, the shorter rostrum and shape of the scent gland allies these two species with *Z. pulla*. In addition to the description of a new species of *Zetekella*, a macropterous specimen of *Z. pulla* was found and is illustrated. All characters, except the hemelytral membrane, remain virtually the same between the macropterous and brachypterous specimens. Only brachypterous specimens previously have been known for species of *Zetekella* and *Minitingis*. We do not agree with the terminology typically used in the specialized literature to differentiate these two wing forms, but we reserve this subject for a more comprehensive, and illustrated, treatment in a future contribution.

Froeschner (1968) noted that only *Minitingis* and *Gonycentrum* Bergroth have seven cephalic spines in Phatnomatini, assuming that *Zetekella* has only five. Drake (1944), however, in describing the genus and *Z. zeteki,* already had observed that "there are indications of a pair of spines on the head behind the eyes and just in front of the collar" and that "as these are very much atrophied, they are not mentioned in the generic description." Because the type specimen housed at the USNH is missing the head, this statement could not be verified. This feature, however, could be seen in the voucher specimen for the new record. Moreover, these spines were also observed in the new species. Yet, the mistake was perpetuated in the identification keys of Froeschner (1996). Froeschner (1968) also delimited and revalidated *Minitingis* on the basis of the acute processes of the paranota, which, however, can vary (Barber 1954).

In addition to cephalic spines and pronotal processes, Froeschner (1968) used rostrum length and presence of an abdominal groove as characters that validate the genus *Minitingis*. These characters were not possible to observe in the holotype (and single known specimen) of *M. elsae* due to the way the specimen is mounted, but they could

Figure 4. Distribution records for species of *Zetekella* and *Minitingis*.. Blue icons = *Zetekella* species; square, circle, and star = *Z. zeteki*, *Z. pulla,* and *Z. henryi* sp. n., respectively; red icons = *Minitingis* records; triangle = *M. minisculus* and hexagon = *M. elsae*. Internal crosses = holotype localities; internal plus signs = new records.

be seen in all specimens of *M. minusculus* studied. We agree with Froeschner (1968) in regarding these two characters as reliable for distinguishing *Minitingis* from *Zetekella*. Froeschner's (1968) comments on the zoogeographical significance of the distributional records of both genera remain relevant following our description of a new species of *Zetekella* and report of new distribution records for *Z. pulla* and *Z. zeteki*.

Therefore, we still consider *Minitingis* a valid genus, but we expanded the diagnosis of *Zetekella* to include the occipital cephalic spines and removed the acute processes on the paranota as a reliable character for delimiting *Minitingis*.

Acknowledgments

We thank Thomas Henry for providing the holotype and photos, which enhanced this contribution in his honor. We also thank the Conselho Nacional de Pesquisa e Desenvolvimento (CNPq, Brazil) and the Smithsonian Institution (Washington, D.C., USA) for funding the first author's studies.

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RESEARCH ARTICLE

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A new species of *Paraceratotingis* Henry, Montemayor & Knudson from Guyana (Hemiptera, Heteroptera, Tingidae)

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Abstract

Paraceratotingis henryi **sp. n.**, is described from Guyana. Color photographs and a diagnostic key are provided to aid in distinguishing the species of *Paraceratotingis* Henry, Montemayor, and Knudson. Diagnoses are also provided.

Keywords

Heteroptera, lace bugs, *Tigava* complex

Introduction

The genus *Paraceratotingis* Henry, Montemayor, and Knudson was erected by Henry et al. (2017) to accommodate two peculiar specimens that were thought to represent a new species of *Ceratotingis* Montemayor (2008). On further examination, Henry et al. (2017) determined that this new species actually belongs in a new genus of the *Tigava* generic complex. Subsequently, while sorting through specimens from the Natural History Museum in London, a single specimen representing another new species of *Paraceratotingis* was discovered, which is described herein.

Materials and methods

The specimens examined for this paper are from the Natural History Museum (London) (**NHMUK**), and the United States National Museum of Natural History (**USNM**) in Washington, DC. Specimens were examined using a Wild M5 stereomicroscope with 10× eyepieces and an ocular doubler. Precision Digital Positioners (Model 3486-1, Boeckler Instruments, Tucson, Arizona) connected to Microcode Digital Dials (IKL Inc., Newport Beach, California) were used to take measurements, which are given in millimeters (mm). Multiple photographs were taken using a Canon EOS 7D with an Automatic Extension Tube Set (Model DG, Kenko Tokina Co., Ltd., Tokyo, Japan) and a macro photo lens (Model MP-E 65mm, Canon, Inc. Tokyo, Japan) attached to a Stack Shot motorized rail (Cognisys, Inc., Traverse City, Michigan). Photographs were then montaged and edited in Adobe Photoshop CS 6.

Results

The discovery of a new species of *Paraceratotingis* necessitates a slight modification of the generic description to accommodate the new species. In the original description of the genus, it was stated that the head has three spines, a pair of occipital spines and a median spine. The new species described in this paper lacks the median spine. Additionally, *Paraceratotingis* was originally defined as having the paranota and the costal and subcostal areas of the hemelytra each with two rows of areoles. The new species has all of these areas with only a single row of areoles. The discoidal cell in *P. convergens* Henry, Montemayor, and Knudson (the type species) is closed apically, whereas in the new species the discoidal area is open apically.

Key to the species of *Paraceratotingis*

1 Head with pair of occipital spines and median spine; paranota, costal, and subcostal areas of hemelytra biseriate .... ***Paraceratotingis convergens* Henry, Montemayor & Knudson**

– Head with pair of occipital spines, median spine lacking; paranota, costal, and subcostal areas of hemelytra uniseriate .... ***Paraceratotingis henryi* sp. n.**

Paraceratotingis convergens Henry, Montemayor & Knudson, 2017

Paraceratotingis convergens Henry, Montemayor & Knudson, 2017: 272–273, figs 7, 13–14.

Diagnosis. Head with pair of extremely long occipital spines and median spine. Paranota biseriate. Pronotal collar produced upward, forming small, elevated, distinct hood. Hemelytra slightly broader, costal and subcostal areas biseriate; discoidal area closed apically.

Material examined. HOLOTYPE: VENEZUELA: Aragua, El Limón, 4 July 1968, J. Maldonado C. (♂USNM).

***Paraceratotingis henryi* sp. n.**

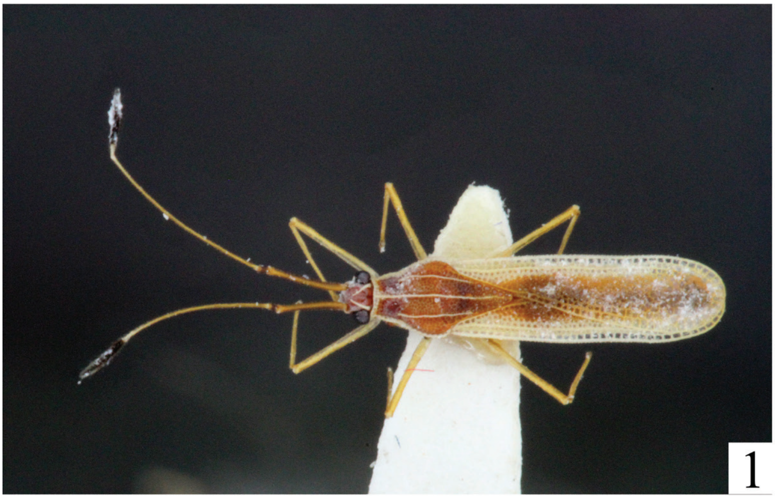
http://zoobank.org/A83E8D61-D3AA-4F6F-AE67-E5155BF9230E
Figs 1–3

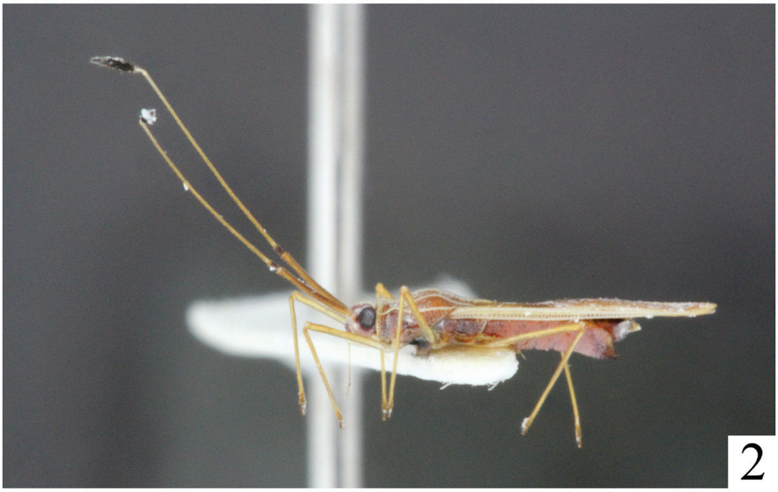
Holotype. GUYANA: Demerara, Soweyo GDF Camp, 27–30 Sept 1991, JH Martin Coll., BM1991-182 (♀NHMUK). Red handwritten label: Holotype *Paraceratotingis henryi* n. sp. Knudson 2018.

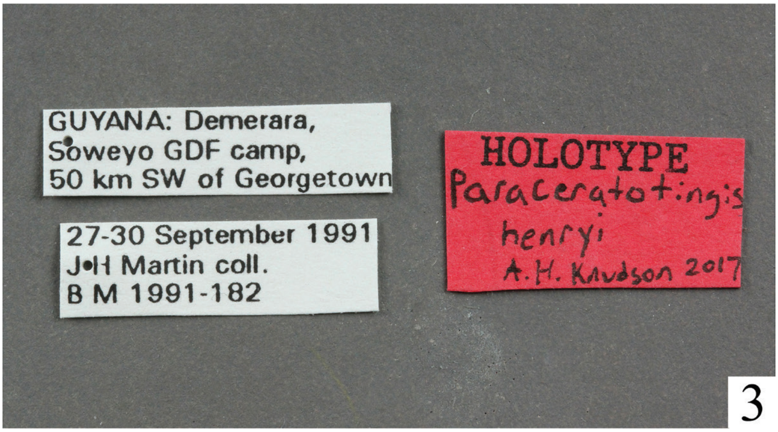
Diagnosis. Head with pair of moderately long occipital spines; medial spine lacking. Paranota uniseriate. Pronotal hood moderately elevated. Hemelytra slightly narrower, costal area uniseriate; subcostal area uniseriate; discoidal area open apically.

Description. ***Head.*** Pale brown; armed with two spines, occipital spines moderately long, converging, but not meeting medially; occipital plates of head lighter in color, obscured by pale wax near bases of antennae; clypeus swollen; eyes bulging, large, 1/3 of head width in dorsal view. Antennae extremely long; segment one long, lightly infuscate, brown, covered with several regular rows of setae; segment two short, concolorous with head, with regular rows of hairs; segment three long, 1.5 times longer than first antennal segment, lighter in color, with regular rows of hairs; segment four clavate, concolorous with preceding segment on basal fourth, black to apex, with longer stouter hairs. Bucculae yellowish, lighter colored than head, bi- to triseriate. Rostrum moderately elongate, apex extended to middle of prothoracic sternite; basal segment brownish, concolorous with basal antennal segment; remaining segments yellow brown except last segment infuscate apically.

Thorax. Pronotum light brown, mostly concolorous with head; tricarinate, punctate, areolate in triangular posterior projection; carinae uniseriate, low, yellowish; pronotal collar lighter in color, slightly tumid, elevated to form hood-like structure; calli large, triangular, lightly pruinose; paranota uniseriate, with minute spinules and pruinescence at outer margins, yellowish. Hemelytra elongate, surpassing abdomen by one fourth to one third its length; outer margin light yellow, with hyaline areolae; costal area of hemelytra uniseriate, with rectangular areolae; subcostal area mostly hyaline, with veins yellowish, subcostal area of wing about two thirds width of costal area, uniseriate with regular areolae; discoidal area poorly differentiated, with five to six rows of areolae at greatest width, open behind; sutural area completely overlapping, wide, with eight to nine rows of areolae at greatest width, cells infuscate, veins brownish,. Hind wings surpassing abdomen in repose, extended halfway between abdomen and hemelytra. Rostral laminae low, uniseriate; sternites dark brown to black. Legs subequal in length, coxae concolorous with pleurites, femora and tibiae elongate, tibiae each with several longitudinal rows of setae, slightly clavate apically, infuscate at apex, with pad of hairs on ventral margin; tarsi darkly infuscate. Ostiolar peritreme small, nearly obsolete.







GUYANA: Demerara,
Soweyo GDF camp,
50 km SW of Georgetown

27-30 September 1991
J•H Martin coll.
B M 1991-182

HOLOTYPE
Paraceratotingis
henryi
A.H. Knudson 2017

Figures 1–3. 1 Dorsal habitus of *Paraceratotingis henryi* **2** Lateral habitus of *Paraceratotingis henryi* **3** Labels of *Paraceratotingis henryi*.

Abdomen. Light brown, sternites broad; pregenital plate scalloped, with two angular projections along lateral posterior margins; gonocoxae slightly excavated at posterior ventral margin, pruinose.

Etymology. This species is named in honor of Dr. Thomas J. Henry, USDA Systematic Entomology Laboratory, National Museum of Natural History, Washington, DC, for his great contributions to the study of Heteroptera, specifically his advances to the systematics of the Miroidea and Lygaeoidea.

Discussion

Paraceratotingis henryi can be separated from *P. convergens* by the characters provided in the diagnoses. *Paraceratotingis convergens* is known only from Venezuela, and the new species described herein is known only from Guyana, suggesting that the genus might be endemic to northern South America. No biological information is available for species of *Paraceratotingis*, but a related genus, *Ceratotingis*, has been found feeding and breeding on *Cecropia* sp. (family Urticaceae) in Costa Rica (Kenji Nishida and Paul Hanson, personal communication). *Paraceratotingis* might also feed on members of this genus or other Urticaceae.

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RESEARCH ARTICLE

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A new *Cervinotaptera* species from northern Madagascar (Hemiptera, Heteroptera, Aradidae)

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Abstract

A new species, *Cervinotaptera tomhenryi,* **sp. n.** (Hemiptera: Heteroptera: Aradidae: Mezirinae), from Montagne d'Ambre National Park in northern Madagascar is described and illustrated. The newly described species is compared with the only other known species, *Cervinotaptera guilberti* Heiss & Marchal, 2012.

Keywords

apterous, *Cervinotaptera*, Mezirinae, new species, northern Madagascar

Introduction

The first comprehensive studies on Aradidae of Madagascar and adjacent islands were provided by Ludvík Hoberlandt (1957, 1963). In the last two decades Ernst Heiss published several taxonomic papers, describing many new genera and species, and summarized all published works in a catalogue (Heiss 2012). Most recently, two new genera and five new species of aradids were published (Heiss et al. 2012, Heiss and Marchal 2012, Heiss and Baňař 2013, Baňař et al. 2016, Baňař and Heiss 2018).

The genus *Cervinotaptera* Heiss & Marchal, 2012 (Hemiptera: Heteroptera: Aradidae: Mezirinae) was erected for the apterous species *Cervinotaptera guilberti* Heiss & Marchal, 2012 from northern Madagascar (Heiss and Marchal 2012). During the expeditions of the first author in January 2015 and January 2016 to Montagne d'Ambre National Park in northern Madagascar, twelve specimens of a new species of *Cervinotaptera* were collected. The species is described in this paper.

Materials and methods

The body surface of most apterous, litter-living aradids is frequently covered by a layer of incrustations, which obscure body structures and intersegmental boundaries (Figure 1C). It was therefore necessary to clean the specimens before examination. In this case, we used a combination of mechanical cleaning in distilled water with common detergent and short treatment in 10% KOH.

The term "dorsal ocular index" refers to the ratio of the minimum interocular distance to the maximum width of the eye; it is best calculated if measured as: (twice minimum interocular distance) / (maximum width across eyes, minus minimum interocular distance).

Color photographs of the newly described species were taken with a Leica MSV266 camera. Scanning electron micrographs of a gold-coated specimen were taken using a JEOL 6380 LV scanning electron microscope.

Measurements were taken using a SZP 11 ZOOM stereoscopic microscope with an eyepiece micrometer. Label data are cited verbatim, including potential errors, using a slash (/) to separate lines on the label; different labels are mentioned and indicated by a double slash (//). Notes of the authors are in [square brackets].

Abbreviations used in text:

deltg	dorsal external laterotergite (connexivum),
mtg	mediotergite,
vltg	ventral laterotergite,
pe-angle	posteroexterior angle (of deltg).

The material studied is deposited in following collections:

MMBC	Moravian Museum, Brno, Czech Republic
CEHI	Ernst Heiss collection, Tiroler Landesmuseum, Innsbruck, Austria.

Taxonomy

Family Aradidae Brullé, 1836
Subfamily Mezirinae Oshanin, 1908
Genus *Cervinotaptera* Heiss & Marchal, 2012

Cervinotaptera tomhenryi sp. n.

http://zoobank.org/0C6FF72F-8E60-47F3-B81E-3D2EF9833596
Figures 1A–C; 2; 3; 4A–B, D–E, G

Material examined. Type material. Holotype male, 'MDA/Jan.2015/11 N MADAGASCAR / MONTAGNE D'AMBRE ~945m, circuit / „Sommet", S12°31'28"E49°09'52" / sifting litter+rotten wood, Winkler app. extr. / 14.1.2015, P. Baňař & E.M. Rabotoson lgt.' [printed] // 'HOLOTYPE / *Cervinotaptera* / *tomhenryi* sp. nov. / Baňař & Heiss des. 2018' [printed red label] (MMBC). Paratypes: 2 ♂♂, 3 ♀♀, same locality label as holotype [one male gold-coated for SEM] (1 ♂, 1 ♀ MMBC; 1 ♂, 2 ♀♀ CEHI); 1 ♂, 2 ♀♀: 'MDA/Jan.2015/12 N MADAGASCAR / MONTAGNE D'AMBRE ~1100m / sifting litter close to camp, 16.1.2015 / Winkler apparatus extraction / P. Baňař & E.M. Rabotoson lgt.' (1 ♀ MMBC; 1 ♂, 1 ♀ CEHI), 3 ♂♂: 'MDA/Jan.2016/02 N MADAGASCAR / MONTAGNE D'AMBRE 1165m, circuit / „Sommet", S12°31'50"E49°10'16" / sifting *Pandanus* litter, Winkler app. extr. / 13.1.2016, P. Baňař & E.M. Rabotoson lgt.' [all three males permanently stored in absolute ethanol available for DNA study] (MMBC). All paratypes are provided with a label: 'PARATYPE / *Cervinotaptera* / *tomhenryi* sp. nov. / Baňař & Heiss des. 2018' [printed red label].

Description. Apterous, body short, broadly oval (Figures 1A–C, 2A). Coloration dark brown to blackish, tarsi and apex of antennal segment IV somewhat paler. Thorax and abdominal laterotergites with tubercle-like processes.

Measurements (in mm). Male holotype (one female paratype in brackets). Total body length: 3.62 (4.04); head length (without collar): 0.67 (0.71); head width across eyes: 0.84 (0.86); minimum interocular distance: 0.59 (0.60); length of antennal segments: I: 0.37 (0.39), II: 0.22 (0.23), III: 0.67 (0.69), IV: 0.37 (0.38); pronotum length [including tubercles]: 0.60 (0.60), pronotum width [including tubercles]: 1.42(1.42); maximum width of abdomen: 1.98 (2.33), tergal plate length: 0.93 (0.93); tergal plate width: 1.22 (1.33).

Head (Figures 2C–D, 4A–B) with longitudinal furrows and ridges and few globular tubercles on dorsal and lateral faces, numerous and more conspicuous on ventral face; wider than long, width : length ratio 1.25 in male, 1.21 in female; clypeus reaching nearly middle of antennal segment I, antenniferous lobes short, slightly shorter than clypeus; antennae long, 1.92 times as long as width of head in male, 1.95 times in female, segment I slightly bent at base, thickest, segment II thinner and shortest, segment III thinnest and longest, segment IV fusiform, antennal formula (longest segment first): III:I=IV:II. Eyes very small, globular, slightly stalked, ocular index 4.72 in male, 4.60 in female. Labium very short, hardly reaching two thirds of head length.

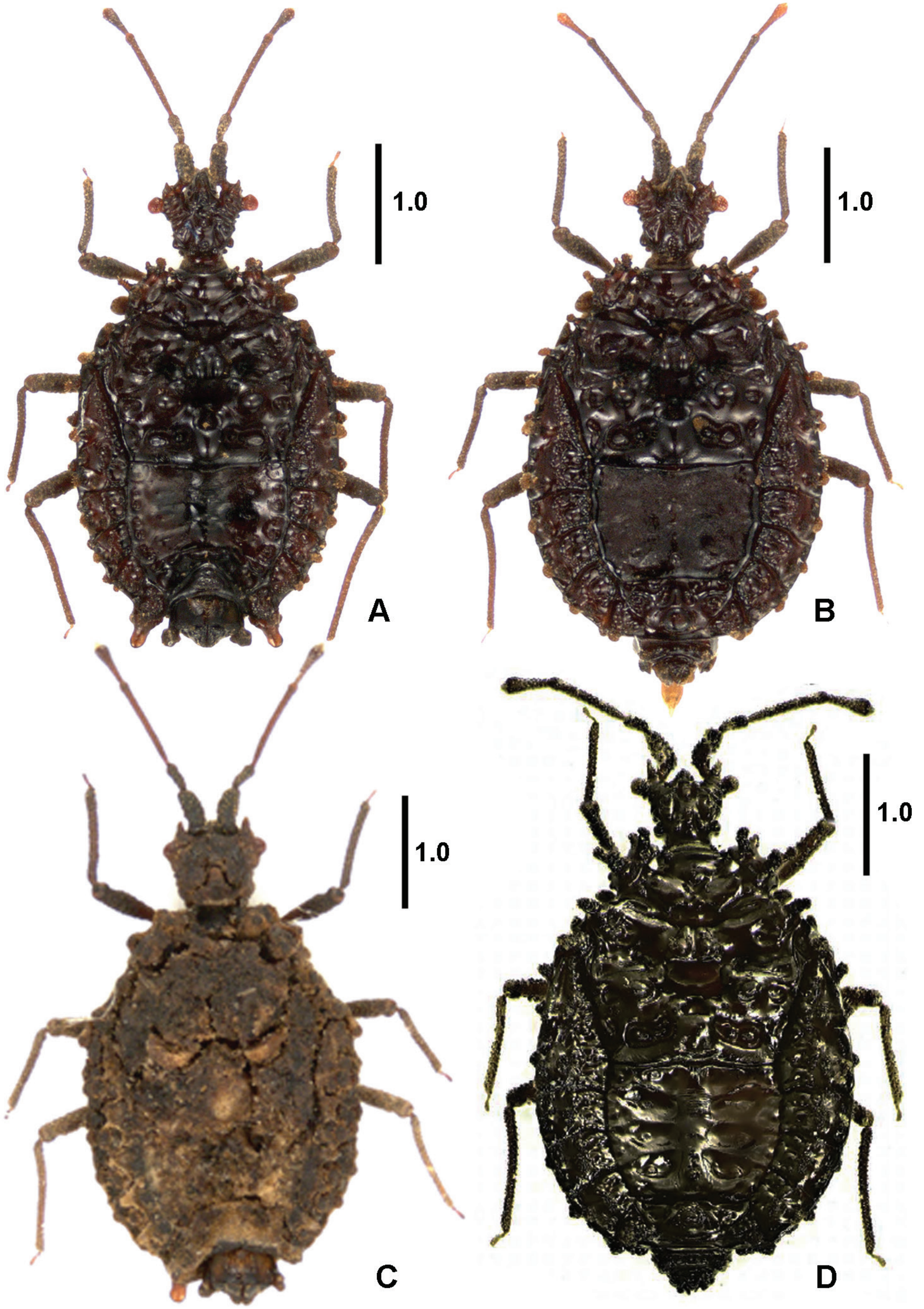

Figure 1. *Cervinotaptera* species, dorsal habitus. **A** *C. tomhenryi* sp. n., male holotype **B** *C. tomhenryi* sp. n., female paratype **C** *C. tomhenryi* sp. n., male paratype, uncleaned specimen **D** *C. guilberti* Heiss & Marchal, 2012, female holotype. Scale bars: 1 mm.

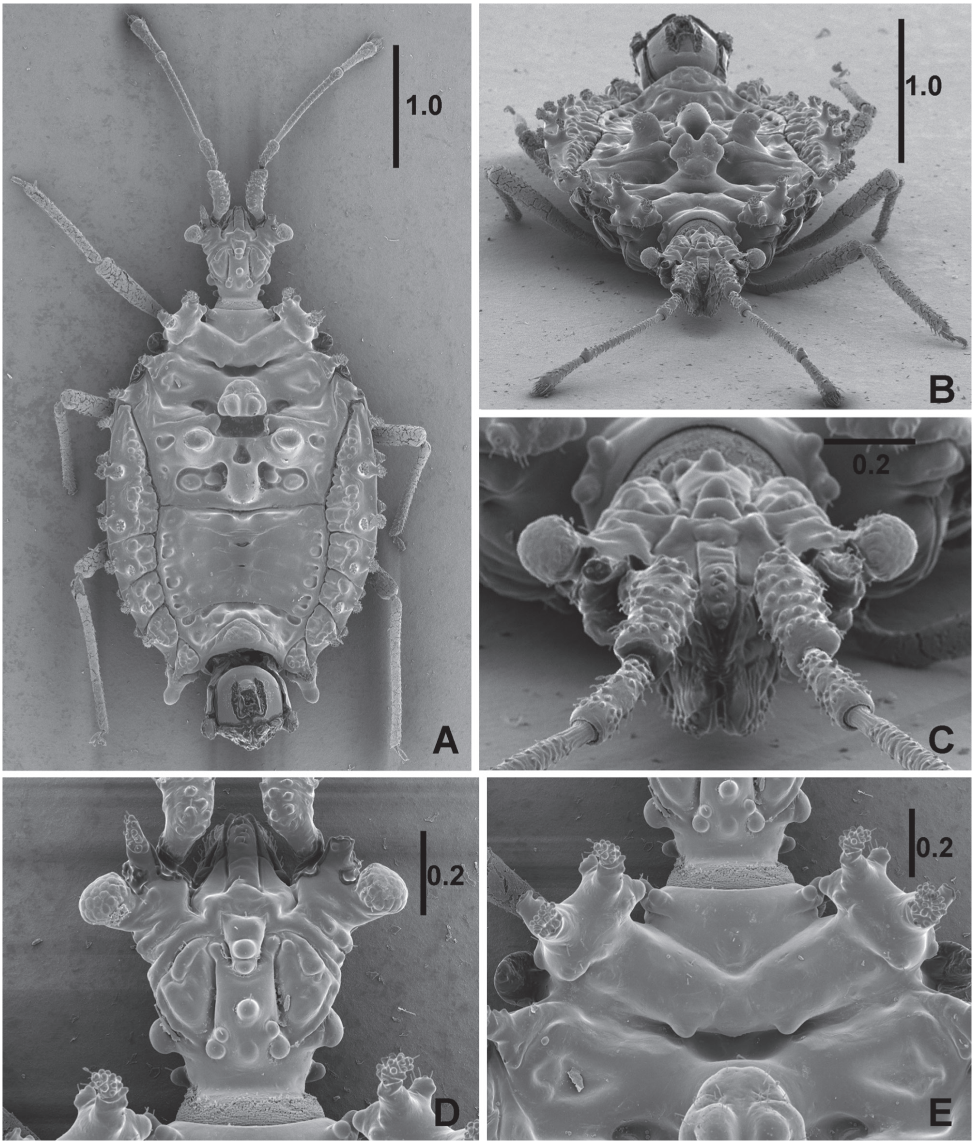

Figure 2. *Cervinotaptera tomhenryi* sp. n., male paratype, scanning electron micrographs. **A** dorsal habitus **B** dorsal habitus, anterior view **C** head, anterior view **D** head, dorsal view **E** pronotum, dorsal view. Scale bars in mm.

Pronotum 2.37 times as long as wide across lateral tubercles in both sexes; anterior lobe with two pairs of lateral tubercles (Figures 2E, 4G), posterior lobe smooth at middle, lateral lobes each with four finger-like processes, posterior margin convex with two small tubercles directed posteriorly. Pronotum separated from mesonotum by deep and wide furrow.

Mesonotum fused to metanotum, fusion lines only partly visible, posteriorly with conspicuous median elevation bearing two semicircular tubercles. Posterior margin with two deep pits connected with very deep and broad median depression on metanotum.

Metanotum (Figure 3B). Fused to mesonotum and mtg I+II, with rectangular median depression on anterior margin. Fused mtg I+II with deep median pit anteriorly, posteriorly with prominent median elevation, lateral parts with two (1+1) round elevations. Posterior margin of mtg I+II almost straight, clearly delimited from tergal plate by conspicuous furrow.

Abdomen. Tergal plate (Figure 3A) shorter than wide, ratio width to length 1.31 in male, 1.43 in female. Scent gland scars visible on posterior margins of mtg III and IV only. Deltg II+III fused to elongate triangular sclerite (Figure 3C), bearing two pairs of finger-like processes, inner process directed upwards, outer process strictly lateral. Deltg III-VII well separated from each other, bearing pair of processes similar to those on deltg II+III, shorter on deltg VI and VII. Vltg VII of male with posteriorly directed glabrous finger-like projections. Spiracles on ventral laterally produced tubercles decreasing in size from vltg II–VII, visible from above, those of paratergites VIII terminal. Metathoracic scent gland with long curved evaporatorium and additional ovate evaporatorium laterally of anterior coxae.

Legs unarmed, slender, sparsely covered with short, semi-erect setae. Femora widening distally, tibiae slightly curved.

Male genitalia (Figures 3E–F). Visible part of pygophore convex, short, and wide, surface with rugosities; parameres hook-like; paratergites VIII rounded, shorter than pygophore.

Female. General body structures similar in both sexes, female larger and wider.

Etymology. Dedicated to our dear colleague and friend Thomas J. Henry, eminent student of the Heteroptera.

Collecting circumstances. All known specimens were collected by sifting mountain evergreen rain forest leaf litter in Montagne d'Ambre National Park (Figure 6A–B) in northern Madagascar. Sifted samples were extracted in a Winkler apparatus during two or three days and were mixed several times daily. *Cervinotaptera tomhenryi* sp. n. shared the microhabitat with the recently described carventine aradid *Comorocoris estherineae* Baňař & Heiss, 2018; the largest parts of the type series of both species were extracted from the same samples during the expedition of 2015.

Distribution. Known only from Montagne d'Ambre National Park in northern Madagascar.

Differential diagnosis. *Cervinotaptera tomhenryi* sp. n. differs from *Cervinotaptera guilberti* Heiss & Marchal, 2012 by wider head; longer and thinner antennae; less curved antennal segment I; shorter antennal tubercles (Figures 4A–C); different proportions of deltg II+III sclerite (longer and narrower in *C. tomhenryi* sp. n.); larger and more prominent tubercles on deltg II+III (smaller in *C. guilberti*) (Figure 4D–F); and shape and size of finger-like processes on pronotum (Figure 4G–H).

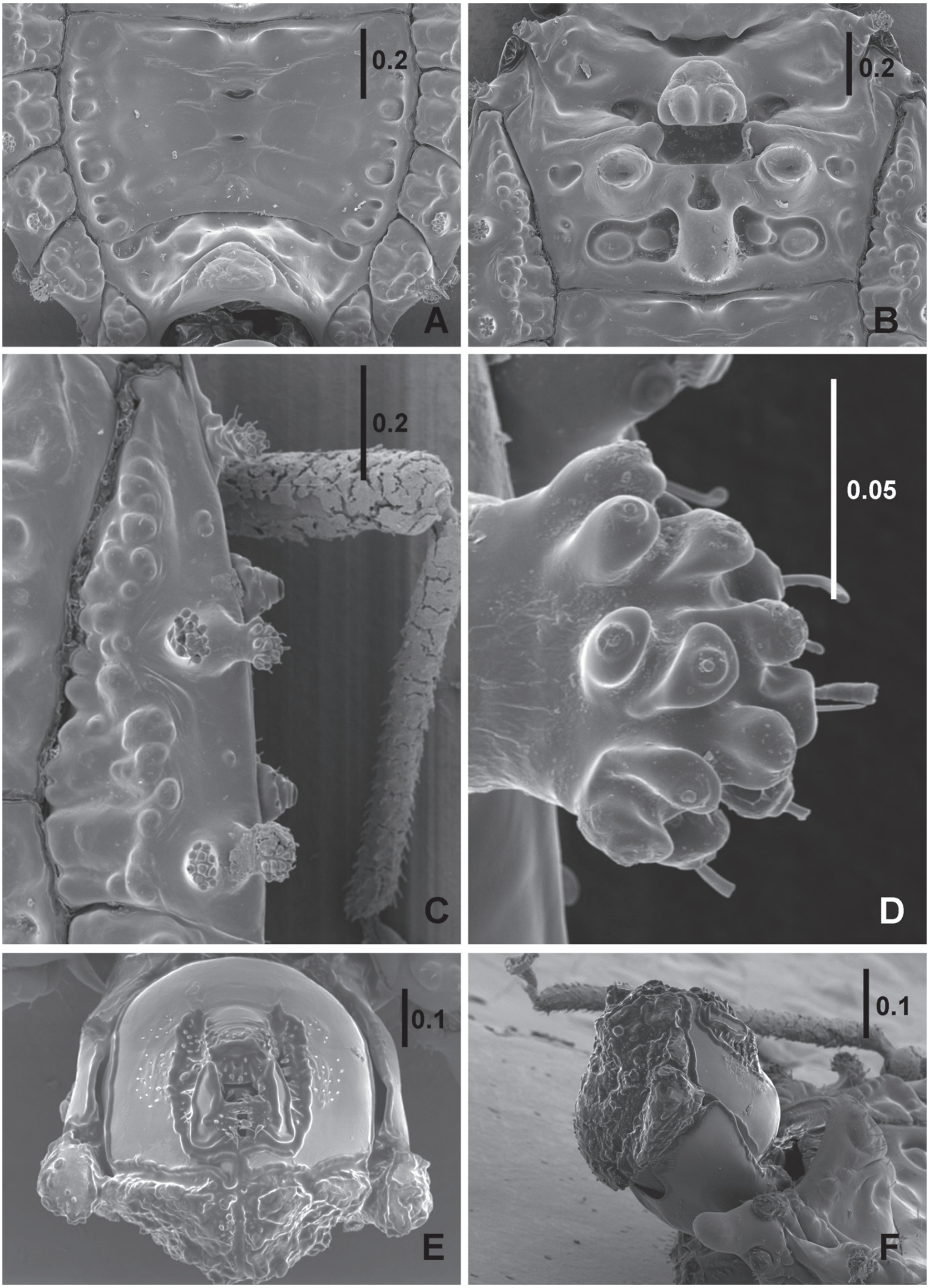

Figure 3. *Cervinotaptera tomhenryi* sp. n., male paratype, scanning electron micrographs. **A** tergal plate **B** mesonotum and metanotum with fused mediotergites I+II **C** triangular sclerite of fused dorsal external laterotergites II+III **D** apex of tubercle of dorsal external laterotergites II+III **E** pygophore dorsal view **F** pygophore lateral view. Scale bars in mm.

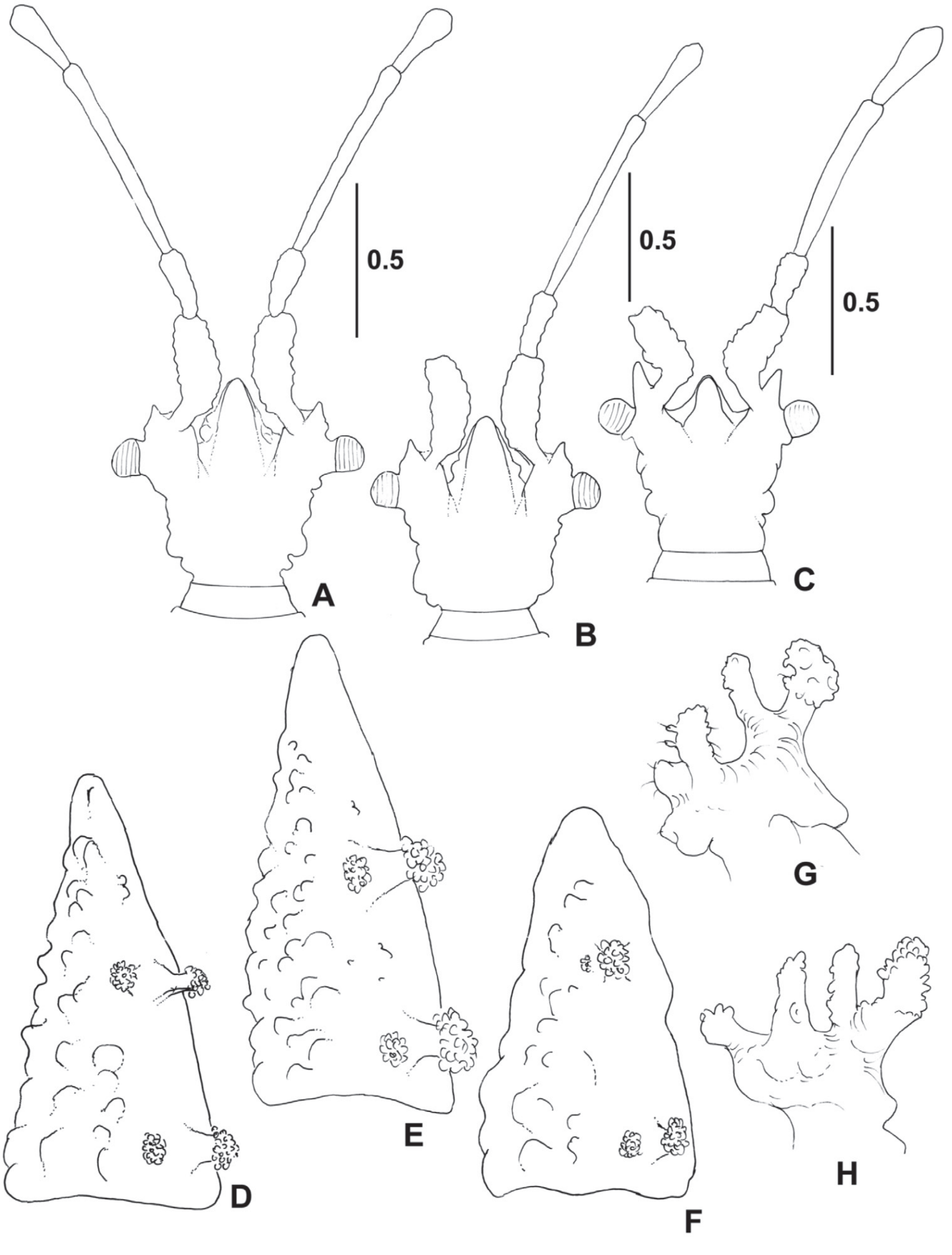

Figure 4. *Cervinotaptera* species. **A–C** outline of head **D–F** fused dorsal external laterotergites II+III **G–H** lateral finger-like processes of pronotum. **A, D** *C. tomhenryi* sp. n., male holotype **B, E, G** *C. tomhenryi* sp. n., female paratype **C, F, H** *C. guilberti* Heiss & Marchal, 2012, female holotype. Scale bars in mm, **D–H** schemes, not measured.

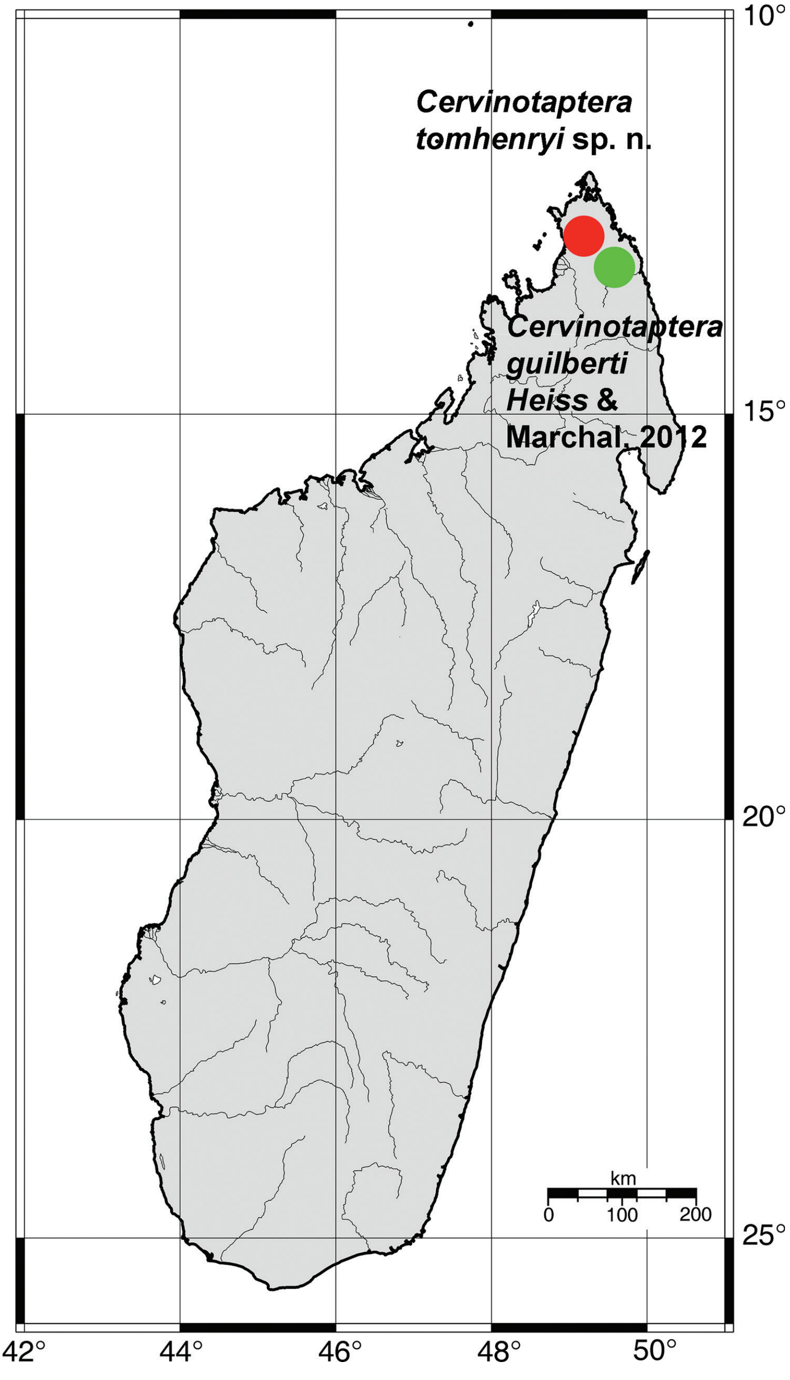

Figure 5. Map of distributions of *Cervinotaptera* species.

Figure 6. Microhabitats of *Cervinotaptera tomhenryi* sp. n. in Montagne d'Ambre National Park. **A** sample MDA/Jan.2015/12 **B** sample MDA/Jan.2015/11.

Discussion

Apterous Aradidae in stable tropical habitats of Madagascar tend to develop curious abdominal structures such as forked lateral expansions on the thorax and abdomen (*Chlonocoris* Usinger & Matsuda, 1959), ovate callosities and nodules (*Comorocoris* Heiss, 1985) or finger-like projections of different size (*Cervinotaptera*) and, in Mezirinae, show a remarkable development of unusual structures of metathoracic (*Ambohitantelya* Heiss & Baňař, 2013) and even prothoracic scent-gland evaporatoria. The adaptive value of these unusual structures and their importance in aradid classification are unknown and require further investigation.

Acknowledgments

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RESEARCH ARTICLE

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Zygochrimnus henryi, a new genus and species from South America (Hemiptera, Lygaeoidea, Lygaeidae)

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Abstract

Zygochrimnus henryi, new genus and new species, is described from Ecuador and Peru, and included in the lygaeid subfamily Lygaeinae. Dorsal and lateral view photographs of *Melanopleurus*, *Melanopleuroides*, and *Zygochrimnus* are provided to allow comparison of the three closely related genera; photographs of the posterior view of the pygophore and the paramere of the new species are included.

Keywords

Insecta, Heteroptera, Lygaeinae, Neotropics, new genus, new species

Introduction

The lygaeid subfamily Lygaeinae is large, with a worldwide distribution; its members are often aposematically colored with contrasting red and black or orange and black. Species of the subfamily are characterized by having the hemelytra impunctate; the membrane of forewing usually with a distinct basal cell; the hindwing with hamus and subcostal vein; all abdominal spiracles dorsal; and sutures of the abdominal venter straight or nearly so, and all reaching lateral margin of abdomen (Slater 1985, Henry 1997, Baranowski and Slater 2005, Henry et al. 2015).

The Western Hemisphere members of this subfamily were revised, twenty-two genera were recognized and their phylogenetic relationships discussed by A. Slater

(1992). Since then only one new genus has been added, *Melanopleuroides* A. Slater & Baranowski, 2001, from Dominican Republic (Slater and Baranowski 2001).

In this paper, one new genus and one new species from Ecuador and Peru are described, illustrated, and compared with the related genera *Melanopleurus* Stål, 1874 and *Melanopleuroides* A. Slater & Baranowski, 2001.

This manuscript recognizes Dr. Thomas J. Henry's brilliant scientific career. I met him for the first time in 1976 and since then, our academic bond has strengthened and a true friendship has developed. We have collected together in different localities throughout Mexico for many years and shared our passion for insects. I have seen him grow and attain an outstanding position within the global field of heteropteran systematics.

Materials and methods

The following abbreviations are used for the institutions cited here: University of California, Riverside, California, USA (**UCR**); Instituto de Biología, Universidad Nacional Autónoma de México (**UNAM**). The holotype is deposited in UCR; paratypes are in UNAM. The classification and terminology proposed by Slater (1992) are followed.

Pictures were taken with a Nikon D200 camera.

Taxonomy

Zygochrimnus **gen. n.**

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Figure 1B, E, G

Type species. *Zygochrimnus henryi* sp. n.

Diagnosis. Distinguished among New World Lygaeinae by dorsal surface of body densely clothed with long, stout, upright hairs; body subovoid, robust; head dorsally black with yellow discoidal spot at vertex; and pro-, meso-, and metapleuron densely punctate.

Description. Male. Moderately robust, subovoid, widest across middle of abdomen, medium sized, length less than 5 mm. ***Head.*** Sloping downward, wider than long, vertex convex; ocelli much closer to eyes than to each other; ocellus small, slightly raised above surface; eyes hemispheric, not protruding, with posterior margin touching frontal angles of pronotum; buccula moderately produced; rostrum reaching posterior margin of metasternum; rostral segment I thickest, touching anterior border of prosternum; segment II slightly thinner, III and IV thinner than II and about equally thick. ***Thorax.*** *Pronotum.* Trapezoidal, wider than long; anterior border slightly concave; frontal angles gently raised, touching posterior border of eyes; posterior margin straight, with shallow but distinct depression laterally; anterolateral margins slightly sinuate; callus indistinct, defined primarily by punctate areas immediately before and behind;

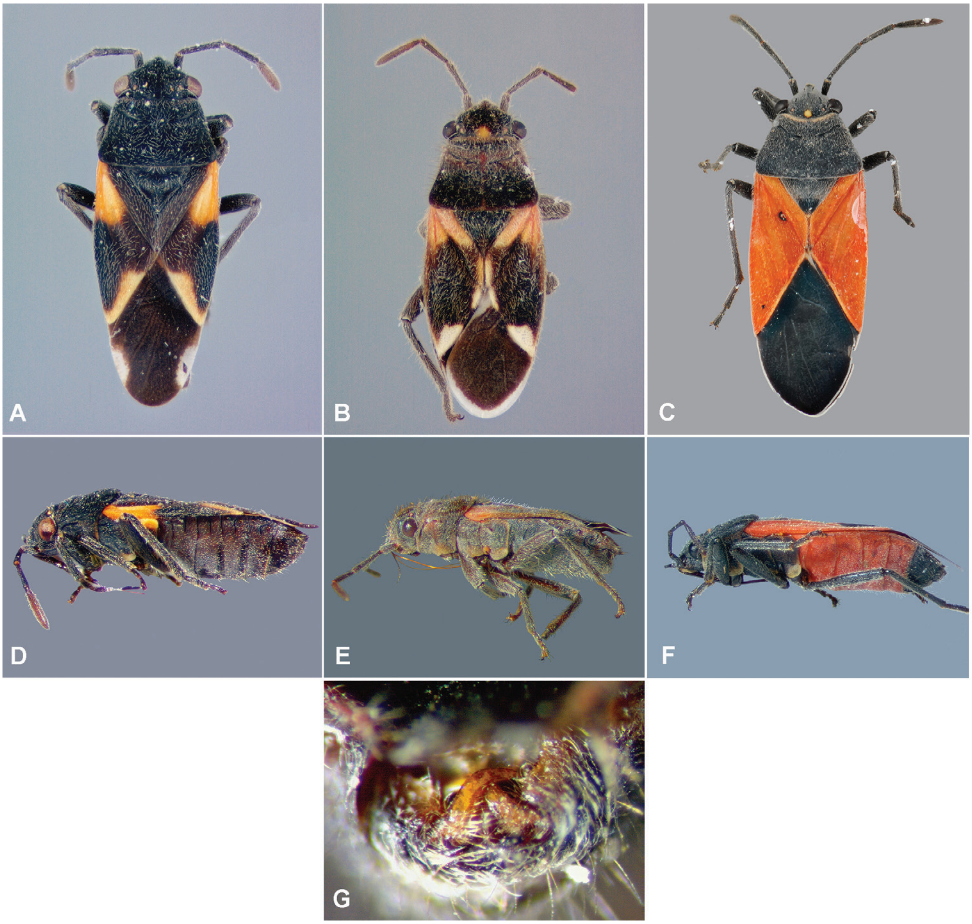

Figure 1. *Melanopleuroides dominicanus* A. Slater & Baranowski female (**A** dorsal side **D** lateral side); *Zygochrimnis henryi* gen. & sp. n. male (**B** dorsal side **E** lateral side **G** genital capsule and paramere); *Melanopleurus bicolor* Herrich-Schäffer female (**C** dorsal side **F** lateral side).

callar impressions unbranched, obliquely sinuate, angled toward frontal pronotal angles; median carina obsolete. *Scutellum*. Wider than long; median carina T-shaped with stem clearly exposed and arms barely defined; lateral fovea deep. *Thoracic pleura*. Propleuron divided into three parts by dorsoventral impressions, anterior and posterior parts coarsely punctate, median part impunctate; mesopleuron divided into anterior and posterior punctate parts by shallow impunctate area; metapleuron with anterior half impunctate, posterior half coarsely punctate, posterior border almost straight, and posterolateral angle produced, somewhat rounded; ostiolar peritreme well developed. *Legs*. Unarmed; femora elongate. *Hemelytron*. Slightly surpassing apex of abdomen; costal margin barely emarginate; veins slightly raised. ***Abdomen.*** Anterolateral scars absent. *Genitalia*. Genital capsule subcircular in cross section. Paramere with well-developed caudolateral lobe; blade broad; posterior projection conical (Figure 1G).

Surface and Vestiture. Impunctate except for punctures immediately before and behind callus and on pro-, meso- and metapleuron. Head dorsally, pronotum, scutellum, clavus, corium, and legs densely clothed with long, stout, golden, upright hairs; head ventrally, thorax and abdomen densely clothed with short, fine, decumbent, silvery hairs.

Female. Unknown.

Discussion. This new genus keys to *Melanopleurus* and *Melanopleuroides* in A. Slater (1992) and Henry et al. (2015). The general appearance is similar, with eyes not on stalks; callus not depressed; hemelytral membrane without hyaline apical area; pronotum without four transverse depressions behind calli; scutellum not swollen; pronotal disk convex, finely punctate and almost entirely black to brownish. *Melanopleuroides* can be distinguished by having the head in dorsal view entirely black without yellowish discoidal spot at vertex; the discoidal spot is clearly defined in the other two genera (Fig. 1A, D). In *Zygochrimnus* gen. n., the head dorsally, pronotum, scutellum, clavus and corium are densely clothed with long, stout, golden, upright hairs; clavus, corium and abdominal sterna III-V are black with or without yellow to orange marks; and pro- meso-, and metapleuron are densely punctate (Fig. 1B, E); in *Melanopleurus* the head dorsally, pronotum, scutellum, clavus and corium are clothed with short, fine, decumbent hairs; the clavus, corium and abdominal sternite III-V are entirely bright orange to reddish orange; and the pro-, meso- and metapleuron are impunctate (propleuron sometimes with a few scattered punctures) (Fig. 1C, F).

***Zygochrimnus henryi* sp. n.**

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Figure 1B, E, G

Material. ***Type material.*** **Holotype, male.** PERU: Amazonas, 1 km W Siempre Viva, 5°44'40"S, 78°40'26"W, 475 m, 14 Dec 2005, F. Andrews (UCR). **Paratypes:** PERU: Cajamarca, 5 km N, Tambopata, 5°25'40"S, 78°48'8"W, 560 m, 15 Dec 2005, F. Andrews 1 male (UNAM). ECUADOR: Manabi, Rio Chico, Puerto Lopez, 5 m, 29 Mar 2002, I. G. Tapia, 1 male (UNAM).

Diagnosis. As in generic diagnosis.

Holotype description. ***Dorsal coloration.*** *Head*: Dark reddish brown to black with yellow discoidal spot at vertex; antennal segments I-III pale reddish brown, IV dark orange. *Pronotum*: Anterior lobe dull black with wide dull orange stripe behind anterior border; posterior lobe shiny reddish brown with wide dull orange irregular stripe behind posterior margin of anterior lobe. *Scutellum*: Black with apex (stem) shiny orange. *Hemelytra*: Clavus with basal half, claval margin bordering scutellum and claval commissure pale yellowish-white; posterior half with pale reddish-brown triangular spot; claval margin bordering scutellum pale yellowish white, contrasting with pale reddish brown margin bordering corium; claval vein concolorous with surrounding area; costal margin of corium pale yellowish white basally and apically, and pale reddish brown between; apical margin of corium pale yellowish white interrupted at middle by pale reddish-brown short stripe; outer spot broader than inner one; hemelytral membrane pale brown with basal angle and outer margin white to yellowish white. *Abdomen*: Connexivum and dorsal abdominal segments dark brown to dark reddish brown.

Ventral coloration. *Head*: Black; buccula black with inner margin dark orange; rostral segments pale castaneous orange. *Thorax*: Propleuron black with anterior and posterior margin and acetabula dark orange; mesopleuron and metapleuron black with posterior margin and acetabula dark orange; pro-, meso- and metasternum dark brown; ostiolar peritreme pale yellowish white. Coxae black with dark reddish-orange reflections; trochanter dark reddish orange; femora dark reddish orange with apical third darker; tibiae dark reddish orange; tarsi pale castaneous orange. *Abdomen*: Abdominal sterna and genital capsule dark reddish brown.

Paratype variation. 1, pronotal disk entirely reddish brown. 2, basal third of clavus and corium pale yellowish orange. 3, acetabula dark yellow. 4, mesopleuron black. 5, metapleuron black with outer margin dark yellow.

Measurements. Male holotype. Body length 4.70 mm; head length 0.55 mm; width across eyes 1.25 mm; interocular distance 0.80 mm; interocellar distance 0.52 mm; preocular distance 0.52 mm; antennal segments: I, 0.32 mm, II, 0.77 mm, III, 0.67 mm, IV, 0.85 mm; pronotum: length 1.07 mm; width across humeral angles 1.32 mm; scutellum: length 0.52 mm; width 0.82 mm; maximum width across abdomen 1.80 mm.

Etymology. Named after Thomas J. Henry, indefatigable and remarkable collector, specialist in several groups of Heteroptera and editor of an entomological journal. Dr. Henry is a great human being, excellent friend, and a true model to be followed by the future generation of entomologists and systematists.

Distribution. Known from Ecuador and Peru.

Acknowledgements

I thank Doug Yanega and Christiane Weirauch (UCR) for the loan of specimens. Special thanks go to Ernesto Barrera (UNAM) for the photographs.

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RESEARCH ARTICLE

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A new genus and two new species of South American Myodochini (Hemiptera, Heteroptera, Rhyparochromidae)

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Abstract

The new Neotropical genus *Henryaria* (Heteroptera, Rhyparochromidae, Myodochini) is established to accommodate two new species from Bolivia and Peru. Photographs of the types and their male genitalia are provided. Similarities with other genera of the tribe are discussed, as well as the characters to distinguish the two new species.

Keywords

Henryaria, *Henryaria thomasi*, *Henryaria zongo*, Lygaeoidea, Rhyparochrominae

Introduction

The Rhyparochromidae are the most diverse group of the Lygaeoidea with more than 2,000 species (Henry et al. 2015). It is divided into two subfamilies Plinthisinae and Rhyparochrominae, the latter of which includes 14 tribes (Henry 1997).

The Myodochini comprise 77 extant genera and 368 species worldwide; 38 genera and 121 species are known from the Neotropics (Dellapé and Henry 2017). Many species live on the ground, where they feed on fallen seeds. The species that ascend plants to feed are the most commonly collected myodochines. Other species live in forest canopies (Dellapé and Henry 2010, Henry et al. 2015). As most rhyparochromids do, the members of this tribe feed on mature seeds. Many species are myrmecomorphic, and in some cases, although they are not morphologically similar to ants, both adults and nymphs mimic them in their movements (Slater and Baranowski 1990).

Phylogenetic relationships within the tribe are not clear. The only attempt to establish a cladistic framework is Harrington's (1980) analysis, where four main groups, representing 56 genera, were established based mainly on characters of the male genitalia. Since then, new genitalic studies and the discovery of new taxa have led to a need for a taxonomic update and reevaluation of relationships.

The actual diversity of the group is much higher than the current numbers indicate (Henry et al. 2015). For example, in the recent revision of the Neotropical genus *Heraeus*, 30 new species and two new genera were described (Dellapé et al. 2016).

In the present contribution a new genus is described to include two new species from Bolivia and Peru.

Materials and methods

Color images were captured using a digital camera (Micrometrics 391CU, 3.2 m) mounted on a Nikon SMZ1000 stereomicroscope. Multiple focal planes were merged using Micrometrics SE Premium 4 software.

The genital structures were dissected under a stereomicroscope, cleared in a 10% KOH aqueous solution, washed in distilled water, and preserved in a vial with glycerin. All measurements are in millimeters. The acronyms used are **USNM** for the National Museum of Natural History, Washington, D.C., USA, and **MLP** for the Museo de la Plata, La Plata, Argentina.

Taxonomy

Tribe Myodochini

Henryaria gen. n.

http://zoobank.org/51EF789F-24B6-40C3-8167-32A9FB387D56
Figures 1–19

Type species. *Henryaria thomasi* sp. n.

Diagnosis. Head strongly convex behind eyes, forming short neck; eyes relatively small, not surpassing dorsal margin of head; jugal ridge developed; vertex rounded; buccular juncture V-shaped. Evaporative area extensive. Mesepimeron emergent. Profemur incrassate, with two rows of spines; aedeagus without spines, seminal duct on vesica and gonoporal process distinctly wide; gonoporal process broadened towards apex.

Description. Relatively small (ca. 6 mm long), pilose. *Head* (Figs 1–3, 11–14) shiny, with many grouped punctures forming a coriaceous texture; head strongly convex behind eyes, forming a short neck; eyes relatively small, not surpassing dorsal margin of head in lateral view; ocelli closer to eyes than to posterior margin of head; jugal ridge developed; vertex rounded; buccular juncture V-shaped at level of antenniferous tubercles. Scape relatively short but surpassing apex of head.

Thorax: Pronotum, scutellum and hemelytra pruinose. Pronotum punctate, with punctures slightly larger on posterior pronotal lobe; lateral margins of both pronotal lobes rounded; with ring-like collar well differentiated. Clavus with 3 rows of punctures, and partial fourth between inner and median rows on distal three-quarters. Evaporative area extensive. Mesepimeron emergent (Fig. 4). Procoxa with spine; protrochanter unarmed; profemur (Figs 5, 13) incrassate, with 2 rows of spines; protibia slightly curved, with numerous minute tubercles over entire ventral surface; male mesofemur unarmed.

Aedeagus (Figs 10, 19) lacking spines, sperm reservoir well developed, vesica with two membranous lobes partially sclerotized; seminal duct on vesica and gonoporal process distinctly wide; gonoporal process broadened towards apex.

Etymology. This new genus is named after our dear friend Thomas J. Henry (Systematic Entomology Laboratory [SEL], ARS, USDA, c/o National Museum of Natural History, Washington, DC), in honor of his many fundamental contributions to the knowledge of Heteroptera. Besides his brilliant career, Dr. Henry has been a role model to us, always sharing his knowledge and passion for true bugs.

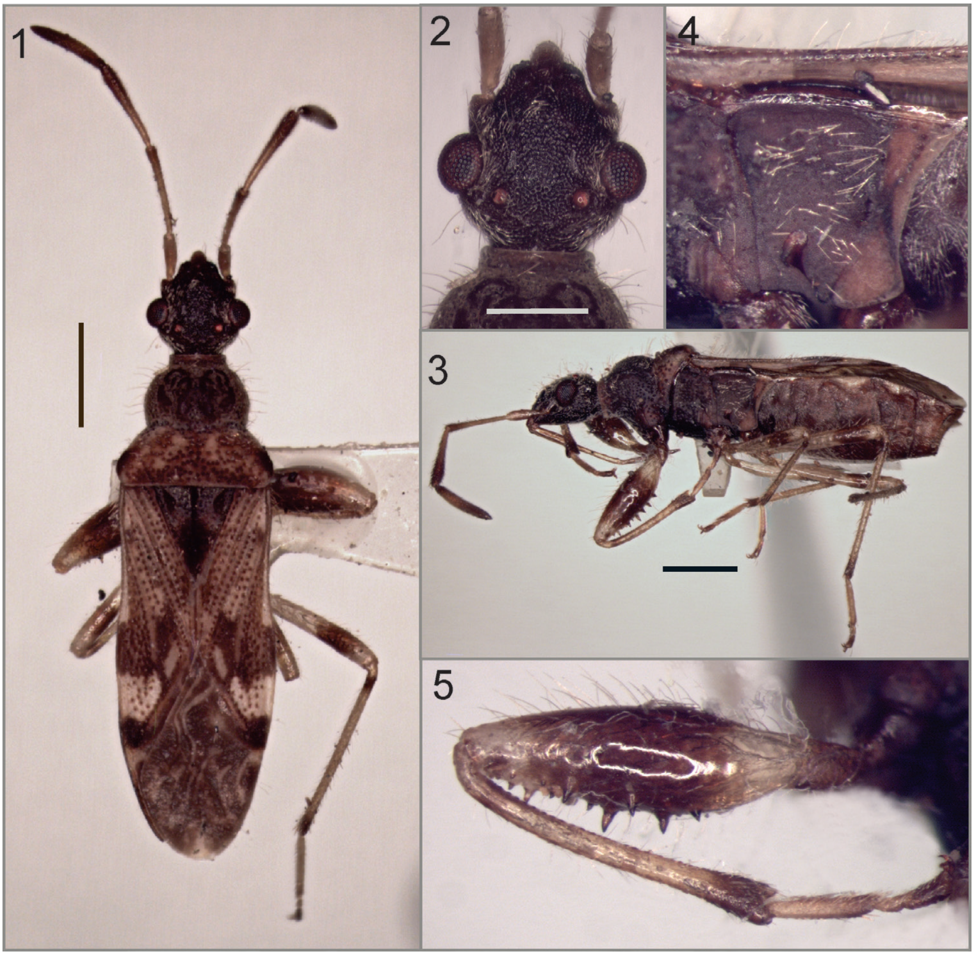
Henryaria thomasi sp. n.

http://zoobank.org/EB39D9B4-8A09-4D47-8E6A-CFCC45D33BE1
Figures 1–10

Material examined. Holotype male, Peru, Satipo, IX-10-1941, P. Paprzychi, J. C. Lutz collection (USNM). Paratype male, same data (USNM). Paratype female, same data, IX-24-1941 (MLP).

Description. ***Male holotype***. Total length 5.89. Head length 1.04, width 1.03. Postocular length 0.29. *Head* (Figs 1–3) reddish brown, clypeus paler; with long erect and semierect setae directed dorsally; ocelli at level of imaginary line across posterior margin of eyes. Interocular space 0.55, interocellar space 0.30. Antennal lengths: scape 0.48, pedicel 0.97, basiflagellomere 0.86, distiflagellomere 1.00. Antennae light brown, with distal region of pedicel and basiflagellomere darker; distiflagellomere with a diffuse paler band basally occupying half of segment; basiflagellomere slightly clavate; with numerous short recumbent setae and sparse erect setae. Labial segment lengths: I 0.62, II 0.66, III 0.38, IV 0.40. Labium light brown with sparse erect setae, surpassing procoxae (Fig. 3).

Thorax: Collar length 0.08, anterior lobe length 0.64, posterior lobe length 0.55; anterior lobe width 1.00, posterior lobe width 1.60. Anterior pronotal lobe dark brown, posterior lobe brown with irregular paler areas, humeral angles darker; with long erect setae on both lobes. Pleurae dark brown, paler on pro- and metaepimeron (Fig. 4); with



Figures 1–5. *Henryaria thomasi* sp. n. **1** dorsal view **2** head **3** lateral view **4** metapleuron **5** anterior leg. Scale bars: 1 mm (**1, 3**); 0.5 mm (**2**).

semierect and erect setae. Scutellum dark brown, with long erect setae. Hemelytron (Fig. 1) with numerous long erect setae; corial margin smooth; clavus light brown; corium irregularly pigmented with darker transverse band across middle and apical region; membrane dark with pale macula at apex, veins partially paler. Coxae, protrochanter, profemur (Fig. 5) except base and apex, distal band on meso- and metafemur, a basal short band on tibiae (diffuse on protibia), tibiae and tarsi distally and pretarsi brown, rest of legs light brown. Femora and tibiae with numerous erect and semierect setae.

Abdomen brown with paler areas on lateral margin of segments V and VI; with numerous recumbent, erect and semierect setae. Male genitalia: Pygophore (Figs 6–7) broadly rounded, anterior margin of dorsal aperture rounded, inner projections produced posteriorly. Parameres: blade relatively short, outer projection broadly rounded (Figs 8–9). Aedeagus (Fig. 10) without spines, vesica with two lobes partially sclerotized; seminal duct on vesica wide; gonoporal process broadened towards apex.

Figures 6–10. *Henryaria thomasi* sp. n. **6–7** Pygophore **6** dorsal view **7** lateral view. **8–9** Parameres **8** inner view **9** outer view. **10** Aedeagus. Scale bars: 0.5 mm (**6, 7, 10**); 0.25 mm (**8, 9**).

Paratypes: As holotype description, except male paratype (Figs 1–2) with distiflagellomere unicolorous; and female paratype with posterior margin of posterior pronotal lobe darker.

Measurements of male and female paratype, respectively: Total length 5.70/5.89. Head length 1.03/1.08, width 0.98/1.03. Postocular length 0.24/0.29. Interocular space 0.55/0.59, interocellar space 0.29/ 0.30. Labial segment lengths: I 0.59/0.65, II 0.66/0.67, III -/0.41, IV -/0.36. Antennal lengths: Scape 0.48/0.48, pedicel 0.92/, basiflagellomere 0.86/-, distiflagellomere 1.01/-. Collar length 0.08/0.08, anterior lobe length 0.65/0.60, posterior lobe length 0.55/0.60; anterior lobe width 1.00/1.04, posterior lobe width 1.52/1.60.

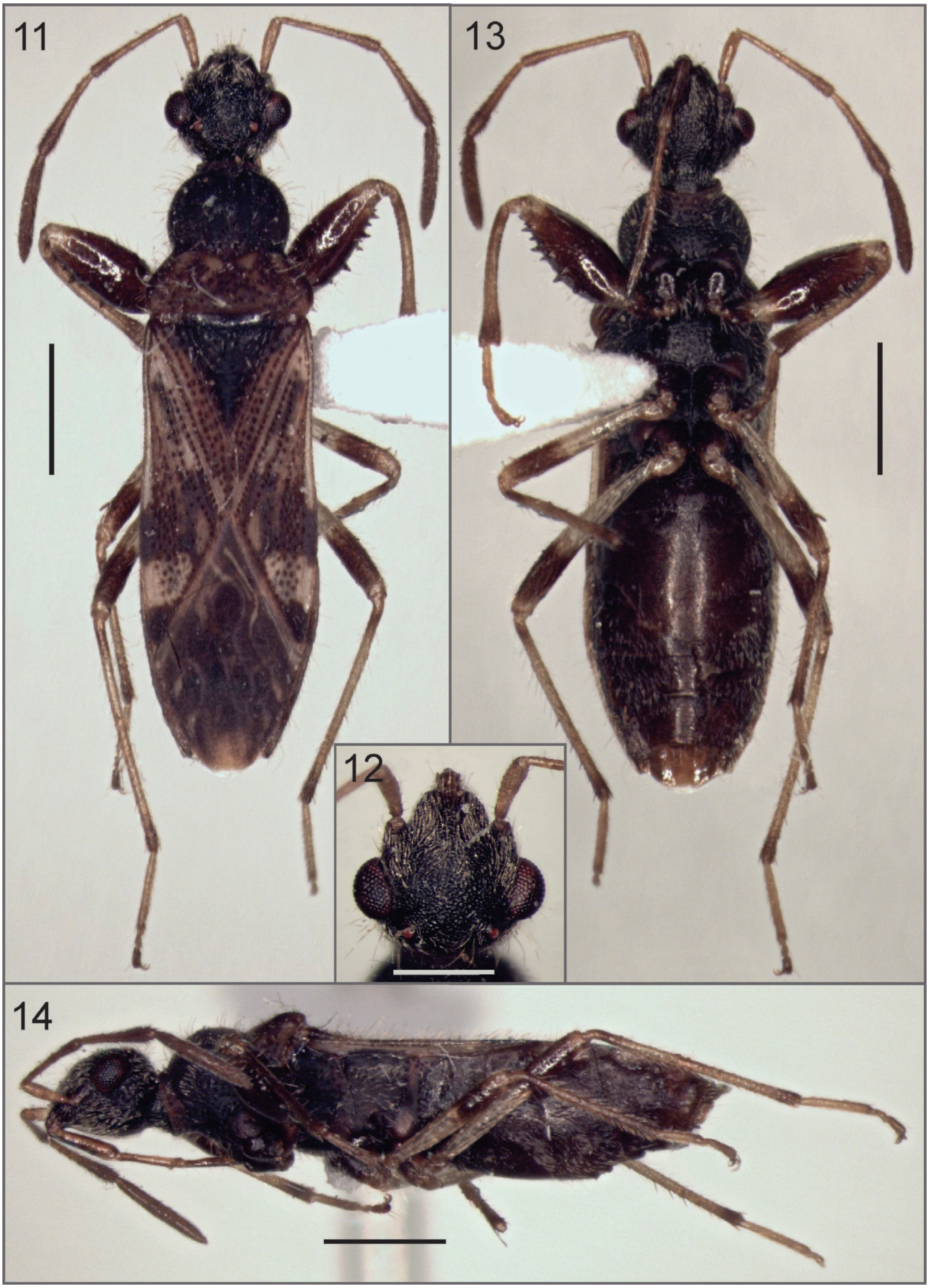
Etymology. We are pleased to dedicate this new species to Thomas Henry in recognition of his invaluable contributions to the knowledge of Heteroptera.

Henryaria zongo sp. n.

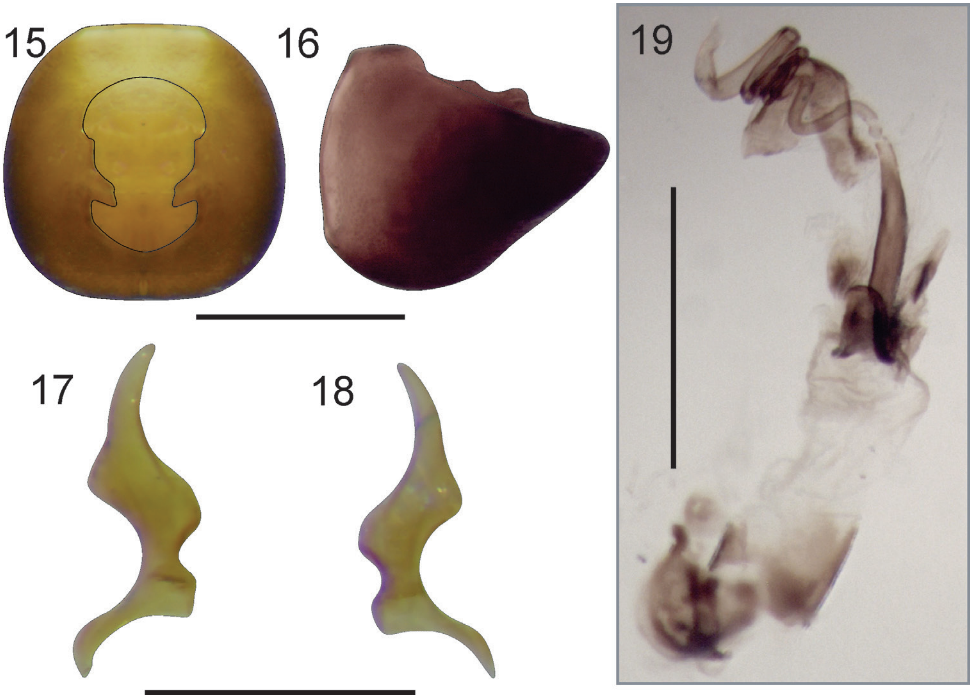
http://zoobank.org/A8259FB9-5161-46A6-9109-8AFF55ADE624

Figures 11–19

Material examined. Holotype male, Bol.[ivia], La Paz, Rio Zongo, 1400 m, 24/30-X-84, L. E. Pena coll. (USNM).



Figures 11–14. *Henryaria zongo* sp. n. **11** dorsal view **12** head **13** ventral view **14** lateral view. Scale bars: 1 mm (**11, 13, 14**); 0.5 mm (**12**).



Figures 15–19. *Henryaria zongo* sp. n. **15–16** Pygophore **15** dorsal view **16** lateral view. **17–18** Parameres **17** inner view **18** outer view. **19** Aedeagus. Scale bars: 0.5 mm (**15, 16, 19**); 0.25 mm (**17, 18**).

Description. ***Male Holotype***. Total length 5.60. Head length 0.94, width 1.04; postocular length 0.24. *Head* (Figs 11, 12, 14) strongly globose; fuscous except clypeous pale brown; with numerous long erect and semierect forward-directed setae, postocular region with same setae but directed backward; eyes oval; ocelli placed just behind imaginary line across posterior margin of eyes. Interocular space 0.62, interocellar space 0.38. Antennal lengths: Scape 0.42, pedicel 0.85, basiflagellomere 0.72, distiflagellomere 0.92. Antennae light brown, distal region of pedicel and basiflagellomere and entire distiflagellomere darker; basiflagellomere slightly clavate; with numerous short recumbent setae and sparse erect setae. Labial segment lengths: I 0.6, II 0.58, III 0.40, IV 0.36. Labium light brown with sparse erect setae, reaching procoxae (Fig. 14).

Thorax: Collar length 0.06, anterior lobe length 0.65, posterior lobe length 0.49; anterior lobe width 1.01, posterior lobe width 1.42. Anterior pronotal lobe fuscous, posterior lobe brown with four irregular light brown maculae (Fig. 11); with long erect setae on both lobes. Pleura dark brown, paler on pro- and metaepimeron; with semierect and erect setae. Scutellum fuscous, with long erect setae. Hemelytron (Fig. 11) with numerous long erect setae; corial margin smooth with numerous setae on anterior half; clavus brown darker basally next to scutellum; corium irregularly pigmented with darker transverse band across middle and apical region; membrane dark with veins partially paler. Coxae, protrochanter, profemur (Fig. 13) except extreme base and apex, distal band on meso- and metafemur, basal band on meso- and metatibia, tibiae distally and pretarsi brown, rest of legs light brown. Femora and tibiae with numerous erect and semierect setae.

Abdomen brown, with numerous recumbent, erect and semierect setae. Male genitalia: Pygophore (Figs 15–16) broadly rounded, anterior margin of dorsal aperture rounded, inner projections produced posteriorly. Paramere: blade relatively long (Figs 17–18) Aedeagus (Fig. 19) without spines, vesica with two lobes partially sclerotized; seminal duct on vesica wide; gonaporal process broadened toward apex.

Etymology. The specific epithet refers to the river where the specimen was collected.

Discussion

Henryaria gen. n. runs to couplet 35 in Harrington's (1980) key to the Myodochini of the world, and to couplet 26 in the key by Henry et al. (2015) to the Neotropical genera of Myodochini. In both keys the genera *Neopamera* Harrington, 1980 and *Orthaea* Dallas, 1852 are recognized. *Neopamera* was erected by Harrington (1980) to include several New World species that lack synapomorphies for the genus. The type species, *N. bilobata* (Say, 1831), has the following character states useful for generic diagnosis: postocular region of head wide not forming neck; male protrochanters with small spine and procoxa with two large spines, and females with profemora less incrassate, trochanters without spines and single spine on procoxa; seminal duct of vesica and gonoporal processes slender. In contrast, the genus *Orthaea* includes large species (Dellapé and Montemayor 2008) ranging from 8.4 to 10.5 mm long. In addition to the slightly elongate head placed at a lower plane than the posterior lobe, as mentioned by Harrington (1980), the species of *Orthaea* are defined by the long scape, at least as long as the head, and the elongated and slightly stout male profemur (Dellapé and Montemayor 2011). Since the key to the Neotropical genera of Myodochini appeared (Henry et al. 2015), two new genera have been described (Dellapé et al. 2016): *Baranowskiobius* Dellapé, Melo and Henry and *Paraheraeus* Dellapé, Melo and Henry. The species included in both genera are larger and more slender (ca. 7 to > 10 mm long), with a postocular region longer than the interocellar length, and less convex, not abruptly constricted, forming a distinct but short neck as in *Henryaria* species.

The two new species included in *Henryaria* are similar in general aspect and color patterns, but they can be distinguished by the shape of the head. *Henryaria zongo* sp. n. presents a shorter and globose head, with a strongly convex dorsal region; the labium is shorter with segment four in resting position between procoxae; and the profemur is more incrassate and almost entirely brown except the extreme base and apex. In contrast, *H. thomasi* sp. n. has a more elongate head; the labium is longer, extending beyond the procoxae; the profemur is less incrassate and the basal and apical pale areas of the profemur are more extended. The male genitalia are similar in both species, but the parameres show differences in the length of the blade (shorter in *H. thomasi*) and in the shape of the inner projection of the dorsal aperture of the pygophore.

Acknowledgements

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Life history of *Mecidea major* with descriptions of nymphal instars (Hemiptera, Heteroptera, Pentatomidae)

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Abstract

The life history of the stink bug *Mecidea major* Sailer was studied in the southern half of New Mexico primarily from January 2005 through December 2007, and the nymphal instars were described. This species was active throughout the year as adults and nymphs, including the winter months. It occurred on various species of grasses during this time but primarily on Lehmann lovegrass, *Eragrostis lehmanniana* Nees; grama grasses, *Bouteloua* spp.; and tobosagrass, *Pleuraphis mutica* Buckley. The times of occurrence and abundance of the eggs, nymphs, and adults suggest this species is bivoltine with the possibility of a third generation. Instars can be distinguished by several morphological features including body size and presence and relative development of wing pads.

Keywords

description, eggs, life history, *Mecidea major*, Pentatomidae

Introduction

The stink bug genus *Mecidea* Dallas (Pentatomidae: Pentatominae: Mecideini), which apparently is associated with xeric and semixeric environments, occurs within the subtropical and adjacent temperate regions of the world (Sailer 1952). This phytophagous genus, which contains 17 species (Sailer 1952, Schuh and Slater 1995), is represented in America north of Mexico by three species: two species, *M. major* Sailer and *M. minor* Ruckes, collectively, occur from the Midwest to California (Sailer 1952, Froeschner 1988, McPherson et al. 2009); the third species, *M. longula* Stål, recently has been found in south Florida (Eger and Dobbs 2010).

Mecidea major ranges from Minnesota (Koch et al. 2014), southern Illinois (McPherson and Vogt 1981), and Missouri west to Arizona (Sailer 1952), and south to Mexico (Thomas 2000). It also has been recorded from Florida (Mead 1988), but Eger and Dobbs (2010) speculated that it probably was an adventitious specimen, perhaps blown in by a hurricane. Little is known about its biology, including its nymphal stages. However, it has been reared in the laboratory (Bundy et al. 2005) and the egg described (Bundy and McPherson 2005).

Mecidea major commonly is found from July to October (Sailer 1952) but has been collected in every month of the year (Sailer 1952, Jones 1993). It apparently is a grass specialist but has been found on both grass and nongrass species (Sailer 1952, Bundy 2004). Host plants include side-oats grama, *Bouteloua curtipendula* (Michaux); sorghum, *Sorghum halapense* (L.); wheat, *Triticum aestivum* L.; "grasses;" spinach, *Spinacia oleracea* L.; cotton, *Gossypium hirsutum* L.; *Senecio* (Sailer 1952); wild oat, *Avena fatua* L.; Bermuda grass, *Cynodon dactylon* (L.); barnyard grass, *Echinochloa crusgalli* (L.); bush muhly, *Muhlenbergia porteri* Beal; *Bromus* sp. (Jones 1993); common oat, *Avena sativa* L.; black grama, *Bouteloua eriopoda* (Torrey); blue grama, *Bouteloua gracilis* Humboldt, Bonpland, & Kunth; common barley, *Hordeum vulgare* L.; foxtail barley, *Hordeum jubatum* L.; mesa dropseed, *Sporobolus flexuosus* (Thurber ex Vasey) Rydberg (Bundy 2004); Wright's three-awn, *Aristida purpurea* Nuttall; tobosagrass, *Pleuraphis mutica* Buckley (Bundy 2004, Bundy and McPherson 2005); Lehmann lovegrass, *Eragrostis lehmanniana* Nees (Jones 1993, Bundy et al 2005); *Baccharis neglecta* Britton (Palmer 1987); guayule, *Parthenium argentatum* Gray (Stone and Fries 1986); and threadleaf snakeweed, *Gutierrezia microcephala* (DC.) A. Gray (as *Zanthocephalum microcephala*) (Foster et al. 1981).

Scattered notes have been published on the field life cycle of *M. major.* Jones (1993) collected second to fifth instars in Arizona on several grass species (e.g., Bermuda grass, Lehmann lovegrass) from early March to early June. He also reported that females caged on potted Lehmann lovegrass (no date given) deposited eggs in two rows of 12–14 at the bases of the stems near the surface of the soil.

During 2003 and 2004 several reproducing populations of *M. major* were found in the southern half of New Mexico on various species of range grasses, primarily on Lehmann lovegrass, *Eragrostis lehmanniana*; grama grasses, *Bouteloua* spp.; and tobosagrass, *Pleuraphis mutica*. The number of bugs and presence of various instars suggested that the populations were large enough for a life history study including descriptions of the instars. Presented here are the results of that study.

Materials and methods

Life history

The field study was conducted in Las Cruces (Doña Ana Co.), New Mexico, from January 2005 through December 2007, supplemented with additional observations in spring and summer of 2017. Two field sites (site 1: 32°20'55.5"N, 106°44'28.8"W, altitude 1202 m; site 2: 32°19'35.2"N, 106°45'10.4"W, altitude 1252 m) were selected: vegetation at site 1 was predominately Lehmann lovegrass with scattered populations of tobosagrass and grama grasses; that at site 2 was Lehmann lovegrass and Bermuda grass.

Weekly sampling was initiated at both sites in late January 2005 and continued through mid-December 2007. Approximately six sets of 25 sweeps were taken with a sweep net (38 cm diam.) at each site per date, counts of nymphs and adults recorded when possible, and the animals released. Specimens that could not be determined to instar(s) were preserved in 80% ethanol (EtOH) for closer examination in the laboratory. Eggs were recorded from visual observations. Representative samples of the eggs and nymphs were preserved in 80% EtOH and examined in the laboratory to spot-check field determinations. During each collecting trip, observations were made on the bugs' activities and development on host plants. Life history data on reproduction and development for the 3 years of this study, plus the observational data from 2017 noted above, were combined to gain a better understanding of the annual life cycle.

Descriptions of immature stages

The egg previously has been described by Bundy and McPherson (2005). The description of each instar is based on ten field-collected individuals. Nymphs were selected from field samples preserved in 80% EtOH that had been collected earlier for spot-checking of instars. Drawings were made on a light box using digital photographs taken through a dissecting microscope. Measurements (in millimeters) were made with an ocular micrometer.

Statistics

Measurements are expressed as means ± SE; standard errors <0.005 are listed as 0.00.

Voucher specimens

Samples of instars have been vouchered in the New Mexico State Arthropod Collection in Las Cruces, NM.

Results and discussion

Life history

This species was active through the year, including the winter months (Figs 1, 2). Adults, eggs, and all instars were collected in October and November but only adults, fourths, and fifths in December. However, all stages, including eggs, were found in January. This strongly suggests that only older individuals (adults, 4ths, and 5ths) successfully overwintered and produced the younger instars (1sts–3rds) found in January.

Eggs (*n* = 86, nine clusters, ≈10 eggs per cluster [9.6 ± 3.19; range 3–14]) were collected sporadically from early January to late November (Figs 1, 2). They were laid in regular alternating double rows of 3 to 14 eggs, on the undersides of leaves, flowers, and maturing heads of *E. lehmanniana*. As with many other pentatomids, eggs were glued to one another and to the substrate. They were yellowish white when deposited, cream-colored after 1–3 days, and light brown at maturity. Eyespots were visible in 4–5 days. The egg burster was visible within 2–3 days of hatching (Bundy and McPherson 2005).

The first instars (a non-feeding stage) were collected in January, April, July, September, and October (*n* = 5); the sample size was low because first instars are small and tend to cluster. The second-fifth instars were collected almost continuously from January into November (second and third instars) and December (fourth and fifth instars) (Figs 1, 2). All five instars were found on *E. lehmanniana*, *P. mutica*, *C. dactylon*, and *Bouteloua* spp.

The number of generations per year in this species is difficult to determine because of the marked overlap of the times of occurrences of the instars and the generations and the lack of definite peaks in abundance during each generation. Based on the early presence of all stages in the field (January), all stages might have overwintered. However, it is more likely that adults, fourth, and fifth instars, which were collected in December, overwintered, whereas eggs and first–third instars began development in January. In either scenario, the result would be spring and summer generations, with the summer generation reaching adults in the fall. If these adults did not reproduce during late fall, this would represent a bivoltine species. However, if adults produced some offspring in the fall that overwintered, this would represent a partial third generation. We believe a partial third is more likely for southern New Mexico. Specimens collected in 2017 supported the life history data from the 2005–2007 study.

Descriptions of immature stages

Egg. See description in Bundy and McPherson (2005) and Bundy et al. (2005).

Instars. The first instar is described in detail, but only major changes from previous instars are described for subsequent instars. Length was measured from the apices of the tylus and juga to the apex of abdomen (two measurements), and width across the

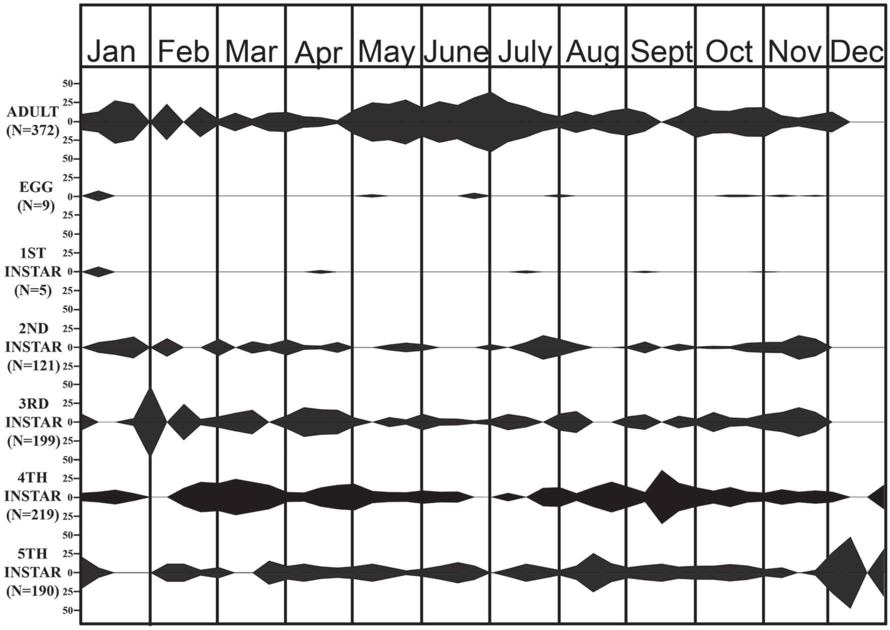


Figure 1. Field life cycle of *M. major*. Percentage in each sample of individuals of each stage collected during 2005-2007 in Las Cruces, NM. Beginning and end points of each shaded area represent sample dates preceding and following collections of specimens, respectively.

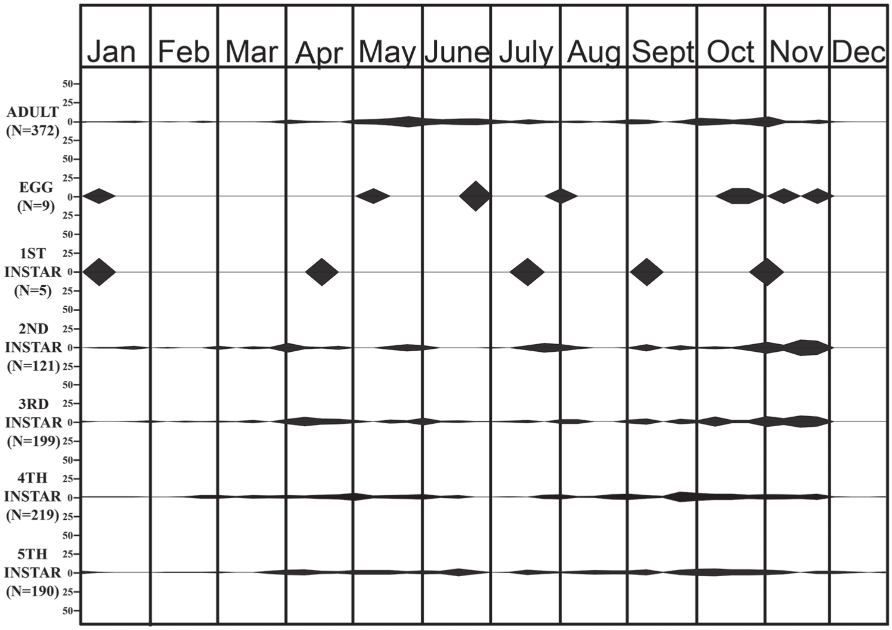


Figure 2. Field life cycle of *M. major*. Percentage in each sample of total individuals of same stage collected during 2005-2007 in Las Cruces, NM. Beginning and end points of each shaded area represent sample dates preceding and following collections of specimens, respectively.

Table 1. Measurements (means ± SE, mm) of *Mecidea major* instars[a].

	Nymph				
	First instar	**Second instar**	**Third instar**	**Fourth instar**	**Fifth instar**
Body length[b]	1.18±0.03	2.06±0.03	3.17±0.07	4.51±0.15	7.62±0.17
Body length[c]	1.16±0.03	2.02±0.03	3.16±0.06	4.53±0.15	7.78±0.17
Head length[d]	0.49±0.01	0.59±0.01	0.76±0.01	1.05±0.01	1.35±0.01
Head length[e]	0.44±0.01	0.54±0.01	0.74±0.01	1.09±0.01	1.49±0.02
Thorax width[f]	0.68±0.02	0.92±0.02	1.31±0.01	2.00±0.04	2.92±0.06
Abdomen width[g]	0.72±0.03	1.09±0.02	1.75±0.04	2.40±0.09	2.99±0.11
Width across eyes	0.50±0.01	0.66±0.01	0.82±0.01	1.12±0.01	1.45±0.02
Synthlipsis	0.38±0.00	0.48±0.01	0.58±0.01	0.79±0.01	0.97±0.02
Antennal segments					
First	0.10±0.00	0.16±0.00	0.24±0.01	0.33±0.01	0.45±0.01
Second	0.18±0.00	0.42±0.01	0.65±0.01	1.06±0.02	1.65±0.05
Third	0.14±0.00	0.30±0.01	0.44±0.01	0.65±0.01	0.93±0.02
Fourth	0.28±0.01	0.42±0.01	0.50±0.01	0.67±0.01	0.83±0.01
Labial segments					
First	0.13±0.00	0.22±0.00	0.31±0.01	0.44±0.01	0.62±0.02
Second	0.19±0.02	0.39±0.00	0.50±0.01	0.73±0.01	1.02±0.02
Third	0.14±0.00	0.22±0.01	0.30±0.01	0.36±0.01	0.51±0.01
Fourth	0.18±0.00	0.27±0.01	0.32±0.00	0.41±0.01	0.57±0.01
Notal lengths[h]					
Pronotum	0.12±0.00	0.22±0.01	0.34±0.01	0.54±0.01	0.94±0.02
Mesonotum	0.08±0.00	0.16±0.00	0.32±0.00	0.66±0.01	1.33±0.04
Metanotum	0.03±0.00	0.04±0.00	0.05±0.01	0.07±0.00	0.04±0.00
Leg lengths					
Protrochanter	0.12±0.00	0.16±0.01	0.20±0.01	0.30±0.01	0.42±0.01
Profemur	0.26±0.01	0.45±0.01	0.63±0.01	0.99±0.01	1.46±0.04
Protibia	0.31±0.01	0.53±0.02	0.74±0.01	1.10±0.02	1.61±0.03
Protarsus	0.22±0.00	0.28±0.01	0.36±0.01	0.52±0.02	0.75±0.02
Protarsomeres[i]					
First	0.08±0.00	0.11±0.00	0.16±0.01	0.25±0.01	0.39±0.01
Second	0.18±0.00	0.22±0.01	0.26±0.00	0.35±0.01	0.48±0.01
Mesotrochanter	0.12±0.00	0.16±0.01	0.21±0.01	0.27±0.01	0.40±0.02
Mesofemur	0.28±0.01	0.45±0.02	0.59±0.01	0.89±0.01	1.27±0.02
Mesotibia	0.31±0.01	0.53±0.02	0.73±0.01	1.05±0.02	1.53±0.03
Mesotarsus	0.22±0.00	0.29±0.01	0.37±0.01	0.50±0.01	0.70±0.01
Mesotarsomeres[i]					
First	0.08±0.00	0.11±0.00	0.17±0.01	0.23±0.00	0.35±0.01
Second	0.18±0.00	0.22±0.01	0.27±0.00	0.34±0.01	0.44±0.01
Metatrochanter	0.12±0.00	0.15±0.01	0.21±0.01	0.32±0.01	0.44±0.01
Metafemur	0.29±0.01	0.51±0.01	0.92±0.02	1.14±0.03	1.86±0.03
Metatibia	0.37±0.01	0.66±0.02	0.36±0.01	1.44±0.03	2.19±0.04
Metatarsus	0.23±0.00	0.27±0.01	0.36±0.01	0.52±0.01	0.75±0.02
Metatarsomeres[i]					
First	0.08±0.00	0.12±0.00	0.16±0.00	0.24±0.00	0.38±0.01
Second	0.18±0.00	0.22±0.01	0.27±0.00	0.35±0.01	0.47±0.01

[a] Measurements based on 10 individuals per instar.

[b] Measured from apex of tylus to apex of abdomen with head in normal declivent position.

[c] Measured from apex to juga (often exceeding tylus) to apex of abdomen with head in normal declivent position.

[d] Measured from apex of tylus to apex of head in horizontal position.

[e] Measured from apex of juga to apex of head in horizontal position.

[f] Measured across mesonotum.

[gf] Measured across abdominal segments 3–4 .

[h] Measured across midline.

[i] Total length of measured segments > overall length because of curvature.

mesonotum or abdominal segments 3–4, whichever was widest (both measurements shown). Additional measurements are given in Table 1.

First Instar **(Fig. 3).** Length, 1.18 ± 0.03 (1.16 ± 0.03); width, 0.72 ± 0.03 (0.68 ± 0.02). Body elliptical, becoming more elongate during stadium; widest at abdominal segments 2–4; yellowish brown, or yellowish brown with head and thorax brown.

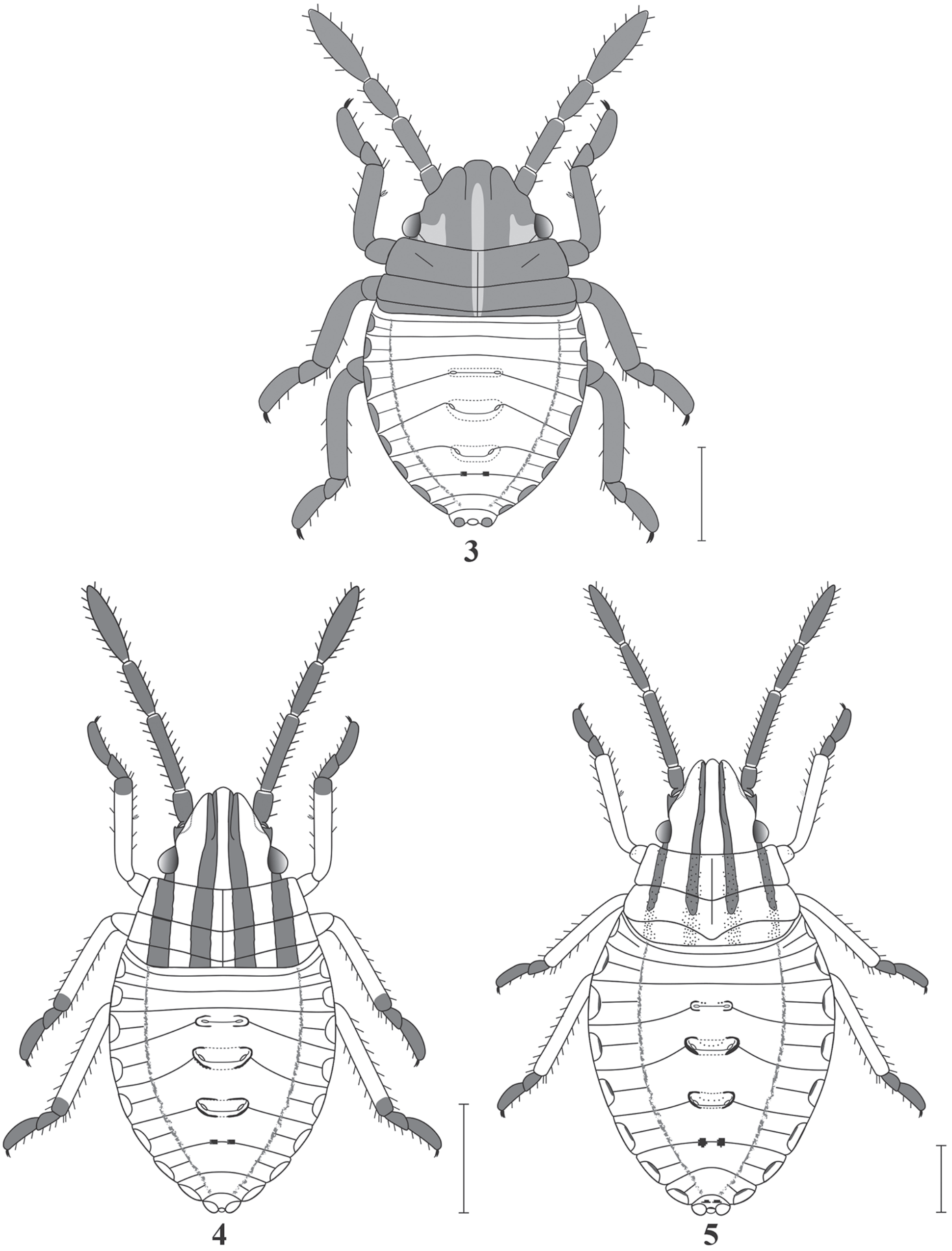
Head yellowish brown to light brown, often with two broad, dark brown, longitudinal stripes submedially, running from apex of tylus to near or reaching posterior margin of head; yellowish-brown region mesad of eye, sometimes extending posteromedially to posterior margin of head and merging medially with that of other side; head declivent, anterolateral margins sinuate; tylus distinctly exceeding juga in length. Antennae 4-segmented, often concolorous with head; dorsal surface of segment 2 with dorsomedial surface not carinate, rounded in cross section; apical segment longest, fusiform; ratio of antennal segment lengths ≈1:1.8:1.4:2.8. Labium 4-segmented, generally concolorous with head, segment 4 often darker, particularly distally.

Thoracic nota yellowish brown to darker laterally; faint yellowish medial stripe present; dark brown longitudinal stripes absent. Pro- and mesonota completely sclerotized, medial areas weakly extended posteriorly, posterior margins straight either side of midline. Metanotum sclerotized only in anterior 1/2, forming plate, this plate narrowed medially, posterior margin straight; posterior margin of segment (i.e., membranous area) also straight; mediolongitudinal line extending from anterior margin of pronotum to posterior margin of metanotal plate. Ratio of pro-, meso-, and metanota (sclerotized and membranous portions combined) ≈1:0.7:0.3. Pleura and sterna brown to yellowish brown. Legs concolorous with body except for distal tip of tarsomere 2, which may be dark brown.

Abdomen yellowish brown dorsally with thin brownish sublateral longitudinal stripe either side and, often, with reddish markings. Faint brown medial (3–4) and lateral (9) plates present: medial plates poorly defined; plate 1 obscure, narrow, rectangular, plates 2–3 subquadrate, plate 4, when present, minute, paired, oval; plates 1–3 each with paired ostioles; lateral plates extending dorsally and ventrally from lateral edge of abdomen: plate 1 rounded dorsally; plates 2 – 9 subquadrate; faint pseudointersegmental lines present mesad of lateral plates 1–8. Ventral surface mostly concolorous with corresponding dorsal surface, ventral extensions of lateral plates similar to dorsal extensions. Abdominal spiracles on segments 2–8, each near lateral margin of corresponding segment. Single trichobothrium (primary trichobothrium) posteromesad of each spiracle on segments 3–7, arising from dark brown sclerite.

Second Instar **(Fig. 4).** Length, 2.06 ± 0.03 (2.02 ± 0.03); width, 1.09 ± 0.02 (0.92 ± 0.02). Body more elongate.

Head, dorsally, with pair of distinct dark submedial stripes, extending from inner margin of juga (and outer margin of tylus) to posterior margin of metanotum; short lateral dark stripe extending from near antenniferous tubercle through eye to posterior margin of head, anterolateral margins straight to weakly sinuate (depending upon angle of view); tylus distinctly longer than juga. Dorsal surface of antennal segment 2 with dorsomedial surface not carinate, rounded in cross section; ratio of antennal segment lengths ≈1:2.6:1.9:2.6.



Figures 3–5. 3 First instar of *M. major* (dorsal view) **4** Second instar of *M. major* (dorsal view) **5** Third instar of *M. major* (dorsal view). Scale bars: 0.5 mm.

Thorax, dorsally, with pair of distinct sublateral dark brown stripes in addition to submedial pair. Pro- and mesonota with medial areas moderately extended posteriorly, posterior margins straight either side of midline. Ratio of pro-, meso-, and metanota ≈1:0.7:0.2.

Pleural area light brown with one to two longitudinal stripes, one dorsopleural, the other ventropleural; dorsopleural stripe always present, extending from posterior margin of head to posterior margin of thorax, a much narrower ventropleural stripe occasionally present (absent in lighter individuals) adjacent to coxae, paralleling dorsopleural stripe. Tarsi dark brown, often extending to distal portion of femur in dark individuals.

Abdomen, dorsally, with medial plates more heavily sclerotized; plates 1–3 with lateral/sublateral margins dark brown extending mediad, in darker specimens, extensions of plates 2–3 may reach almost to the midline; plate 4 present, slightly larger. Ventrally, sclerite surrounding each primary trichobothrium larger. Second, smaller trichobothrium (secondary trichobothrium) present on segments 3–7, adjacent to and slightly laterad of primary trichobothrium, each arising from dark brown sclerite, sclerite smaller than that associated with primary trichobothrium. Otherwise, like first instar.

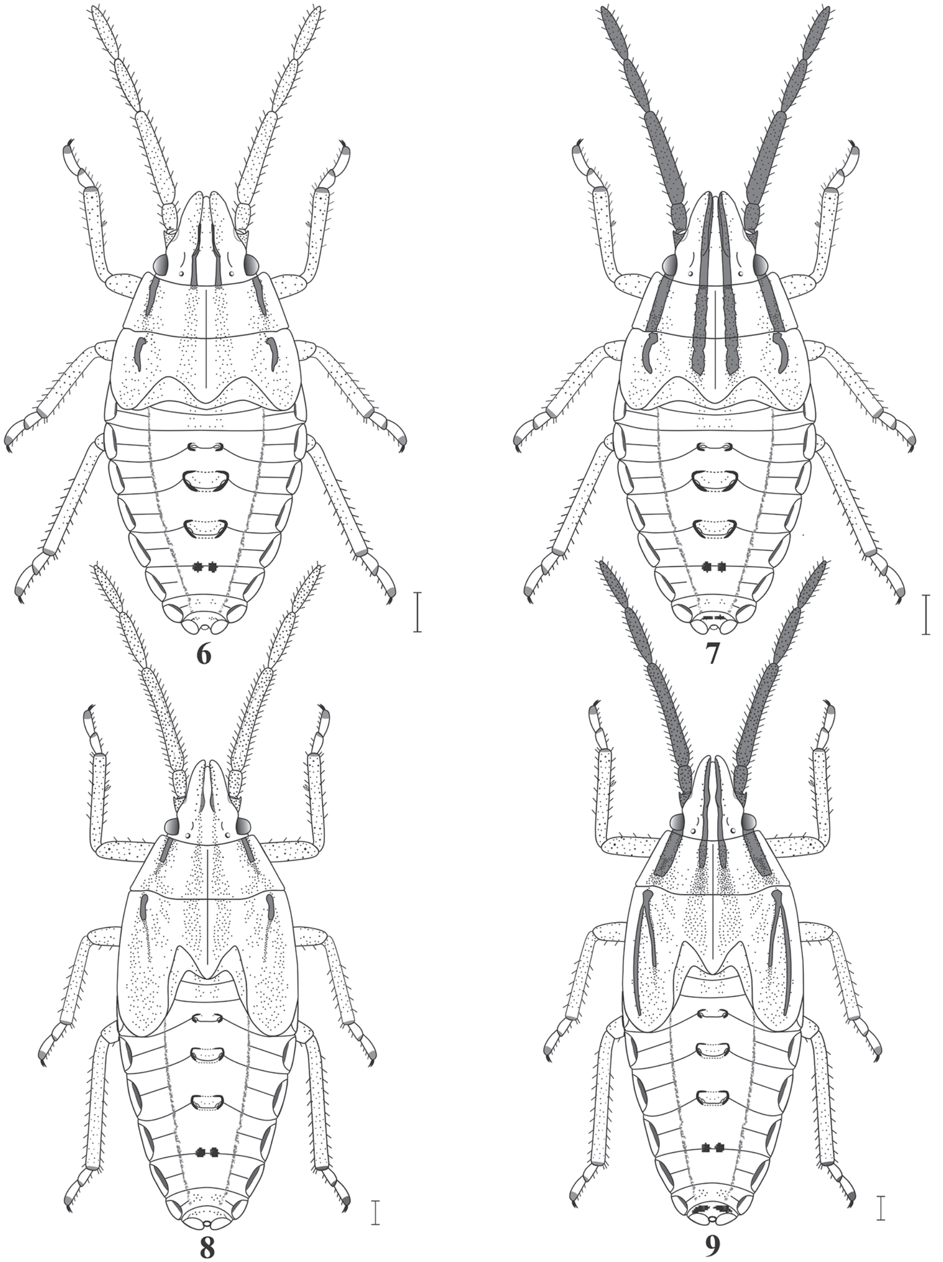
***Third Instar* (Fig. 5).** Length, 3.17 ± 0.07 (3.16 ± 0.06); width, 1.75 ± 0.04 (1.31 ± 0.01). Head with juga and tylus subequal in length. Dorsal surface of antennal segment 2 with dorsomedial surface carinate, segment subtriangular in cross section, slightly widening basally; ratio of antennal segment lengths ≈1:2.7:1.8:2.1.

Mesonotum with medial area strongly extended posteriorly, posterior margin rounded medially, weakly arcuate laterally; mediolongitudinal line faint, usually extending from anterior margin of pronotum to near posterior margin of mesonotum. Submedial and sublateral stripes less distinct, often broken or reduced to a series of punctures, particularly caudad. Ratio of pro-, meso-, and metanota ≈1:0.9:0.1. Pleura with ventropleural stripe absent, region concolorous with thorax.

Abdomen with lateral plates, dorsally and ventrally, often darkly pigmented along lateral margins. Ventrally, sclerites surrounding primary trichobothria larger, often evident as distinct spots in darker specimens. Otherwise, like second instar.

***Fourth Instar* (Figs 6, 7)**. Length, 4.51 ± 0.15 (4.53 ± 0.15); width, 2.40 ± 0.09 (2.00 ± 0.04). Two color forms present, one light , one dark. Head with juga exceeding tylus in length. Ocelli visible between compound eyes. Dorsally, submedial brown stripes of head, nota, and sublateral stripes of nota further reduced to punctures; dark punctures generally more diffuse, particularly on wing pads. Antennal segments 1–4 with brown punctures, ground color of lighter specimens concolorous with head; antennal segment 2 more widening basally; ratio of antennal segments ≈1:3.2:2:2. Mesonotum with posterior margin rounded medially, strongly arcuate laterally; wing pads evident, extending to abdominal segment 2. Metanotal wing pads evident but not as well defined as anterior pair. Ratio of pro-, meso-, and metanota ≈1:1.2:0.1. Legs generally concolorous with thorax, dark areas often reduced to tips of tarsomeres. Pleura with dorsopleural stripe present as a curved brown line laterally per segment, each enclosing a series of brown spots. Abdomen, dorsally, often with an irregular series of transverse spots submedially on segments 8–9, particularly in dark forms. Ventrally, sclerite surrounding each primary trichobothrium larger, usually evident as distinct spot; dark forms often with dark brown median longitudinal spots on one or more segments. Otherwise, like third instar.

***Fifth Instar* (Figs 8, 9)**. Length, 7.62 ± 0.17 (7.78 ± 0.17); width, 2.99 ± 0.11 (2.92 ± 0.06). Two color forms present, one light, one dark. Body widest at mesonotum. Antennal segments more heavily punctate; ratio of antennal segments ≈1:3.7:2.1:1.8.



Figures 6–9. 6 Fourth instar of *M. major*, light form (dorsal view) **7** Fourth instar of *M. major*, dark form (dorsal view) **8** Fifth instar of *M. major*, light form (dorsal view) **9** Fifth instar of *M. major*, dark form (dorsal view) Scale bars: 0.5 mm.

Thorax, dorsally, with punctures more numerous and diffuse; wing pads well developed, mesonotal pads extending to abdominal segments 3–4, metanotal pads ≈same length. Ratio of pro-, meso-, and metanota ≈1:1.4:0.04. Otherwise, like fourth instar.

Diagnosis

The five instars are readily distinguishable by characters other than differences in body size. The first instar differs from later instars by the absence of distinct dorsal submedial and sublateral longitudinal stripes on the nota; the thoracic pleura, which are completely brown and lack stripes; and the presence of a single trichobothrium posteromesad of each spiracle on segments 3–7. Older instars have distinct submedial and sublateral stripes on the nota, the thoracic pleura usually have two longitudinal stripes, one dorsal, one ventral; and two trichobothria are present posteromesad of each spiracle on abdominal segments 3–7. The second instar can be distinguished from older instars by the juga, which exceeds the length of the tylus; the dorsal surface of antennal segment 2, which is rounded; the posterior margin of the mesonotum, which is moderately extended medially, straight either side of midline; and the presence of two well-developed thoracic pleural stripes, which are unbroken. Older instars have the juga equal to or longer than the tylus; the dorsal surface of antennal segment 2 is carinate; the posterior margin of the mesonotum is strongly extended medially, arcuate laterally; and the thoracic pleural stripes are broken. The third instar can be distinguished from the fourth and fifth instars by the juga and tylus, which are equal in length, posterior margin of mesonotum, which is weakly arcuate laterally, and by the lack of wing pads. The fourth and fifth instars have the juga distinctly longer than the tylus, posterior margin of the mesonotum is strongly arcuate laterally, and the wing pads that are easily discernible. The fourth and fifth instars can be distinguished by the lengths of the wing pads, which reach abdominal segment 2 in the fourth and abdominal segments 3 or 4 in the fifth.

Acknowledgments

It is with a great deal of pleasure that we dedicate this paper to Dr. Tom Henry on the occasion of his 70th birthday in recognition of his outstanding contributions to our understanding of the systematics and bionomics of the Heteroptera, particularly the Miridae. He has been an avid researcher, authoring numerous papers of high quality and importance. Tom has been a close friend and colleague for many years, always willing to help facilitate our research in any way possible. We offer him our thanks, appreciation, and respect for all that he has done during his career. We also thank the New Mexico State Agricultural Experiment Station, Las Cruces, for partially funding this research.

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Review of the Neotropical genus *Rhyncholepta* with descriptions of three new species-group taxa (Hemiptera, Heteroptera, Pentatomidae)

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Abstract

The genus *Rhyncholepta* Bergroth, 1911 (Hemiptera: Heteroptera: Pentatomidae: Pentatominae: Chlorocorini) is redescribed and five species-group taxa are recognized, keyed, their diagnostic characters illustrated, and the distribution reviewed. Among the five taxa, two species and one subspecies are recognized as new: *Rhyncholepta grandicallosa grandicallosa* Bergroth, 1911 (Brazil, Ecuador, French Guiana, Guyana, Peru, Suriname), *Rhyncholepta grandicallosa centroamericana* **subsp. n.** (Belize, Costa Rica, Guatemala, Mexico, Panama), *Rhyncholepta henryi* **sp. n.** (French Guiana), *Rhyncholepta meinanderi* Becker & Grazia-Vieira, 1971 (Bolivia, Brazil, Ecuador, Peru), and *Rhyncholepta wheeleri* **sp. n.** (Guyana). The structure of the male genital capsule was found to be the only reliable character for identifying species-group taxa. For this reason, a simultaneous application has been submitted to the International Commission on Zoological Nomenclature to set aside the non-informative female lectotype of *Rhyncholepta grandicallosa grandicallosa* and replace it with the male neotype suggested herein. Based on the available label data and our field experience, most of the specimens were collected by various types of light traps in or near dense forests. Adults can be collected throughout the year.

Keywords

distribution, Hemiptera, Heteroptera, key, Neotropical Region, new species, new subspecies, new record, Pentatomidae, phenology, taxonomy

Introduction

Bergroth (1911) described a new pentatomid genus, *Rhyncholepta* Bergroth, 1911, which included the new species *Rhyncholepta grandicallosa* Bergroth, 1911, from French Guiana. He originally placed *Rhyncholepta* in the subfamily Arminae (currently valid name Asopinae) because of a habitus superficially similar to that of members of the asopine genera *Apateticus* Dallas, 1851 and *Podisus* Herrich-Schaeffer, 1851, and also listed several structural differences including the eponymous slender rostrum (Bergroth 1911, 1914), which actually excludes it from that subfamily. Bergroth (1914) provided an excellent color painting of *Rh. grandicallosa*. The genus *Rhyncholepta* was not mentioned during the following decades until Pirán (1956), who reported a male from Bolivia, provided a line drawing of the abdominal apex and the genital capsule in ventral view, and erroneously designated it as the allotype of *Rh. grandicallosa*. Becker and Grazia-Vieira (1971) first studied this genus in detail including descriptions of the external and internal genitalia of both sexes and distinguished two species, *Rh. grandicallosa* (interpretation based on examination of the female primary type) and a new species, *Rh. meinanderi* Becker & Grazia-Vieira, 1971 (= *Rh. grandicallosa* sensu Pirán). They transferred *Rhyncholepta* from the Asopinae to the Pentatominae, tribe Pentatomini, indicating that the genus is probably related to *Loxa* Amyot & Serville, 1843, and *Fecelia* Stål, 1872 (cf. Thomas 1992). Despite the transfer of *Rhyncholepta* to the Pentatominae, the genus was omitted in keys to the pentatomine genera of the New World (cf. Rolston and McDonald 1981, 1984; Rolston et al 1980). *Rhyncholepta* since has been included in a generic key by Torres Gutiérrez (2005), and several authors have provided new distributional records or checklists from Honduras, Panama, Colombia, Venezuela, Brazil and Peru (Grazia 1984, Froeschner 1999, Arismendi and Thomas 2003, Arnold 2011, Castro-Huertas et al. 2015, Cambra et al. 2018, Rider et al. 2018, Silva et al. 2018). Greve et al. (2013) included *Rh. grandicallosa*, along with *Loxa deducta* Walker, 1867 and *Mayrinia curvidens* (Mayr, 1864), as out-groups in their cladistic analysis of *Chloropepla* Stål, 1867, considering them closely related (based mainly on the presence of the hypandrium on the ventral wall of the genital capsule). The hypothesized relationship of *Rhyncholepta* with the allied genera was formalized by the description of the tribe Chlorocorini Rider, Greve, Schwertner & Grazia, 2018 (in Rider et al. 2018), including *Arvelius* Spinola, 1837, *Chlorocoris* Spinola, 1837 (with 3 subgenera: *Arawacoris* Thomas, 1998, *Chlorocoris*, and *Monochrocerus* Stål, 1872), *Chloropepla*, *Eludocoris* Thomas, 1992, *Fecelia*, *Loxa*, and *Mayrinia* Horváth, 1925.

Our examination of representative material of 1125 specimens of *Rhyncholepta* collected in the last few decades revealed a very complicated situation in this genus. We distinguish five species-group taxa based on the structure of the genital capsule of the male. The existence of two morphologically nearly identical species syntopic in the area of French Guiana (type locality of *Rh. grandicallosa*) required reinterpretation of the taxon *Rh. grandicallosa*. Females, however, are insufficiently informative to serve this purpose; therefore, we selected a male candidate neotype for *Rh. grandicallosa grandicallosa* Bergroth, 1911, and we are asking the International Commission on Zoological Nomenclature to set aside the non-informative female lectotype (Kment et al., submitted).

Materials and methods

Labels of the name-bearing types are quoted verbatim. A slash (/) is used to divide data on different lines of one label, a double slash (//) to divide data on different labels, and authors' comments are given in square brackets [ ]. Label data of paratypes and other non-type material are provided in standardized format.

The following dimensions were measured: total body length (from apex of mandibular plates to apex of membrane, in dorsal view), body length to segment VII (from apex of mandibular plates to apices of segment VII, in dorsal view), head length (from apex of mandibular plates to anterior margin of pronotum, in anterodorsal view, i.e. with surface of the head parallel with the plane of focus), head width (maximum width across eyes, in anterodorsal view), interocular width (between inner margins of compound eyes, in anterodorsal view), length of each antennal segment (maximum length), pronotum length (medially, in most exposed – i.e., anterodorsal – view), pronotum width (maximum width including humeral processes, in dorsal view), scutellum length (medially from base to apex, in dorsal view), and scutellum width (maximum width at base, in dorsal view). Measurements are presented, in millimeters, as median and minimum-maximum range.

Uncoated specimens were examined by a Hitachi S-3700N environmental scanning electron microscope at the Department of Palaeontology, National Museum, Prague. Habitus photographs were taken in National Museum in Prague using a Canon MP-E 65 mm macro lens attached to a Canon EOS 550D camera and stacked from multiple layers using the Helicon Focus 5.1 Pro software. Photos by Joe Eger were taken and edited using Auto-Montage™ software (Syncroscopy, Cambridge, UK) at the Florida State Collection of Arthropods, Gainesville, FL.

Morphological terminology mostly follows Tsai et al. (2011), Tsai and Rédei (2014), Kment (2015), Kment et al. (2016) and Rédei (2017). Parts of the thoracic efferent system of the metathoracic scent glands are named in accordance with Kment and Vilímová (2010). The nomenclature of antennomeres follows Zrzavý (1990): scape (I), pedicel subdivided into basipedicellite (IIa) and distipedicellite (IIb), basiflagellum (III) and distiflagellum (IV).

The distribution maps were processed in QGIS 2.18 (qgis.org/en/site/forusers/download.html) using the geographic co-ordinates provided on labels or acquired subsequently using Google; the latter are given in square brackets.

The material examined or cited is deposited in the following collections:

BMNH	The Natural History Museum, London, United Kingdom
DARC	David A. Rider collection, Fargo, North Dakota, USA
DBTC	Donald B. Thomas collection, Edinburgh, Texas, USA
FSCA	Florida State Collection of Arthropods, Gainesville, Florida, USA
HNHM	Hungarian Natural History Museum, Budapest, Hungary
INBIO	Instituto Nacional de Biodiversidad, San José, Costa Rica
INPA	Instituto Nacional de Pesquisas da Amazonia, Manaus, Amazonas, Brazil
IZAV	Instituto de Zoologia Agricola, Universidad Central de Venezuela, Maracay, Venezuela

JEEC	Joe E. Eger collection, Tampa, Florida, USA
MMBC	Moravian Museum, Brno, Czech Republic
MNHN	Muséum national d'Histoire naturelle, Paris, France
MZHF	Finnish Museum of Natural History, Helsinki, Finland
NHMW	Naturhistorisches Museum in Wien, Vienna, Austria
NMPC	National Museum, Prague, Czech Republic
RLFF	Roland Lupoli collection, Fontenay-sous-Bois, France
USNM	Smithsonian Institution, National Museum of National History, Washington, D.C., USA
ZJPC	Zdeněk Jindra collection, Prague, Czech Republic

Taxonomy

Rhyncholepta Bergroth, 1911

Rhyncholepta Bergroth, 1911: 120–121 (description, differential diagnosis). Type species: *Rhyncholepta grandicallosa* Bergroth, 1911, by monotypy.

Rhyncholepta: Becker and Grazia-Vieira (1971): 391–393 (redescription, taxonomy, distribution); Rolston (1987): 64 (morphology: lack of parameres); Froeschner (1999): 185 (checklist); Torres Gutiérrez (2005): 70–71, 84, 95: fig. 4.42, 109, 114–115, 118 (diagnosis, key to genera, distribution, record, habitus photo); Greve et al. (2013): 2, 3, 5, 12: fig. 4L, 14, 16: fig. 64 (cladistic analysis, morphology of male genitalia); Cambra et al. (2018): 13, 17: fig. 37 (list, habitus photo); Rider et al. (2018): 66, 81, 110, 190: fig. 2.21 (tribal placement).

Redescription. ***Coloration.*** Dorsal surface of body (Figs 1, 3, 5–8) reddish to reddish brown with large callosities on anterolateral region of pronotum and anterolateral angles of scutellum, small callosity at apex of scutellum, and entire connexiva yellowish (in living specimens phosphorous greenish yellow); impunctate spot on corium appears more or less yellowish red according to specimen. Dorso- and ventrolateral margins of mandibular plates each with a narrow black stripe, head along inner margin of compound eyes with fine black line in some specimens. Scutellum ante-apically with black V-shaped spot which may be reduced to a small black dot on each side of the apex (Figs 14–25). Antennae and legs yellowish (sometimes slightly reddish), apices of basi- and distiflagellum sometimes contrastingly red or brownish. Hypocostal lamina of hemelytron and ventral surface of the body yellowish (Figure 2). Apex of rostrum and tarsal claws distally black. Membrane colorless, hyaline, and translucent. Abdominal terga reddish yellow.

Structure. Body elongate, deltoid, widest across humeral angles and narrowing anteriad and posteriad (Figs 1–2, 5–7). Dorsal surface of body slightly convex, venter strongly convex. Body length 11.22–14.00 mm.

Head (Figs 9–11) roughly triangular, approximately as long as wide across eyes (ca. 1.1 : 1.0), compound eyes large, exceeding head outline laterally by about half their width, dorsal surface of head flat. Mandibular plates continually narrowing from eyes toward apices, lateral margins slightly concave at midlength and slightly convex in anterior half, surpassing clypeus by about basal width of clypeus but not meeting each other, leaving narrow, V-shaped notch in front of clypeus (Figure 9; width of notch varies intraspecifically). Clypeus sharply narrowing in anterior half, apically free but slightly depressed compared to mandibular plates. Ocelli large, posteromedial to compound eyes, distance between ocellus and adjacent compound eye about diameter of ocellus, distance between ocelli about three diameters (Figure 9). Antenniferous tubercles (Figs 9–11) short, completely visible in dorsal view, without spine or tubercle laterally. Antennae long, surpassing apex of scutellum when folded backwards (Figure 5), pentamerous, scape (I) short, reaching ca. apex of head, cylindrical, stout (about twice diameter of basipedicellite), remaining antennomeres slender, narrowly cylindrical, basipedicellite (IIa) longer than scape but about half the length of distipedicellite (IIb), basiflagellum (III) and distiflagellum (IV), all nearly same length (for exact lengths see Table 1). Joint between basipedicellite and distipedicellite inconspicuous, more or less fused (Figs 12–13). Bucculae (Figs 10–11) short, low, anteriorly rectangular without spine or produced into a short acutangulate spine (varies intraspecifically), posteriorly reaching about anterior margin of eye, evanescent (Figure 11). Apex of rostral segment I slightly surpassing bucculae (Figs 10–11), apex of rostrum reaching anterior margin of metacoxae (Figure 2); length ratio of rostral segments: II > I = III > IV, II about twice length of segment IV.

Thorax. Pronotum (Figs 1, 3, 5–8) trapezoid with prominent humeral angles, each bearing a stout, sharp spine directed laterad. Anterior pronotal margin concave to receive postocular portion of head (Figure 9); each anterolateral angle nearly rectangular, apically with small rounded tubercle (Figs 9, 11); anterolateral margins straight, slightly crenulate (Figure 11), without emargination or carina; posterolateral margins shallowly sinuate; posterolateral angles obtusangulate; posterior margin straight. Pronotal surface simply convex, anterior to humeral angles, sloping toward head.

Scutellum (Figs 1, 3, 5–8) longer than wide, triangular, apically acutangulate, surface convex in frenal portion (appearing slightly gibbose near anterolateral callosities), postfrenal portion flat, apex with more or less prominent V-shaped callosity (Figs 14–25).

Clavus narrow, anteriorly with maximally 5 rows of punctures, narrowing towards frena (Figs 1, 5, 7). Lateral margins of corium narrowing posteriad. Anterodistal angle of each corium (appearing posterolateral in resting position!) sharply acutangulate, far surpassing apex of scutellum, reaching middle of connexival segment VII (Figs 5–6); posterodistal angle rounded, distal (membranal) margin concave (Figs 5, 7). Membrane surpassing apex of abdomen (about one third of its length), with numerous longitudinal, parallel veins branching from basal transverse vein (Figure 7).

Mesosternum with low median carina, most prominent anteriorly; metasternum hexagonal, flat. Each ostiole between meso- and metacetabulum, small, oval (Figure 26), opening posterolaterad (invisible in ventral view); periostiolar depression small (Figure 27). Peritreme in form of short groove, slightly curved anterolaterad, apically rounded and elevated above surrounding pleuron (Figs 26, 27). Metapleural evaporatoria large, each occupying nearly inner two thirds of metapleuron, laterally emarginated by low sinuate carina (Figure 26); mesopleural evaporatoria small, each limited to posterior margin (narrowly reaching posterolateral angle of mesopleuron) and not well delimited (Figure 26).

Femora slender, cylindrical (Figure 2), with short, stout spine dorsoapically (Figs 1, 2, 5–7), ventral surface unarmed. Tibiae slender, rounded, only slightly flattened dorsoapically, without spines or impressed lines on outer surfaces. Length of tarsal segments I > III > II, I about as long as II and III combined (Figure 29).

Abdomen with ventral surface regularly convex, without median keel or groove (Figure 2). Abdominal segment III anteromedially with low, broadly rounded protuberance not reaching between metacoxae (Figure 2). Abdominal segments III–VII with anterior margins convex and posterior margins concave medially, more pronounced posteriad; segment VII anteriorly distinctly produced forwards, longer medially than preceding segments (Figure 2). Spiracles concolorous with surrounding abdominal surface, each not surrounded by a callosity. Trichobothria 2 + 2 on each abdominal segment, arranged immediately behind stigma, one on each side.

Lateral margins of connexivum exposed in dorsal view (Figs 1, 5–7). Posterolateral angles of connexival segment III rectangular, not produced, posterolateral angles of following segments more prominent, becoming acutangulate on segment VI; posterolateral angles of segment VII acutangulate, distinctly produced posteriad and surpassing posterior margins of genital segments in male (Figure 1) and female (Figs 2, 90–93).

Male genitalia. Genital capsule (Figs 30, 32, 34, 36, 38, 40) relatively large, as long as or slightly shorter than wide; width of genital capsule 2.2–2.5 mm. Dorsal wall (Figs 54, 56, 58, 60, 62, 64, 66–71) rather short, gibbose, simple. Ventral wall (e.g. Figs 30, 32, 34, 36, 38, 40, 66–71) produced posteriad with large depression anteapically. Posterolateral angles of genital capsule each with thin wall, opened dorsally and rounded posteriorly (e.g. Figs 54, 56, 60), space between posterolateral angles filled by ventral rim. Ventral rim expanded dorsally and anteriorly forming complicated hypandrium (of species-specific shape) (e.g. Figs 42, 48, 54, 60, 66), wider than long, symmetrical along median axis and bearing three short-to-long, narrow-to-large projections (posterior, lateral, and anterior) on each side (e.g. Figs 55, 57, 59, 61, 63, 65, 72–77). Proctiger simple. Parameres lacking. Phallus (Figs 78–89) (description follows Becker and Grazia-Vieira 1971: figs 6–11; with original terminology in parentheses): strongly sclerotized basal plates of articulatory apparatus joined by ponticulus basilaris ventrally, with degree of sclerotization equal to that of basal plates; dorsal connectives almost as wide as lateral areas of basal plates; capitate process (= processus capitatus) well developed; phallotheca cylindrical, with pair of small dorsal processes at base; endophallic (= ejaculatory) reservoir voluminous; aedeagus (= vesica) more or less sinuous, contained within conjunctiva, with apical opening through which phallotreme (= secondary gonopore) emerges (Figs 79, 82, 85, 88).

Female genitalia (description follows Becker and Grazia-Vieira 1971: figs 12–17; original terminology in parentheses): External female genitalia (Figs 90–93) with posterior margins of laterotergites VIII and IX acutangulate; posterior margins of valvifers (= gonocoxae) VIII straight; valvulae (= gonapophyses) VIII fused medially, forming triangulum; valvifers (= gonocoxites) IX fused along median line forming partially covered plate-like sclerite (= pseudosternite); valvulae IX fused medially, forming single piece as wide as valvifers IX. Internal female genitalia (Becker and Grazia-Vieira 1971: figs 14–17): Dorsal wall of gynatrium (= pars communis) showing a thickening of vaginal intima around spermathecal opening (= orifice receptaculi). Spermatheca (= receptaculum seminis): Proximal duct (= ductus receptaculi anterior) much longer and thinner than distal duct (= ductus receptaculi posterior), distal duct widening towards proximal flange; spermathecal dilation well developed; intermediate part of spermatheca with proximal flange narrower than distal flange, apical receptacle (= capsula seminalis) subglobular with three hook-shaped projections.

Vestiture. Body appearing bare, but pro-, meso- and metapleura with very short adpressed pale setae (invisible in greasy specimens). Antennae and legs with short semierect pale setae, at least slightly shorter than diameter of particular antennomere or tibia. Abdomen ventrally along midline and external female genitalia with sparse long, erect, pale setae. Genital capsule with short, erect, pale hairs around anteapical depression on ventral wall (Figs 32, 39, 44, 67), along margins of genital aperture (Figs 55, 63), on posterloateral angles (Figs 32, 52) and on hypandrium (Figs 43, 55, 73, 77). Apical surface of head (except small area medially of compound eyes) (Figure 9), pronotum (except large anterolateral callosities, cicatrices and humeral spines), clavus, and corium (except round spot on corial disc at level of postfrenal portion of scutellum) (Figs 1, 5, 7) regularly covered with black punctures, only punctures near posterolateral angle of each corium distinctly smaller and sometimes concolorous. Disc of scutellum (except pair of anterolateral and one apical callosity) with large, reddish to concolorous punctures (those near V-shaped line sometimes black). Connexivum and legs with very small concolorous punctures. Callosities of pronotum and scutellum (Figure 1) smooth, lustrous. Pro-, meso- and metapleura with sparse concolorous punctures, best visible laterally on propleuron (punctures near humeral angles sometimes black) and laterally and posteriorly on metapleuron. Ventral surface of head, sterna, abdomen ventrally, genital capsule, and female external genitalia smooth.

Measurements. See Table 1. The five species-group taxa we recognize more or less overlap in all measurements that were taken.

Differential diagnosis. Greve (2010) and Rider et al. (2018) characterized members of the tribe Chlorocorini as being medium to large in size, green (fading to yellow after death), and somewhat depressed. They also noted that the head is usually flat dorsally, subtriangular with the apices of the mandibular plates often acute or spinosely produced. The antennae are pentamerous. The anterolateral margins of the pronotum typically are each provided with a row of small to large denticles, and the humeral angles are often prominently spined. The metathoracic scent gland peritremes are usually spout-shaped, relatively short, and do not extend beyond the middle of the metapleuron; the associated evaporatoria typically are large and extensive. The mesosternum is provided with a medial longitudinal carina that does not project forward onto the prosternum. In most included genera, the apex of each femur is provided with a short, dorsal tooth; the tarsi are three-segmented. In all but one included genus, the base of the abdomen is unarmed; that is, lacks a forward-projecting spine or tubercle. Greve (2010) also noted that in most genera, the ventral rim of the pygophore is produced into a process, the so-called hypandrium.

The genus *Rhyncholepta* fits the above criteria except that the head, although relatively flat dorsally and subtriangular, does not have the apices of the mandibular plates acute or spinose, but are narrowly rounded (Figure 9); they typically are reddish brown with pale yellowish green areas in life; the pale areas fade after death.

Rider et al. (2018) included the following genera in Chlorocorini: *Arvelius*, *Chlorocoris*, *Chloropepla*, *Eludocoris*, *Fecelia*, *Loxa*, *Mayrinia*, and *Rhyncholepta*. *Rhyncholepta* can be separated from the above genera by the dorsal coloration (e.g., Figs 1, 3, 5–8). Coloration is consistent among species of *Rhyncholepta*: reddish brown, with a large, impunctate pale spot on each basal angle of the scutellum and another pale, impunctate area along each anterolateral margin of the pronotum. This color pattern is not seen in any other chlorocorine species. A few species in other genera may have small pale spots or areas but these are usually confined to the hemelytra. *Rhyncholepta* can be distinguished from *Arvelius* by the unarmed abdominal base (spined in *Arvelius*) and the less developed mesosternal carinae (much more elevated in *Arvelius*). The apices of the mandibular plates are acute to spinose (with lateral margins of the mandibular plates relatively straight) in *Arvelius*, *Chlorocoris* (except the subgenus *Monochrocerus*), *Chloropepla*, *Fecelia* [acute only in *F. minor* (Vollenhoven, 1868)], *Loxa*, and *Mayrinia*. The apices of mandibular plates are narrowly rounded only in *Rhyncholepta* and *Chlorocoris* subgenus *Monochrocerus*; they are broadly rounded in *Eludocoris* (the head is broad apically, not subtriangular). Both *Chloropepla* and *Eludocoris* have elongate, apically acuminate metathoracic scent gland peritremes that separate those genera from all other chlorocorine genera, including *Rhyncholepta*. Furthermore, *Chlorocoris* and some species of *Chloropepla* lack the apical tooth on each femur that is present in all other chlorocorine genera.

Males of *Rhyncholepta* lack parameres in the genitalia. Besides *Rhyncholepta*, this condition is also known in four South American genera, *Luridocimex* Grazia, Fernandes & Schwertner, 1998, *Stysiana* Grazia, Fernandes & Schwertner, 1999 (both Carpocorini), *Patanius* Rolston, 1987 (unplaced in a tribe), and one still undescribed genus. None of these genera possess the characters found in the Chlorocorini (Rolston 1987; Grazia et al. 1998, 1999; Rider et al. 2018).

Etymology. The generic name is composed of the Ancient Greek words ῥύγχος (*rhýnchos*, = snout, muzzle, beak) and λεπτός (*leptós*, = thin), referring to the slender rostrum of the species. The gender is feminine, as it is evident from its ending *-a* and original combination with the adjective *grandicallosus* (*-a*, *-um*) given by Bergroth (1911) in its feminine form *grandicallosa*.

Bionomics. Based on label data and Joe Eger's and Roland Lupoli's field experience, most of the specimens were collected by various types of light traps (UV, mercury vapor, metal halide, black, GemLight and Polyvie). GemLight and Polyvie traps are automatic light traps with visible light from LED, blue, pink, white or green; SEAG (= Société Entomologique Antilles-Guyane) is performing year-round surveys of insects in French Guiana using those traps (R Lupoli, pers. comm.). Almost all of the traps were exposed to fairly dense forest or adjacent to such a forest, except in Macouria, where one specimen was collected in the littoral secondary forest and one in the savanna. They have never been seen when collecting by hand catching, sweeping, or beating the vegetation during the day or night by JE Eger (pers. observ.) or R Lupoli (pers. comm.). One specimen was collected by flight intercept trap at Matiti, French Guiana, but there were no specimens of *Rhyncholepta* collected by glass interception traps operated by the SEAG during 3–4 years (R Lupoli, pers. comm.).

Collecting dates of the specimens examined indicate that species of *Rhyncholepta* are found year round, although distinct peaks might occur (Figs 94–98, especially in the case of *Rh. grandicallosa grandicallosa*).

Distribution (Figs 98–100). The genus currently includes four species, one of them subdivided into two subspecies, distributed in the Neotropical Region from southern Mexico (Chiapas) to Bolivia and northwestern Brazil (Amazonas, Rondônia).

Species composition and delimitation. Our examination of 1125 specimens revealed five more or less distinct morphotypes based almost exclusively on structure of the male genital capsule and especially the hypandrium (expanded portion of ventral rim). The five morphotypes may be grouped by morphological similarity as ((*grandicallosa grandicallosa* + *grandicallosa centroamericana*) (*henryi* (*meinanderi* + *wheeleri*))).

Rhyncholepta grandicallosa differs from all three species of the *Rh. meinanderi* species-group by the following main characters: i) Genital capsule in ventral view with ventral rim apically bilobed, with small, shallow, V-shaped notch medially, hypandrial projections not visible in this view (Figs 30–35). ii) Anterior hypandrial projections large, lobe-like, apically rounded (Figs 42–47: ap, 72–74: ap). iii) Lateral hypandrial projections long, directed anteriad and golf-club shaped (Figs 54–59: lp). iv) Posterior hypandrial projections short, spinose, situated more laterally, directed ventrally (Figs 42–47: pp), not visible in ventral and dorsal views (Figs 30–35, 54–59). v) Phallus with aedeagus strongly S-shaped apically (Figure 82: ae). Within the morphotype of *Rh. grandicallosa*, the variability in shape of the anterior and lateral hypandrial projections enables two subtle, but stable, subtypes to be recognized. Differences between these subtypes are smaller than those between any two morphotypes/species of the *Rh. meinanderi* species-group, and both of the subtypes represent strictly allopatric populations. We, therefore, decided to classify them as subspecies: *Rh. g. grandicallosa* in South America and *Rh. g. centroamericana* subsp. n. in Central America.

The three remaining morphotypes form a distinct group characterized by the following shared characters: i) Genital capsule in ventral view with ventral rim apically convex, truncate or concave but never bilobed; posterior hypandrial projections visible in this view (Figs 36–41). ii) Anterior hypandrial projections triangularly narrowing, spinose at apex in dorsal (Figs 48–53: ap) and dorso-posterolateral (most exposed) view (Figs 75–77: ap). iii) Lateral hypandrial projections short, directed laterad, not golf-club shaped (Figs 60–65: lp). iv) Posterior hypandrial projections longer, spinose or widely rounded apically, situated more ventrally, directed ventrally or laterally (Figs 42–47: pp), visible in ventral and dorsal views (Figs 30–35, 54–59). v) Phallus with aedeagus only slightly sinuate apically (Figs 79: ae, 82: ae).

These morphotypes represent three related species that form the *Rh. meinanderi* species-group defined by the characters mentioned above. *Ryncholepta henryi* sp. n. differs from *Rh. meinanderi* and *Rh. wheeleri* sp. n. by its different shape and position of the posterior hypandrial projection (narrowly rounded apically, directed laterally; Figs 37, 49, 61, 75: pp), and by the prominent posterolateral angles of the genital capsule (a character shared with *Rh. grandicallosa*). *Rhyncholepta meinanderi* and *Rh. wheeleri* sp. n. share the short spinous, ventrally directed posterior hypandrial projection (Figs 39, 41, 51, 53, 63, 65, 76–77: pp) and obtusangulate angles of the genital capsule. Both species differ in the shape of the three hypandrial projections (see key below).

Although we cannot confirm that the morphological differences between morphotypes reflect their phylogenetic relationships, the genus *Rhyncholepta* might be an interesting model group for phylogenetic and phylogeographic analyses.

Key to the males of *Rhyncholepta*

1 Genital capsule in ventral view with ventral rim apically bilobed, small shallow V-shaped notch medially, hypandrial projections not visible (Figs 30–35). Hypandrium in posterior view with anterior projections large, lobe-like (not spinose apically) (Figs 42–47: ap); projections in dorso-posterolateral (most exposed) view large and rounded apically (Figs 72–74: ap). In dorsal view, lateral hypandrial projections long, directed anteriad and golf-club shaped (Figs 54–59: lp). Phallus with aedeagus S-shaped apically (Figure 82: ae)...... ....***Rh. grandicallosa* Bergroth, 1911**, **2**

– Genital capsule in ventral view with ventral rim apically slightly convex, truncate, or widely V-shaped concave but not bilobed with shallow V-shaped notch medially, posterior hypandrial projections visible in this view (Figs 36–41). Anterior hypandrial projections triangularly narrowing, apically spinose both in dorsal (Figs 48–53: ap) and dorso-posterolateral (most exposed) view (Figs 75–77: ap). In dorsal view, lateral hypandrial projections shorter, directed laterad, not golf-club shaped (Figs 60–65: lp). Phallus with aedeagus only slightly sinuate apically (Figs 79, 82: ae)................ ***Rh. meinanderi* species-group**, **3**

2 Anterior hypandrial projections in posterior view with apices appearing rounded (Figs 42, 43: ap), larger in most exposed (dorso-posterolateral) view, lateral margins parallel-sided in middle, widely rounded apically (Figs 55: ap, and 72: ap). In dorsal view, apices of anterior hypandrial projections directed right upwards, median outline regularly convex (Figs 54, 55: ap); lateral hypandrial projections with "handles" approaching each other towards apices (Figs 54, 55: lp), each apically regularly (C- shaped) curved inwards (Figs 55:

lp, 72: lp). Northern South America .... ***Rh. grandicallosa grandicallosa*** **Bergroth, 1911**

– Anterior hypandrial projections in posterior view with apices appearing acute (Figs 44, 45: ap, 46, 47: ap), smaller, parabolic, in most exposed (dorso-posterolateral) view apex narrowly rounded (Figs 73, 74: ap). In dorsal view, apices of anterior hypandrial projections directed anterodorsally, median outline straight (Figs, 56, 57: ap, 58, 59: ap); lateral hypandrial projections with "handles" nearly parallel, suddenly (ca. in right angle) curved inward apically (Figs 57, 59: lp, 73, 74: lp). Central America .... ***Rh. grandicallosa centroamericana*** **subsp. n.**

3 Genital capsule with posterolateral angles prominent (Figs 36, 60) in ventral and dorsal view. Ventral rim in ventral view truncate apically (Figs 36–37), posterior hypandrial projections directed laterad, rounded apically, together with ventral rim forming broad T (Figs 36–37). Anterior hypandrial projections in most exposed (dorso-posterolateral) view with dorsal margin nearly straight (Figure 75: ap); posterior and lateral projection forming acute angle (Figure 75: a); posterior projection appearing straight, wide, broadly rounded apically (Figure 75: pp). French Guiana .... ***Rh. henryi*** **sp. n.**

– Genital capsule in ventral and dorsal view with posterolateral angles obtusangulate, not prominent (Figs 38, 40, 62, 64). Ventral rim in ventral view apically convex (Figs 38–39) or concave (Figs 40–41), posterior hypandrial projections directed ventrally, apically spinose (Figs 39, 41, 50–53). Posterior hypandrial projections in most exposed (dorso-posterolateral) view narrowing towards acute apex (Figs 76, 77: pp) **4**

4 Ventral rim in ventral view apically widely convex; posterior projections lateral on median projection (Figs 38–39). Hypandrium in posterior view with posterior projections short, spinose, curved, apices directed ventrally (Figs 50, 51: pp). Anterior hypandrial projections in most exposed (dorso-posterolateral) view with dorsal margin slightly convex, apically with sharp spine bent downwards (Figure 76: ap); bases of posterior and lateral projections approached together, forming acute angle (Figure 76: a). In dorsal view, anterior hypandrial projections in apical half narrow (Figs 62, 63: ap), posterior projections directed laterad (Figs 62, 63: pp). Northern South America. .... ***Rh. meinanderi*** **Becker & Grazia-Vieira, 1971**

– Ventral rim in ventral view apically with wide M-shaped projection, shallow V-shaped incision medially; posterior hypandrial projections posterolateral (Figs 40–41). Hypandrium in posterior view with posterior projections very short, acute but not spinose, directed posterolaterad (Figs 52, 53: pp). Anterior hypandrial projections in most exposed (dorso-posterolateral) view with dorsal margin slightly concave, apically with sharp spine strongly curved downwards (Figure 77: ap); bases of posterior and lateral projections widely separated, both projections parallel (Figure 77: a). In dorsal view, anterior hypandrial projections wide (Figs 64, 65: ap); posterior projections visible as acute angles directed posterolaterad (Figure 65: ppb). Guyana .... ***Rh. wheeleri*** **sp. n.**

Rhyncholepta grandicallosa grandicallosa Bergroth, 1911

Figs 1–4, 9, 11–12, 14–18, 29–31, 42–43, 54–55, 66, 72, 78–80, 90, 94

Rhyncholepta grandicallosa Bergroth, 1911: 121–122. Syntype(s): ♀, French Guiana (MZHF).

Rhyncholepta grandicallosa: Bergroth (1914): 441 (list), Pl. XI: fig. 6 (habitus illustration); Becker and Grazia-Vieira (1971): 393–396, 398–399, figs 1–3, 6–7, 10, 12, 14, 16 (redescription, habitus and detailed morphological illustrations, inadvertent lectotype designation, distribution); Arnold (2011): 104 (record); Greve et al. (2013): 3, 5, 12: fig. 4L, 14, 16: fig. 64 (cladistic analysis, morphology of male genitalia); Castro- Huertas et al. (2015) [?]: 563 (record); Rider et al. (2018): 190: fig. 2.21 (habitus photo, distribution); Silva et al. (2018): 437 (checklist).

Rhyncholepta grandicalosa (incorrect subsequent spelling): Grazia (1984): 79 (record).

Rhyncholepta sp. [?]: Torres Gutiérrez (2005): 95: fig. 4.42, 109, 115 (record, habitus photo).

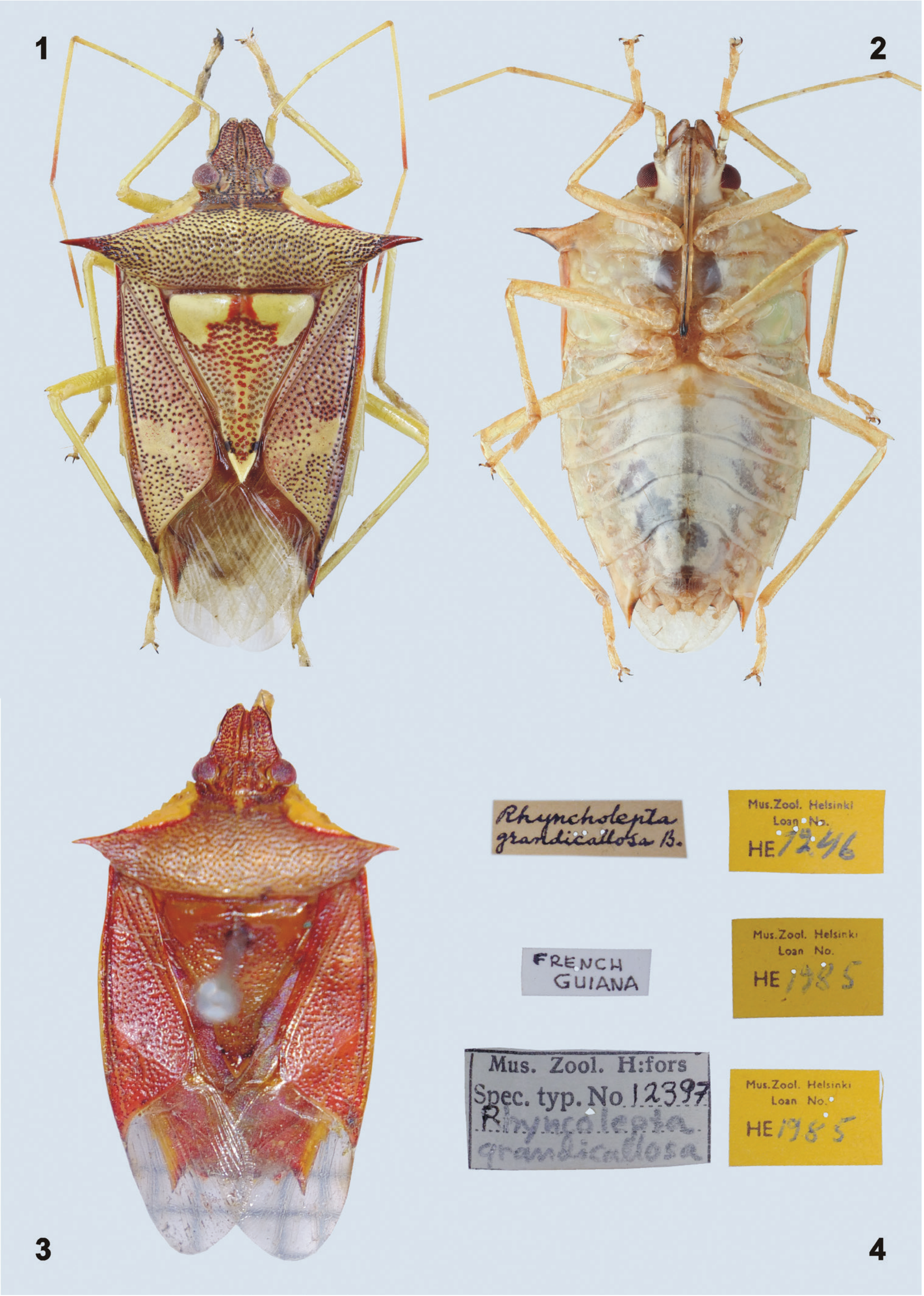
Type locality. French Guiana (without further details) (Bergroth 1911). Designation of neotype would change the type locality as follows: French Guiana, Roura Commune, Route de Kaw, Camp Caimans, 4°34'09.8"N 52°13'05.5"W, 320 m a.s.l.

Type material examined. Lectotype (designated by Becker and Grazia-Vieira (1971: 396), by use of "holótipo"; requested to be supressed by Kment et al. in press) (Figs 3–4, 14): ♀, **FRENCH GUIANA:** "FRENCH / GUIANA [handwritten in black ink, white label] // Rhyncholepta / grandicallosa B. [handwritten in black ink, white label] // Mus. Zool. H:fors. / Spec. Typ. No [printed] 12397 / Rhyncholepta / grandicallosa [handwritten in black ink and pencil, white label with black marginal frame] // Mus.Zool. Helsinki / Loan No. / HE [printed] 1246 [handwritten in blue ink, yellow label] // Mus.Zool. Helsinki / Loan No. / HE [printed] 1985 [handwritten in blue ink, yellow label] // Mus.Zool. Helsinki / Loan No. / HE [printed] 1985 [handwritten in blue ink, yellow label]" (MZHF). The lectotype is pinned through scutellum, antennomeres IIa–IV of both antennae missing, left hind leg and right fore and middle legs missing.

Neotype (here suggested) (Figs 1, 15): ♂, **FRENCH GUIANA:** "GUYANE FR., Rt. De Kaw / Camp Caimans, 320 m a.s.l. / 04.5694N, 52.2182W / 11.-19.i.2016, S. MURZIN lgt. [printed, white label] // COLLECTIO / NATIONAL MUSEUM / Praha, Czech Republic [printed, white label] // ♂ [printed, white label] // NEOTYPUS / *RHYNCHOLEPTA* / *G. GRANDICALLOSA* / Bergroth, 1911 / des. Kment, Eger, Rider 2017 [printed, red label]" (NMPC). The candidate neotype is card-mounted, with detached genital capsule glued on a separate small piece of card.

Additional material examined (males and associated females). BRAZIL: Amazonas: Barcelos, Rio Aracá, boca do Rio Curuduri, 00°05'50"N 63°17'22"W, light trap, 15.–18.vi.2010, 1 ♂, C. Schwertner lgt., C. Schwertner and J. Grazia det. (INPA); Barcelos, Rio Aracá, comunidade Bacuquara, 00°09'17"N 63°10'35"W, light trap, 12.–14.vi.2010, 1 ♂, C. Schwertner lgt., C. Schwertner and J. Grazia det. (INPA);

Barcelos, Rio Padauari, comunidade Ararão/Ararinha, 00°30'18"N 64°03'30"W, light trap, 4.–7.vi.2010, 1 ♂, C. Schwertner lgt., C. Schwertner and J. Grazia det. (INPA); Ipixuna, Rio Gregório, comunidade Lago Grande no Seringal do Recreio, 07°10'11.7"S 70°49'10.3"W, light trap, 17.–23.v.2011, 2 ♂♂ 3 ♀♀, C. Schwertner lgt., C. Schwertner and J. Grazia det. (INPA). – **ECUADOR: Napo Province:** Misahualli, 600 m a.s.l., 10.ix.1996, 1 ♂, D. Robacker lgt. (DBTC); Puerto Mis[a] hualli env., 1650–1900 ft [= 503–582 m a.s.l.], 1°2'49.2"S, 77°39'49.2"W, Mercury vapor and Ultraviolet lights, 6.–19.ix.1998, 2 ♂♂ 2 ♀♀, J. E. Eger lgt. (JEEC). **Orellana Province:** Cerca Pompeya, Yasuni NP, 00°38–40'S 76°22–27'W, 280 m a.s.l., 1.–11.x.2002, 3 ♂♂, D. Robacker lgt. (DBTC); Yasuni Research Station, ca. 40 km SE Limonccha, 3.–6.iv.2001, 1 ♂ 1 ♀, P. J. Landolt lgt. (JEEC). **Santo Domingo de los Tsáchilas Province:** Tinalandia [ca. 0.297304°S, 79.051773°W], 9.–16.vii.1980, 1 ♂, H. V. Weems, Jr. lgt. (FSCA). – **FRENCH GUIANA: Cayenne Arrondissement: Iracoubo Commune:** 16 km W Iracoubo, 5.49°N 53.31°W, 1.–2.i.2018, 1 ♂, S. Murzin lgt. (NMPC). **Macouria Commune:** Matiti, Za Wayabo, Flight Intercept Trap, 1.–31.iii.2013, 1 ♂ 1 ♀, J. L. Giuglaris lgt. (JEEC). **Montsinéry-Tonnegrande Commune:** 8 km W of Risquetout, 4°55.097'N 52°33.121'W, 45 m a.s.l., MV Light, 15.iv.2007, 1 ♂, D. G. Hall and J. E. Eger lgt. (FSCA). **Régina Commune:** 41 km SE Roura on Kaw Rd., 4°32.214'N 52°07.420'W, 272 m a.s.l., MV Light, 8.xii.2002, 4 ♂♂ 8 ♀♀, J. E. Eger lgt. (4 ♂♂ 4 ♀♀ FSCA, 4 ♀♀ JEEC); Route de Kaw, 4.5461°N 52.1221°W, 220 m a.s.l., 19.–23.xii.2015, 1 ♂, S. Murzin lgt. (ZJPC). **Roura Commune:** 14 km E of N2 on road to Dégrad Corréze, 4°29.964'N, 52°20.260'W, 108 m a.s.l., MV Light, 6.xii.2002, 2 ♂♂ 10 ♀♀, J. E. Eger lgt. (2 ♂♂ 5 ♀♀ FSCA, 5 ♀♀ JEEC); 15 km W of N2 on Belizon Rd., 6.–7.xii.2002, 1 ♂ 3 ♀♀, J. L. Giuglaris lgt. (FSCA); 17 km W of N2 on Belizon Rd., 4°17.825'N 52°22.812'W, 94 m a.s.l., MV Light, 3.xii.2002, 3 ♂♂ 1 ♀, J. E. Eger lgt. (2 ♂♂ FSCA, 1 ♂ 1 ♀ JEEC); 27 km SE Roura on Kaw Rd., 4°34.116'N 52°12.614'W, 308 m a.s.l., MV Light, 12.–20.xi.2009, 4 ♂♂ 8 ♀♀, L. Pöllumea and O. Maasikas lgt. (FSCA); the same locality, 12.–14.xii.2009, 2 ♂♂ 2 ♀♀, L. Pöllumea and O. Maasikas lgt. (1 ♂ 1 ♀ FSCA, 1 ♂ 1 ♀ JEEC); the same locality, 5.ii.2010, 2 ♂♂, J. E. Eger lgt. (FSCA); 28 km SE Roura on Kaw Rd., 4°34.252'N, 52°12.797'W, 306 m a.s.l., MV Light, 17.ii.2010, 2 ♂♂, J. E. Eger lgt. (FSCA); 32 km SE Roura on Kaw Rd., 4°33.612'N 52°11.350'W, 287 m a.s.l., MV Light, 15.ii.2010, 8 ♂♂ 3 ♀♀, J. E. Eger lgt. (7 ♂♂ 3 ♀♀ FSCA, 1 ♂ JEEC); 33 km SE Roura on Kaw Rd., 4°34.135'N, 52°11.150'W, 227 m a.s.l., MV Light, 1.xii.2002, 1 ♂ 1 ♀, J. E. Eger lgt. (FSCA); the same locality, MV Light, 26.xii.2002, 1 ♂ 5 ♀♀, F. Goubert lgt. (1 ♂ 3 ♀♀ FSCA, 2 ♀♀ JEEC); the same locality, MV Light, 1.–2.vi.2005, 5 ♂♂ 7 ♀♀, J. E. Eger and M. T. Messenger lgt. (FSCA); the same locality, MV Light, 12.–13.iv.2007, 17 ♂♂ 22 ♀♀, D. G. Hall and J. E. Eger lgt. (FSCA); 38 km SE Roura on Kaw Rd., 4°34.214'N, 52°09.566'W, 256 m a.s.l., MV Light, 4.xii.2002, 5 ♂♂, J. E. Eger lgt. (4 ♂♂ FSCA, 1 ♂ JEEC); the same locality, 25.xii.2002, 1 ♂, F. Goubert lgt. (FSCA); Amazone Nature Lodge env., 30 km SE Roura on Kaw Rd., 4°33.570'N, 52°12.433'W, 300 m a.s.l., UV Light Trap, 2.–8.vi.2005, 2 ♂♂ 1 ♀, J. E. Eger and M. T. Messenger lgt. (FSCA); the same



Figures 1–4. Habitus of *Rhyncholepta grandicallosa grandicallosa* Bergroth, 1911. **1** candidate neotype, ♂, French Guiana, Camp Caimans **2** ♀, ventral view, French Guiana, Camp Caimans **3** lectotype, ♀, French Guiana **4** labels of the lectotype. (photographs **1, 2** – P. Kment; **3, 4** – A. Albrecht)

Figures 5–8. Habitus of *Rhyncholepta* species. **5** *Rh. grandicallosa centroamericana* subsp. n., paratype, ♂, Panama, Pipeline Road **6** *Rh. henryi* sp. n., holotype, ♂, French Guiana, Camp Caimans **7** *Rh. meinanderi* Becker & Grazia-Vieira, 1971, ♂, Ecuador, Arajuno env. **8** *Rh. wheeleri* sp. n., holotype, ♂, Guyana. (photographs P. Kment)

locality, UV Light Trap, 10.–18.iv.2007, 3 ♂♂ 1 ♀♀, D. G. Hall and J. E. Eger lgt. (FSCA); the same locality, UV Light Trap, 5.–19.ii.2010, 3 ♂♂ 2 ♀♀, J. E. Eger lgt. (3 ♂♂ 1 ♀ FSCA, 1 ♀ JEEC); the same locality, MV Lights, 4.–15.i.2016, 11 ♂♂ 11 ♀♀, J. Eger, R. Morris and J. Wappes lgt. (JEEC); 1 km S Amazone Nature Lodge, 30 km SE Roura on Kaw Rd., 4°32.961'N, 52°12.830'W, 288 m a.s.l., 3.–4.vi.2005, 1 ♂ 3 ♀♀, J. E. Eger and M. T. Messenger lgt. (FSCA); Cacao env., 150 m a.s.l., 4.572°N 52.427°W, 2.–4.i.2018, 1 ♂ 3 ♀♀, S. Murzin lgt. (1 ♂ 1 ♀ NMPC, 1 ♀ HNHM, 1 ♀ NHMW); Entomotech Lodge, 30 km SE Roura on Kaw Rd.N, 4°33.570'N 52°12.433'W, 300 m a.s.l., MV Light, 1.–12.xii.2002, 6 ♂♂ 7 ♀♀, J. E. Eger lgt. (4 ♂♂ 3 ♀♀ FSCA, 2 ♂♂ 4 ♀♀ JEEC); the same locality, MV Light, xi.2004–ii.2005, 4 ♂♂ 3 ♀♀, 2.ii.2005, 2 ♂♂, F. Goubert lgt. (FSCA); Highway D6 to Kaw, 33.5 km SE of Roura [ca. 4°32'47"N 52°08'41"W], 10.ii.1986, 1 ♂ 2 ♀♀, G. Tavakilian lgt. (DARC); Kaw Road km 18, 26.viii.1995, 1 ♂, J. E. Wappes lgt. (DBTC); Route de Kaw, Caiman Camp env., 4.i.2007, 1 ♂, M. Snížek lgt. (ZJPC; labeled as paraneotype); Route de Kaw, Camp Caimans, 4.5694°N 52.2182°W, 320 m a.s.l., 11.–19.i.2016, 3 ♂♂ 1 ♀, S. Murzin lgt. (2 ♂♂ 1 ♀ NMPC, 1 ♂ BMNH, males labeled as paraneotypes); 20.–31.i.2016, 2 ♂♂ 5 ♀♀, S. Murzin lgt. (1 ♂ 2 ♀♀ NMPC, 2 ♂♂ 4 ♀♀ ZJPC; males labeled as paraneotypes); 1.–3.ii.2016, 3 ♂♂ 1 ♀, S. Murzin lgt. (1 ♂ 1 ♀ NMPC, 2 ♀♀ ZJPC, male labeled as paraneotypes); Camp Caiman, 4.569°N 52.218°W, 260 m a.s.l., 8.–31.i.2018, 2 ♂♂ 1 ♀, S. Murzin lgt. (1 ♂ 1 ♀ NMPC, 1 ♂ MMBC; males labeled as paraneotypes). **Sinnamary Commune:** Sinnamary [ca. 5.374628°N 52.955196°W], Route de St. Elie, 14.i.2007, 1 ♂, M. Snížek lgt. (ZJPC). **Saint-Georges Commune:** Pied Saut, Oyapok River [= north bank of the Oyapock River, ca. 12 km upstream of Saint-Georges, at the foot of the first rapids on this, 3°48'30"N 51°52'30"W – see Ingels et al. (2012)], 1 ♂, S. M. Klages lgt., C. M. Acc. 6111, D. B. Thomas det. (DBTC). **Saint-Laurent-du-Maroni Arrondissement: Mana Commune:** Rte. d'Apatou (Chutes Voltaire), 5.15°N 54.023°W, 6.–31.xii.2017, 3 ♂♂ 1 ♀, S. Murzin lgt. (1 ♂ 1 ♀ NMPC, 1 ♂ HNHM, 1 ♂ NHMW). **Saint-Laurent-du-Maroni Commune:** Camp Voltaire, 5.0530°N 54.0881°W, 60 m a.s.l., 25.–31.xii.2015, 3 ♂♂ 2 ♀♀, S. Murzin lgt. (1 ♂ NMPC, 2 ♂♂ 2 ♀♀ ZJPC). – **PERU: Loreto Province:** 80 km NE Iquitos [ca. 3.341878°S 72.741851°W], Explorama Lodge, 1 km from Amazon R.[iver] on R.[iver] Yanamono, at light, 25.–28.viii.1992, 1 ♂, J. Castner, P. Skelley et al. lgt. (JEEC).

Material examined (tentatively identified females). ECUADOR: Orellana Province: Yasuni Research Station, 250 m a.s.l., 0°38'S, 76°36'W, 17.–31.x.1998, 1 ♀, B. K. Dozier lgt. (JEEC). **Sucumbíos Province:** Limoncocha on Rio Napo [ca. 0°24'24"S 76°37'15"W], 13.v.1974, 1 ♀, 19.i.1974, 1 ♀, B. A. Drummond, III lgt. (JEEC). – **FRENCH GUIANA: Cayenne Arrondissement: Régina Commune:** 21 km SE Roura on Kaw Rd., 4°36.115'N, 52°15.972'W, MV Light, 6.–7.ii.2010, 3 ♀♀, J. E. Eger lgt. (2 ♀♀ FSCA, 1 ♀ JEEC); 33 km SE Roura on Kaw Rd., 4°34.135'N, 52°11.150'W, 227 m a.s.l., MV Light, 7.xii.2002, 2 ♀♀, J. E. Eger lgt. (FSCA); Entomotech Lodge, 30 km SE Roura on Kaw Rd.N, 4°33.570'S 52°12.433'W, 300 m a.s.l., MV Light, 5.xii.2004, 1 ♀, 6.xii.2004, 1 ♀, 9.xii.2004, 1 ♀, F. Goubert lgt. (FSCA).

Not identified: Montagne Tortua, 26.viii.1981, 1 ♀, G. Tavakilian lgt. (DARC). – **GUYANA:** Essequibo R.[iver], Moraballi Creek [Moraballi Creek about 3 km above junction with Essequibo River, 6°11'N – see Davis and Richards (1933) / 6°12'16.9"N 58°33'51.6"W], 4.ix.1929, 1 ♀, Oxf. Univ. Expedn., B.M. 1929-485 (BMNH); New River, iii.–v.1938, 1 ♀, viii.1938, 1 ♀, C. A. Hudson lgt., Brit. Mus. 1939–370 (BMNH). – **SURINAME:** Raleigh Falls [4°40'N 56°09'W], 25.–27.vii.1975, 1 ♀, L. H. Rolston lgt. (DARC).

Material identified by Roland Lupoli (deposited in RLFF). FRENCH GUIANA: Cayenne Arrondissement: Camopi Commune: Itoupé [Mt.; 3°01'N 53°04'W], 600–800 m a.s.l., Light Trap, 19.xi.–1.xii.2014, 5 spec., SEAG [= Société Entomologique Antilles-Guyane] lgt. **Macouria Commune:** Forêt littorale de Maya, Polyvie (Blue LED) Trap, 12.xii.2015, 1 spec., SEAG lgt.; Savane Lambert [ca. 4°53'26"N 52°31'46"W], Polyvie (Blue LED) Trap, 9.vii.2016, 1 spec., SEAG lgt. **Matoury Commune:** La Désirée, Polyvie Trap (Blue LED), 8.vi.2014, 4 spec., 20.ix.2014, 1 spec., SEAG lgt. **Saint-Elie Commune:** Inselberg Haute-Koursibo [4°18'59"N 53°17'10"W], Light Trap, 3.iii.2013, 3 spec., SEAG lgt.; the same locality, Polyvie (Blue LED) Trap, 5.iii.2013, 1 spec., 26.x.2013, 1 spec., 2.xi.2013, 1 spec., SEAG lgt.; Réserve Naturelle de la Trinité [ca. 4°04'18"N 52°33'18"W], Zone Bénitier, Light Trap, 9.x.2010, 1 spec., 7.–8. and 10.xi.2013, 5 spec., SEAG lgt. **Régina Commune:** Piste Bélizon, km 20, Light Trap, 26.viii.2003, 1 spec., 21.xii.2003, 1 spec., R. Lupoli lgt.; Piste Bélizon, km 4, 8.v.2004, 5 spec., R. Lupoli lgt.; RN2, km 136, Light Trap, 8.iv.2014, 1 spec., SEAG lgt.; Nouragues [ca. 4°04'18"N 52°43'57"W], Saut Pararé, Light Trap, 23.vii.2009, 1 spec., 22.ii.2010, 2 spec., SEAG lgt.; Nouragues, Inselberg, Automatic Light Trap, 13.x.2012, 6 spec., SEAG lgt. **Roura Commune:** Route de Kaw, km 36–38, 9.ii.1993, 1 spec., Lecourt lgt.; the same locality, Light Trap. 12.ix.1998, 1 spec., 23.ix.2000, 2 spec., 24.viii.2003, 1 spec., 6.v.2004, 1 spec., 10.v.2004, 3 spec., Lupoli lgt.; Montagne des Chevaux RN2 km 22 [ca. 4.7216°N 52.3073°W], 23.v.2009, 1 spec., SEAG lgt.; the same locality, Automatic Light Trap, 20.vi.2009, 1 spec., 14.v.2010, 1 spec., 5.ii.2012, 1 spec., SEAG lgt.; the same locality, GemLight Trap, 20.v.2012, 1 spec., SEAG lgt.; the same locality, Polyswing Trap, 8.vii.2012, 1 spec., SEAG lgt.; the same locality, Automatic Light Trap, 21.x.2012, 1 spec., SEAG lgt.; the same locality, GemLight Trap, 9.xii.2012, 3 spec., SEAG lgt.; the same locality, Polyvie Trap (Blue LED), 16.xii.2012, 2 spec., 24.xii.2012, 6 spec., 9.i.2013, 3 spec., 13.i.2013, 5 spec., 27.i.2013, 9 spec., 4.ii.2013, 2 spec., 11.ii.2013, 14 spec., 16.ii.2013, 5 spec., 24.ii.2013, 2 spec., SEAG lgt.; the same locality, GemLight Trap, 4.iii.2013, 1 spec., SEAG lgt.; the same locality, Polyswing and GemLight Traps, 24.iii.2013, 2 spec., SEAG lgt.; the same locality, Polyvie (Blue LED) and GemLight Traps, 6.iv.2013, 10 spec., 13.iv.2013, 37 spec., 20.iv.2013, 18 spec., 27.iv.2013, 17 spec., 4.v.2013, 48 spec., 13.v.2013, 42 spec., 19.v.2013, 40 spec., 25.v.2013, 22 spec., SEAG lgt.; the same locality, Polyvie Trap (Blue LED), 1.vi.2013, 29 spec., SEAG lgt.; the same locality, Polyvie (Blue LED) and GemLight Traps, 8.vi.2013, 19 spec., 15.vi.2013, 27 spec., 22.vi.2013, 15 spec., 29.vi.2013, 1 spec., 6.vii.2013, 13 spec., 13.vii.2013, 21 spec., 20.vii.2013, 3 spec., 27.vii.2013, 4 spec., 3.viii.2013, 3 spec., 10.viii.2013, 5 spec., 17.viii.2013, 3 spec., 24.viii.2013, 1 spec., 31.viii.2013, 1 spec., 7.ix.2013, 1 spec., 14.ix.2013, 2 spec., 21.ix.2013, 1 spec., 5.x.2013, 3 spec., 19.x.2013, 1 spec., 3.xi.2013, 1 spec., SEAG lgt.; the same locality, Polyvie Trap (Blue LED), 30.xi.2013, 1 spec., 14.xii.2013, 1 spec., 28.xii.2013, 1 spec., 4.i.2014, 3 spec., SEAG lgt.; the same locality, GemLight Trap, 11.i.2014, 1 spec., SEAG lgt.; the same locality, Polyvie Trap (Blue LED), 18.i.2014, 1 spec., 25.i.2014, 2 spec., 1.ii.2014, 5 spec., 15.ii.2014, 1 spec., 29.iii.2014, 7 spec., SEAG lgt.; the same locality, Polyvie Trap (Rose and Blue LED), 5.iv.2014, 2 spec., SEAG lgt.; the same locality, GemLight Trap, 19.iv.2014, 2 spec., 27.iv.2014, 2 spec., SEAG lgt.; the same locality, Polyvie Trap (Rose and Blue LED), 27.iv.2014, 4 spec., SEAG lgt.; the same locality, Polyvie (Blue LED) and GemLight Traps, 3.v.2014, 2 spec., SEAG lgt.; the same locality, Polyvie Trap (Rose and Blue LED), 17.v.2014, 4 spec., 31.v.2014, 5 spec., SEAG lgt.; the same locality, GemLight Trap, 7.vi.2014, 1 spec., SEAG lgt.; the same locality, Polyvie Trap (Blue LED), 26.vii.2014, 1 spec., 2.viii.2014, 2 spec., 9.viii.2014, 5 spec., 21.viii.2014, 13 spec., 30.viii.2014, 1 spec., SEAG lgt.; the same locality, Polyvie Trap (Rose LED), 20.ix.2014, 1 spec., 27.ix.2014, 1 spec., SEAG lgt. **Sinnamary Commune:** Route Barrage Petit Saut km 21–22 [ca. 5°04'14"N 53°00'21"W], Light Trap, 11.ii.2002, 3 spec., R. Lupoli lgt.; the same locality, Light Trap, 29.iv.2002, 4 spec., 23.v.2003, 1 spec., 4.vi.2003, 1 spec., all Bout lgt.; the same locality, Light Trap, 12.x.2004, 1 spec., Lupoli lgt. **Saint-Laurent-du-Maroni Arrondissement: Mana Commune:** Laussat ouest [ca. 5°29'16"N 53°33'46"W], Light Trap, 14.v.2010, 1 spec., Lamarre lgt. **Maripasoula Commune:** DZ rivière Coulé coulé, Light Trap, 22.x.2004, 1 spec., Champenois lgt.; Massif du Mitaraka [ca. 2°17'29"N 54°31'18"W], Light Traps, 23.ii.–25.iii.2015, 49 spec., MNHN lgt. **Saül Commune:** Belvédère [ca. 2.41°N 53.1°W], Light Trap, 13.iii.2013, 1 spec., SEAG lgt.; the same locality, Polyvie (Blue LED) Trap, 1.ix.2015, 2 spec., 15.ix. 2015, 6 spec., 13.xi.2015, 4 spec., 27.xi.2015, 2 spec., 11.xii.2015, 1 spec., 8.i.2016, 14 spec., 22.ii.2016, 1 spec., 9.iii.2016, 1 spec., 31.v.2016, 8 spec., SEAG lgt. **St-Laurent du Maroni Commune:** Village Espérance [ca. 5°25'39"N 54°03'04"W], Polyvie Trap (Blue LED), 1.iv.2014, 1 spec., 15.v.2014, 2 spec., SEAG lgt.; Sommet Massif Lucifer [ca. 4°45'57"N 53°56'26"W], Light Trap, 25.x.2014, 1 spec., SEAG lgt.

Diagnosis. Coloration, structure of head, thorax and pregenital abdomen, and vestiture as in other species of the genus (see redescription of *Rhyncholepta* above) except the following characters:

Apex of scutellum with anteapical black V-shaped stripe usually reduced to small black spot at lateral margin at anterior end of apical V-shaped callosity (Figs 14–17). However, two examined males (♂ [Figure 18], French Guiana, Camp Caimans, 20.–31.i.2016, NMPC; ♂, French Guiana, Pied Saud, DBTC), have the black V complete. Apical callosity large, branches of the V short, forming ca. one third, less frequently one half, of length, tip of scutellum therefore with rather large triangular callosity (Figs 14–18).

Male genitalia. Genital capsule in ventral view distinctly constricted lateroapically (Figs 30: arrow, 54: arrow), posterolateral angles prominent, ca. rectangular (Figs 30,

Table 1. Measurements of *Rhyncholepta* species-group taxa.

Measurement (mm): median, minimum–maximum, n of specimens	***Rhyncholepta grandicallosa grandicallosa***		***Rhyncholepta grandicallosa centroamericana***		***Rhyncholepta henryi***		***Rhyncholepta meinanderi***		***Rhyncholepta wheeleri***
	male	**female**	**male**	**female**	**male**	**female**	**male**	**female**	**male**
Total body length	12.79	11.95	12.66	12.67	12.18	12.20	12.55	12.50	13.17
	11.75–13.30	**11.25–12.53**	**11.22–13.44**	**11.29–14.00**	**11.44–12.88**	**11.70–12.80**	**12.50–13.90**	**12.20–13.74**	
	n = 9	n = 10	n = 10	n = 10	n = 9	n = 10	n = 5	n = 6	n = 1
Body length to segment VII	11.31	11.19	10.92	11.90	10.78	11.23	11.20	11.25	–
	10.50–12.30	**10.25–11.70**	**10.01–11.68**	**10.61–12.80**	**10.00–11.24**	**10.90–11.45**	**10.70–11.90**	**10.70–11.40**	
	n = 10	n = 10	n = 10	n = 10	n = 10	n = 10	n = 7	n = 8	n = 1
Head length	2.41	2.45	2.46	2.55	2.50	2.50	2.48	2.51	2.65
	2.22–2.50	**2.30–2.60**	**2.24–2.70**	**2.27–2.76**	**2.34–2.65**	**2.35–2.64**	**2.20–2.55**	**2.35–2.76**	
	n = 10	n = 10	n = 10	n = 10	n = 10	n = 10	n = 7	n = 10	n = 1
Head width	2.31	2.30	2.34	2.40	2.35	2.38	2.30	2.34	2.40
	2.21–2.37	**2.25–2.40**	**2.12–2.42**	**2.21–2.53**	**2.27–2.49**	**2.30–2.45**	**2.25–2.45**	**2.25–2.42**	
	n = 10	n = 10	n = 10	n = 10	n = 10	n = 10	n = 7	n = 10	n = 1
Interocular width	1.05	1.05	1.08	1.16	1.12	1.05	1.10	1.10	1.18
	0.95–1.16	**1.00–1.15**	**1.04–1.15**	**1.03–1.21**	**1.01–1.19**	**1.00–1.21**	**1.00–1.14**	**1.00–1.17**	
	n = 10	n = 10	n = 10	n = 10	n = 10	n = 10	n = 7	n = 10	n = 1
Pronotum length	2.49	2.45	2.50	2.59	2.47	2.45	2.65	2.53	2.65
	2.35–2.70	**2.30–2.65**	**2.28–2.71**	**2.36–2.84**	**2.26–2.65**	**2.10–2.55**	**2.51–2.80**	**2.40–2.70**	
	n = 10	n = 10	n = 10	n = 10	n = 10	n = 10	n = 7	n = 10	n = 1
Pronotum width	8.36	7.99	7.69	8.00	7.67	7.88	8.80	8.43	8.14
	7.93–8.70	**7.75–8.75**	**6.85–8.24**	**7.03–8.68**	**7.53–8.10**	**7.55–8.10**	**8.40–9.85**	**7.85–8.85**	
	n = 10	n = 10	n = 10	n = 10	n = 10	n = 10	n = 7	n = 10	n = 1
Scutellum length	4.44	4.26	4.41	4.50	4.26	4.28	4.70	4.45	4.61
	4.25–4.75	**4.10–4.42**	**3.97–4.69**	**4.08–4.85**	**4.04–4.45**	**4.05–4.34**	**4.55–5.01**	**4.30–4.70**	
	n = 10	n = 10	n = 10	n = 10	n = 10	n = 10	n = 7	n = 10	n = 1

Measurement (mm): median, minimum–maximum, n of specimens	***Rhyncholepta grandicallosa grandicallosa***		***Rhyncholepta grandicallosa centroamericana***		***Rhyncholepta henryi***		***Rhyncholepta meinanderi***		***Rhyncholepta wheeleri***
	male	**female**	**male**	**female**	**male**	**female**	**male**	**female**	**male**
Scutellum width	3.77	3.60	3.73	3.83	3.53	3.70	3.90	3.80	3.73
	3.53–3.91	**3.40–3.93**	**3.39–3.90**	**3.44–4.10**	**3.10–3.69**	**3.60–3.76**	**3.80–4.15**	**3.50–4.00**	
	n = 10	n = 10	n = 10	n = 10	n = 10	n = 10	n = 7	n = 10	n = 1
Scape (I) length	0.79	0.75	0.76	0.77	0.79	0.80	0.79	0.78	0.78
	0.69–0.87	**0.67–0.80**	**0.56–0.84**	**0.64–0.84**	**0.66–0.86**	**0.63–0.85**	**0.70–0.90**	**0.66–0.89**	
	n = 10	n = 10	n = 10	n = 10	n = 10	n = 10	n = 7	n = 10	n = 1
Basipedicellite (IIa) length	1.25	1.22	1.32	1.33	1.30	1.20	1.30	1.23	1.22
	1.12–1.38	**1.14–1.36**	**1.16–1.43**	**1.21–1.44**	**1.08–1.48**	**1.10–1.25**	**1.18–1.50**	**1.15–1.46**	
	n = 10	n = 10	n = 10	n = 10	n = 10	n = 10	n = 7	n = 10	n = 1
Distipedicellite (IIb) length	2.55	2.35	2.50	2.44	2.56	2.55	2.70	2.52	2.63
	2.38–2.70	**2.10–2.40**	**2.05–2.73**	**1.95–2.78**	**2.40–2.80**	**2.30–2.70**	**2.60–3.00**	**2.30–2.82**	
	n = 10	n = 10	n = 10	n = 10	n = 10	n = 10	n = 7	n = 10	n = 1
Basiflagellum (III) length	3.37	3.18	3.06	3.12	3.50	3.50	3.65	3.44	–
	2.96–3.60	**3.05–3.35**	**2.60–3.44**	**2.68–3.43**	**3.20–3.65**	**3.12–3.70**	**3.40–3.95**	**3.25–3.60**	
	n = 10	n = 9	n = 10	n = 8	n = 10	n = 10	n = 7	n = 8	
Distiflagellum (IV) length	2.93	2.65	2.58	2.64	2.76	2.95	3.13	3.00	–
	2.72–2.95	**2.60–2.71**	**1.89–2.78**	**2.33–2.77**	**2.67–2.95**	**2.72–3.15**	**2.90–3.20**	**2.80–3.15**	
	n = 7	n = 5	n = 8	n = 7	n = 5	n = 9	n = 6	n = 7	

54); dorsal wall at base of posterolateral angles deeply impressed (Figs 54: arrow, 66). Ventral rim in ventral view apically bilobed, with shallow V-shaped notch medially (Figs 30–31); hypandrial projections not visible in ventral view (Figs 30–31). Hypandrium in posterior view with pair of large-lobe like anterior projections, apices appearing rounded (Figs 42, 43: ap) and very short, pointed posterior projections directed posterolaterad (Figs 42, 43: pp); lateral projections not visible in ventral view but placement of their attachment apparent as small convexity laterally on anterior projections (Figure 43: lpb). Anterior hypandrial projection in most exposed (dorso-posterolateral) view larger than in *Rh. grandicallosa centroamericana*, with lateral margins parallel-sided in middle, broadly rounded apically (Figure 72: ap). In dorsal view, apices of anterior hypandrial projections directed straight upwards, their median outline regularly convex (Figs 54, 55: ap; straight in *Rh. g. centroamericana*); lateral hypandrial projections long, golf-club shaped, their "handles" approaching apically (Figs 54, 55: lp; nearly parallel in *Rh. g. centroamericana*), apically regularly (C-shaped) curved inwards (Figs 55: lp, 72: lp). *Phallus* (Figs 78–80; described and illustrated in detail by Becker and Grazia-Vieira 1971: figs 6, 7, 10): Basal plates U-shaped. Phallotheca cylindrical, curved dorsally at right angles at apex. Conjunctiva variably sclerotized ventrally, with pair of laminar sclerites flanking distal region of aedeagus, but not reaching phallotreme (Figure 79: cjs); dorsally with strong expansion giving conjunctiva sacculiform appearance. Aedegaus (= vesica) elongate, S-shaped, covered with conjunctiva except at apex (Becker and Grazia-Vieira 1971: fig. 10; in Figure 79: ae the S-shaped sinuation less prominent due to overmaceration in KOH).

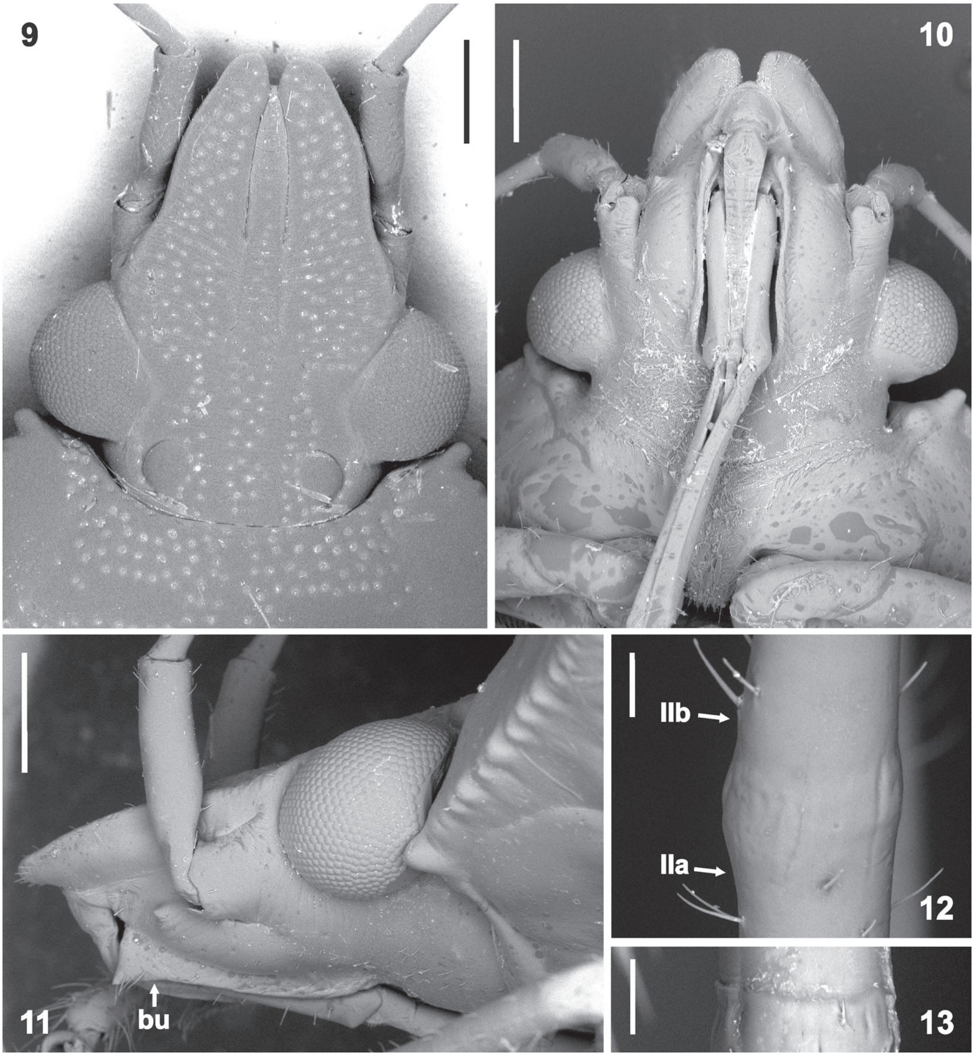
Female genitalia. Posterior edges of laterotergites VIII abruptly attenuated apically, as long as or slightly more prominent posteriad compared with laterotergites IX (Figure 90). Internal female genitalia described in detail by Becker and Grazia-Vieira (1971: figs 14, 16).

Measurements. See Table 1. Measurements of candidate neotype (in mm): Body length 12.07, body length to segment VII 10.85, head length 2.35, head width 2.25, interocular width 1.03, length of antennomeres: I – 0.83, IIa – 1.23, IIb – 2.50, III – 3.43, IV – 2.94, pronotum length 2.55, pronotum width 8.24, scutellum length 4.41, scutellum width 3.53.

Differential diagnosis. See characters in the key above. Most specimens of this subspecies differ from *Rh. henryi* sp. n. by the incomplete black V-shaped band anteapically on scutellum; however, this character does not work for all specimens.

Etymology. The species name is a composed Latin adjective, *grandicallosus* (*-a*, *-um*), meaning "bearing large callosities."

Bionomics. Specimens mainly were collected by various types of light traps (UV light, mercury vapor light, GemLight and Polyvie traps) in dense forests or adjacent to such a forest, except in Macouria, where one specimen was collected in the littoral secondary forest and one in the savanna. This species has never been collected by hand catching, sweeping, or beating the vegetation during the day or night. One specimen was collected by flight intercept trap at Matiti, French Guiana (JE Eger, pers. observ.; R Lupoli, pers. comm.). Collection dates of specimens examined indicate that *Rh. g.*



Figures 9–13. Morphology of *Rhyncholepta* species. **9, 11–12** *Rh. grandicallosa grandicallosa* Bergroth, 1911, ♂, French Guiana, Camp Caimans **10, 13** *Rh. grandicallosa centroamericana* subsp. n., paratype, ♂, Costa Rica, Rancho Quemado. **9** head, dorsal view (magnification 37×) **10** head, ventral view (37×); **11** head, lateral view (50×) **12–13** joint between basipedicellite and distipedicellite (**12** lateral view, 300×; **13** ventral view, 300×). Abbreviations: **bu** buccula, **IIa** basipedicellite, **IIb** distipedicellite. Scale bars: 0.5 mm (**9–11**); 50 µm (**12–13**). (micrographs P. Kment)

grandicallosa occurs year round, with a distinct peak in April–June (Figure 94) (Becker and Grazia-Vieira 1971, Castro Huertas et al. 2005, this paper).

Distribution (Figs 99–100). Brazil: Amazonas (Becker and Grazia-Vieira 1971, Arnold 2011, Silva et al. 2018); ?Colombia: Chocó (Torres Gutiérrez 2005, as *Rhyncholepta* sp.; Castro-Huertas et al. 2015); French Guiana (Becker and Grazia-Vieira

Figures 14–25. Apex of scutellum of *Rhyncholepta* species. **14–18** *Rh. grandicallosa grandicallosa* Bergroth, 1911: 14 – ♀, lectotype, French Guiana **15** ♂, candidate neotype, French Guiana, Camp Caimans **16** ♂, French Guiana, Camp Voltaire **17–18** French Guiana, Camp Caimans (**17** ♀, **18** ♂). **19–22** *Rh. grandicallosa centroamericana* subsp. n.: **19** ♀, Panama, Barra del Colorado **20** ♀, Costa Rica, Rancho Quemado **21** ♂, Panama, Pipeline Road **22** Guatemala, Firmeza. **23** *Rh. henryi* sp. n., holotype, ♂, French Guiana, Camp Caimans. **24** *Rh. meinanderi* Becker & Grazia-Vieira, 1971, ♂, Ecuador, Arajuno env. **25** *Rh. wheeleri* sp. n., holotype, ♂, Guyana. (photographs **14** A. Albrecht; **15– 21, 23–25** P. Kment; **22** J.E. Eger)

1971); Guyana (new country record); Peru (new country record); Suriname (new country record); Venezuela (Becker and Grazia-Vieira 1971, Grazia 1984).

Records from Colombia, Guyana, and Suriname require confirmation based on males. The subspecific identity of *Rh. grandicallosa* population from Chocó, Colombia requires revision.

Comments. Bergroth (1911) described the species based on the female sex, but did not indicate the number of specimens (syntypes) examined, though the fact that a single measurement and not a range was given for the body length (‘Long. ♀ (sine membr. [= without membrane]) 11 mm) suggests that he had only one specimen. Bergroth (1914: fig. 6) provided a color painting of an adult. Neither of the Bergroth's two papers mentioned the depository of the type(s).

Pirán (1956: 29, 35: fig. 1) illustrated the male genitalia of a specimen from Bolivia and designated the specimen as the allotype. The designation of a male allotype by Pirán (1956) is an invalid action without nomenclatural consequence because his specimen was not a part of the original type series (see ICZN 1999: Article 72). Furthermore, his illustration more closely conforms to *Rh. meinanderi* as described by Becker and Grazia-Vieira (1971).

Becker and Grazia-Vieira (1971: 396) referred to a female holotype from French Guiana, deposited in the collection of the MZHF. We consider the action of Becker and Grazia-Vieira (1971: 396) as a valid lectotype designation under Article 74.6 (ICZN 1999) because the term holotype was used explicitly for the only existing (syn) type specimen. Becker and Grazia-Vieira (1971) distinguished two species of the genus *Rhyncholepta*. They interpreted *Rh. grandicallosa* based on their examination of the lectotype and described its male and a new species, *Rh. meinanderi*, which differs from *Rh. grandicallosa* in structure of the male and female genitalia (Becker and Grazia-Vieira 1971: figs 2, 3 versus 4, 5 and 12 versus 13).

Our revision of the genus *Rhyncholepta*, however, reveals five taxa that are indistinguishable based on coloration, structure of body and pregenital abdomen, vestiture, and morphometric characters (see Table 1). The most promising external character, the development of the black V-shaped anteapical band on the scutellum and its apical V-shaped callosity, might help in identifying specimens of *Rh. grandicallosa grandicallosa* versus *Rh. henryi*, but we found two males of *Rh. g. grandicallosa* from French Guiana with a complete V-shaped band on the scutellum, as in *Rh. henryi*. This character also varies widely in *Rh. grandicallosa centroamericana*. The painting by Bergroth (1914), depicting almost certainly the lectotype of *Rh. grandicallosa*, shows an apparent black V-shaped band anteapically on the scutellum. The black V-shaped band, however, is not well delimited in recent photographs of the lectotype (see Figure 5), which might be attributed to inaccuracy of the painting or fading of the specimen's coloration during a century of preservation.

The female external genitalia allow *Rh. meinanderi* to be distinguished from both subspecies of *Rh. grandicallosa* and *Rh. henryi* sp. n., but those taxa cannot be reliably separated based on this character (Figs 93 versus 90–92). Also, the internal female genitalia did not provide suitable identification characters. Moreover, the female of *Rh. wheeleri* sp. n., the taxon probably most closely related to *Rh. meinanderi*, remains unknown.

The structure of the male genital capsule and, to a lesser extent, of the phallus thus remain the only reliable characters for identifying species of *Rhyncholepta*. The presence of two sympatric taxa in French Guiana, the type locality of *Rh. grandicallosa*, required reconsideration of the identity of this taxon. Careful examination of the photographs of the lectotype provided by MZHF confirmed that, in the absence of a reliable character allowing identification of female *Rh. grandicallosa* and *Rh. henryi*, the lectotype is not sufficient to determine the specific identity of *Rh. grandicallosa*. We decided to follow Article 75.5 of ICZN (1999) by petitioning the International Commission on Zoological Nomenclature to suppress the existing non-informative lectotype and replace it with a male neotype. Herein we suggest a suitable male neotype, which is properly documented to fulfill all requirements of Article 75.3 of ICZN (1999) and conserves the identity of *Rh. grandicallosa* sensu Becker and Grazia-Vieira (1971) and all subsequent authors. The case is being submitted to the ICZN simultaneously with this paper (Kment et al., submitted).

Rhyncholepta grandicallosa centroamericana **subsp. n.**

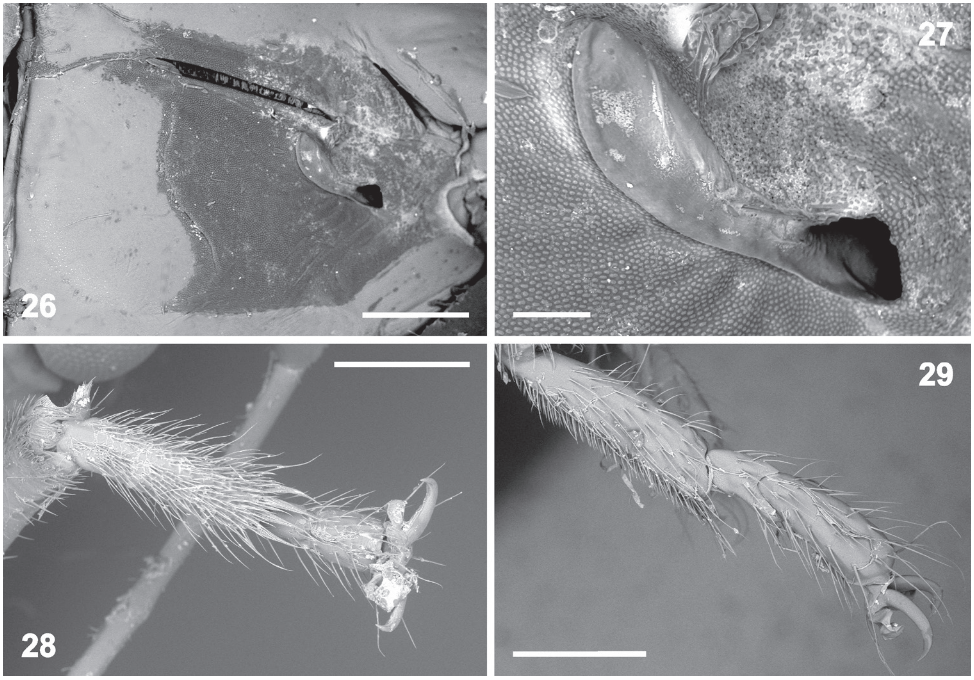
http://zoobank.org/6B0F453F-819C-4360-BC13-9E87ED75901A
Figs 5, 10, 13, 19–22, 26–28, 32–35, 44–47, 56–59, 67–68, 73–74, 81–83, 91, 95

Rhyncholepta grandicallosa: Becker and Grazia-Vieira (1971): 396 (partim, records from Panama); Froeschner (1999): 185 (checklist); Arismendi (2002): 31 (distribution); Arismendi and Thomas (2003): 223, 230 (distribution, records); Cambra et al. (2018): 13, 17: Figure 37 (list, photo).

Type locality. Panama, Panamá Province, El Lano Cartí Road, km 8–11, 1100' [= 335 m a.s.l.], ca. 9°17'N 78°58'W.

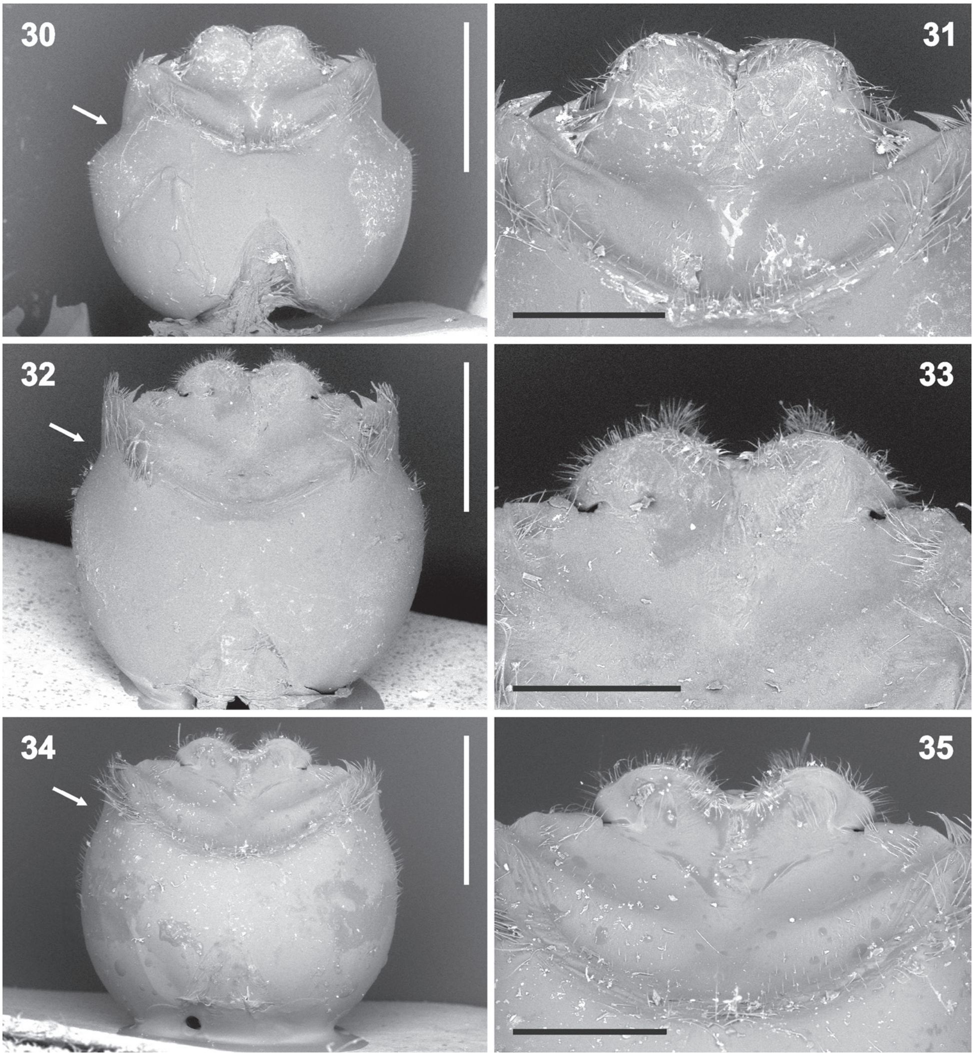
Type material. Holotype: ♂, "PAN. Panama Prv / El Lano Carti Rd k / 8–11 24 May–2 June / 1992 1100' JE Wappes [printed, white label] // DBT [printed, white label] // ♂ [printed, white label] // HOLOTYPUS / *RHYNCHOLEPTA* / *GRANDICALLOSA* subsp. / *CENTROAMERICANA* nov. / det. Kment, Eger, Rider 2017 [printed, red label]" (DBTC → USNM). The holotype is pinned through scutellum, left distiflagellum is missing.

Paratypes: **MEXICO: Chiapas:** Palenque [17°29'15"N 92°02'47"W], MV Light, 19.viii.1990, 1 ♂, P. J. Landolt lgt. (JEEC). – **BELIZE:** British Honduras, 5.iv.1937, 1 ♂, no collector, J. Grazia-Vieira 1973 det. (DARC); British Honduras, Rio Grande, viii.1935, 1 ♀, J. J. White lgt., B.M. 1935-597, *Rhyncholepta grandicallosa* det. Ruckes 1961 (BMNH). – **GUATEMALA: Izabal Province:** 30 km SE of Morales, Finca Firmeza [15.379°N 88.695°W], at light, 7.–22.vii.2008, 4 ♂♂ 2 ♀♀, F. Skillman, C. and L. O'Brien lgt. (FSCA); Izabal, road up to Firmeza, 30 km SE Morales, 22.vii.2008. 1 ♂, C. W. and L. B. O'Brien and F. Skillman lgt. (JEEC); D. Izabel, Firmeza, 30 km SE Morales, at UV and metal halide light, 23.vii.2008, 1 ♀, C. W. and L. B. O'Brien and F. Skillman lgt. (JEEC). – **COSTA RICA: Alajuela Province:** 20 km S Upala [ca. 10°43'11"N 85°01'06"W], 11.–21.vi.1991, 1 ♀, F. D. Parker lgt. (DBTC); Ca. 15 km SW Volcán Arenal, Arenal Vista Lodge [ca. 10°25'47"N 84°45'40"W], at mercury vapor and black light, 13.–15.viii.1995, 1 ♂ 1 ♀, J. E. Eger coll. [Costa Rica Collecting Permit No. 00113412] (1 ♂ JEEC, 1 ♀ INBIO); Caño Negro [ca. 10°53'35"N 84°47'45"W], R.N.V.S., 20 m a.s.l., 5.–28.ii.1995, 1 ♂, K. F. Flores lgt., L_N_319100_450200 #4424 (INBIO); Finca Monte Sele [ca. 10.57°N



Figures 26–29. Morphology of *Rhyncholepta* species. **26–28** *Rh. grandicallosa centroamericana* subsp. n.: ♂, Costa Rica, Rancho Quemado: **26** external scent efferent system of metathoracic scent gland (magnification 55×) **27** peritreme and ostiole (200×) **28** protarsus, ventral view (70×) **29** *Rh. grandicallosa grandicallosa* Bergroth, 1911, ♂, French Guiana, Camp Caimans, metatarsus, lateral view (70×). Scale bars: 0.5 mm (**26, 28–29**); 100 µm (**27**). (micrographs: P. Kment)

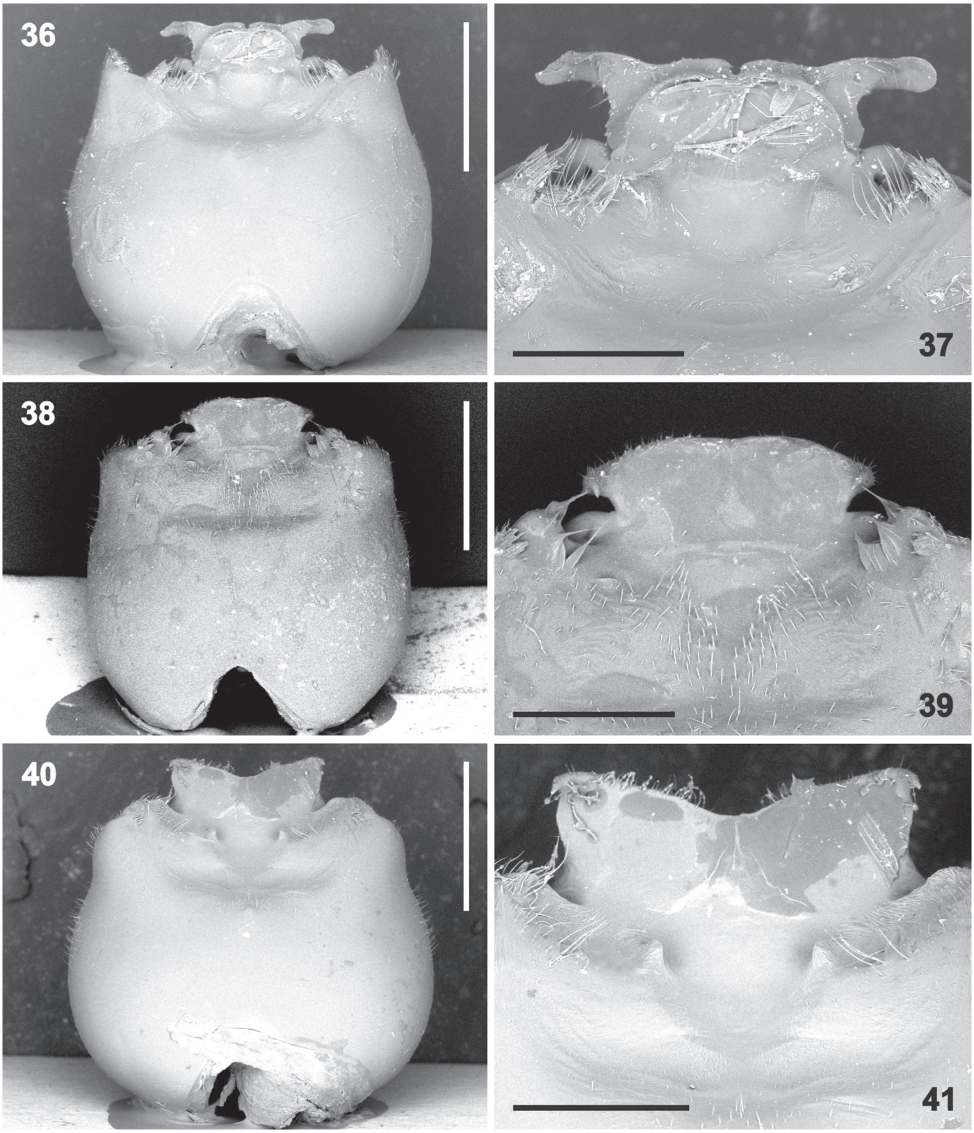
85.25°W], 750 m a.s.l., ix.1994, 2 ♂♂, C. Moraga lgt., L N 326200_379900 #3204 (INBIO). **Cartago Province:** Monumento Nacional Guayabo [ca. 9°58'16"N 83°41'27"W], Turrialba, 1100 m a.s.l., ix.1994, 1 ♂, G. Fonseca lgt., L N 217200_570300 #3202 (INBIO); Paso Marcos env., 9°48.71'N 83°29.85'W, 2450' [= 747 m a.s.l.], 1 ♂, D. Thomas, D. Robacker and W. Warfield lgt. (DBTC). **Guanacaste Province:** Est. Pitilla, 9 km S Sta. Cecilia, P. N. Guanacaste, xi.1988, 1 ♂, C. Chaves and M. Espinosa lgt., L-N 330200, 380200 (INBIO); Est. Pitilla, 9 km S Sta. Cecilia, P. N. Guanacaste, i.–ii.1990, 1 ♂, GNP Biod. Survey, L-N 330200, 380200 (INBIO); Est. Pitilla, 9 km S Sta. Cecilia [ca. 10°58'48"N 85°24'48"W], P. N. Guanacaste, x.1992, 1 ♂, C. Moraga lgt., L-N 330200, 380200 (INBIO); Hacienda El Oro, 450–500 m a.s.l., vii.1996, 1 ♂, A. Masis, M. M. Chavarria, C. Moraga, P. Ríos, de Luz [= light trap], L_N_332600_377400 #45263 (INBIO). **Heredia Province:** Est. El Ceibo, Braulio Carrillo N. P., 400–600 m a.s.l., v.1990, 1 ♀, C. Chaves lgt., L-N-527700, 256500 (INBIO); Est. Magsasay [ca. 10°24'19"N 84°03'18"W], P.N. Braulio Carrillo, 200 m a.s.l., v.1991, 1 ♀, A. Fernández lgt., L-N-264600, 531000 (INBIO); Finca la Selva Verde, 12 km S. Puerto Viejo, 500 ft [= 152 m a.s.l.], 23.–26.ix.1986, 1 ♂ 1 ♀, J. E. Eger lgt. (JEEC); La Selva Biological Station, 3 km S Pto. Viejo, 10°26'N



Figures 30–35. Genital capsule (**30, 32, 34** magnification 32×) and detail of hypandrium (**31, 33, 35** 80×) in ventral view. **30–31** *Rh. grandicallosa grandicallosa* Bergroth, 1911, French Guiana, Camp Caimans **32–35** *Rh. grandicallosa centroamericana* subsp. n.: **32–33** Panama, Pipeline Road **34–35** Costa Rica, Rancho Quemado. Scale bars: 1 mm (**30, 32, 34**); 0.5 mm (**31, 33, 35**). (micrographs: P. Kment)

84°01'W, 26.vii.1992, 2 ♂♂, H. A. Hespenheide lgt., La Selva Project (DARC); Los Arbolitos [ca. 10°38'47"N 83°59'36"W], 30 m a.s.l., 20.–27.iii.1993, 2 ♂♂, F. Araya lgt., L N 536100_291400 #1952 (1 ♂ FSCA, 1 ♂ INBIO); near Puerto Viejo, La Selva Biological Station, 10°25'N 84°00'W, 179 ft [= 55 m a.s.l.], at light, 1.iii.2004, 1 ♂, C. R. Bartlett, J. Cryan and J. Urban lgt. (DARC). **Limón Province:** Amubri [ca. 9°31'34"N 82°57'08"W], 70 m a.s.l., 12.–31.x.1993, 1 ♂, G. Gallardo lgt., L S 385500_578000 #2407 (INBIO); Amubri, A. C. Amistad, 70 m a.s.l., 2.–20.ix.1993, 1 ♂, G. M. Gallardo lgt., L S 385500_578000 #2368 (INBIO); Cerro Tortuguero [ca. 10°35'02"N 83°31'38"W], P.N. Tortuguero, 100 m a.s.l., xi.1989, 1 ♂, J. Solano lgt., L-N 285000, 588000 (INBIO); Cerro Tortuguero, P.N. Tortuguero, 0–100 m a.s.l., v.1990, 1 ♀, J. Solano lgt., L-N 285000, 588000 (INBIO); Cerro Tortuguero, P.N. Tortuguero, 0–120 m a.s.l., vi.1991, 2 ♂♂, R. Delgado lgt., L-N 285000, 588000 (INBIO); Est. Cuatro Esquinas [ca. 10°27'23"N 83°40'19"W], P. N. Tortuguero, 0 m a.s.l., 27.iii.–29.iv.1992, 2 ♂♂, D. Garcia lgt., L-N 280000, 590500 (INBIO); Est. Hitoy Cerere, R. Cerere, Res. Biol. Hitoy [ca. 9°38'50"N 83°04'15"W], 100 m a.s.l., 28.–12.[sic!].iv.1992, 1 ♂, E. Lopez lgt., L-N 184200, 643300 (INBIO); Río Sardinas, R.N.F.S. Barra del Colorado [ca. 10°46'07"N 83°35'08"W], 10 m a.s.l., 14.x.1992, 1 ♂, F. Araya lgt., L N 291500_564700 (INBIO); Río Sardinas, R.N.F.S. Barra del Colorado, 10 m a.s.l., 12.–30.ix.1993, 4 ♂♂ 4 ♀♀, F. Araya lgt., L N 291500_564700 #2355 (2 ♂♂ 2 ♀♀ INBIO, 1 ♂ BMNH, 1 ♂ 1 ♀ NHMW, 1 ♀ NMPC); Río Sardinas, R.N.F.S. Barra del Colorado, 10 m a.s.l., 11.–19.x.1993, 1 ♀, F. Araya lgt., L N 291500_564700 #2398 (INBIO); Río Sardinas, R.N.F.S. Barra del Colorado, 10 m a.s.l., 2.–12.i.1994, 1 ♂, F. Araya lgt., L N 291500_564700 #2552 (INBIO); R.V.S., Barra del Colorado, Camino a Linda Vista, 98 m a.s.l., 19.viii.2004, 1 ♂, B. Gamboa, W. Porras, D. Briceno, M. Moraga and Y. Cárdenas lgt., light trap, LN 284965 568835//77943 (INBIO); Sardinas, Barra del Colorado, 15 m a.s.l., 27.iii.–3.iv.1995, 2 ♂♂, F. Araya lgt., L N 291900 565900 #4414 (INBIO); Sector Cerro Cocori, Fca de E. Rojas [E. Rojas' farm; 10.60°N, 83.72°W], xi.1990, 1 ♂, E. Rojas lgt., L-N-286000, 567500 (INBIO). **Puntarenas Province:** Esquipulas de Tasazu, 27 km NE of Quepos, 27.v.2003, 2 ♂♂ 1 ♀, J. C. Burne lgt. (DBTC); Est. Agujas [ca. 8.537998°N 83.471381°W], 300 m a.s.l., night collecting, 25.–28.x.1995, 1 ♂, A. Azofeifa lgt., L_S_276750_526550 #6373 (INBIO); Est. Quebrada Bonita, R. B. Carara [ca. 9°47'02"N 84°34'02"W], 80 m a.s.l., xi.1994, 1 ♂, J. C. Sobrio lgt., L N 194500_469850 #3290 (INBIO); Est. Sirena [ca. 8°32'37"N 83°31'18"W], P. N. Corcovado, 0–100 m a.s.l., x.1989, 1 ♂, G. Fonseca lgt., L-S-270500, 508300 (INBIO → FSCA); x.1989, 1 ♂, G. Fonseca lgt., L-S-270500, 508300 (FSCA); the same locality, x.1989, 1 ♂, C. Saborio lgt., L-S-270500, 508300 (INBIO → FSCA); Est. Sirena, P. N. Corcovado, 1–100 m a.s.l., vi.1990, 1 ♂, G. Maass lgt., L-S-270500, 508300 (INBIO); Est. Sirena, P. N. Corcovado, 1–100 m a.s.l., vi.1990, 1 ♀, N. Obando lgt., L-S-270500, 508300 (INBIO); Est. Sirena, P. N. Corcovado, 1–100 m a.s.l., v.1994, 1 ♂, G. Fonseca lgt., L S 270500_508300 #2899 (INBIO); Sirena, Corcovado Nat. Pk., Osa Peninsula, 14.viii.1980, 1 ♂, H. Janzen and W. Hallwachs lgt., INBIO, CRI001 715796 (INBIO → FSCA); Golfo Dulce, P.N. Corcovado, Est. Agujas [ca. 8.537998°N 83.471381°W], 200–300 m a.s.l., 10.–12.x.2007, 1 ♂, J. A. Azofeifa lgt., Tp. Luz [= light trap], L_S_276750_526550 #92557 (INBIO); Lepanto, Montaña Grande, Estac. Karen Mogensen [ca. 9°52'14"N 85°03'30"W], 320 m a.s.l., 25.–30.ix.2003, 1 ♂ 1 ♀, Y. Cardenas lgt., Tp. de Luz [= light trap], L_N_205600_420300 #75455 (INBIO); near Villa Neily [ca. 8°38'47"N 82°56'44"W], 5.–11.viii.1963, 1 ♂, C. L. Hogue lgt. (DARC); Osa, Ciudad P[uer]to Cortés [ca. 8°57'52"N 83°31'33"W], Cuesta del Burro, 680 m a.s.l., 6.vi.2005, 1 ♂,

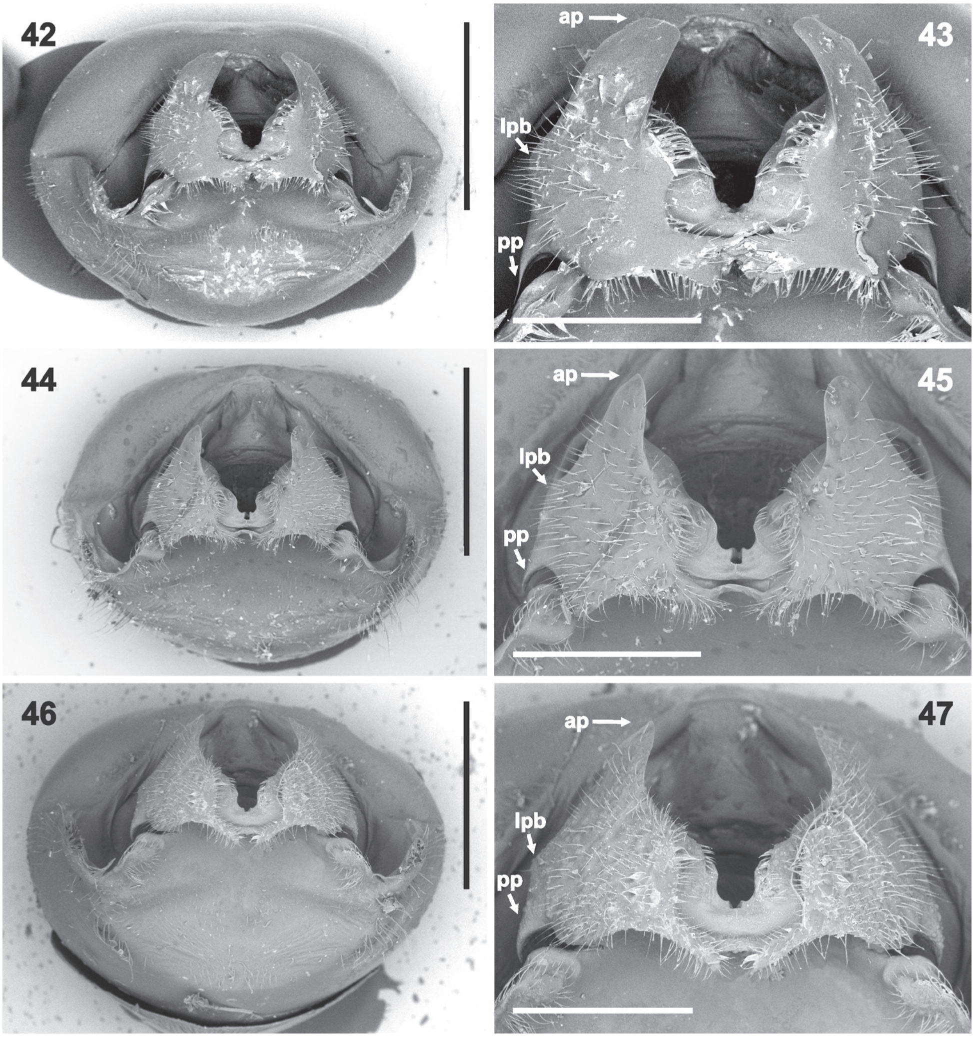
J. Montero, B. Gamboa, J. Gutiérrez, M. Moraga, J. Azofeifa, Y. Cárdenas and J. Mata, Tp. Luz. [= light trap], L_S_330629_517352 #83476 (INBIO); Osa Peninsula, Sirena, Corcovado Nat. Pk., 13.viii.1980, 2 ♂♂, D. H. Janzen and W. Hallwachs lgt. (INBIO); R. Priv. Karen Mogensen, Alred. Estación, 350 m a.s.l., 6.vii.2003, 1 ♀, M. A. Zumbado and W. Porras lgt., Tp. Luz. Mercurio [= mercury vapor light], L N 205600 420300 #74586 (INBIO); R.V.S. Río Piro, Golfito [ca. 8°37'09"N 83°08'40"W], Finca Catalino, 200 m a.s.l., 16.ix.2004, 1 ♀, Y. Cardenas, D. Briseño and B. Gamboa, Luz. [= light trap], L_S_264550_535590 #78215 (INBIO); Rancho Quemado [ca. 8°40'55"N 83°33'38"W], Peninsula de Osa, x.1990, 6 ♂♂ 13 ♀♀, F. Quesada lgt., L-S-292500, 511000 (1 ♂ 5 ♀♀ FSCA, 2 ♂♂ 5 ♀♀ INBIO, 1 ♀ BMNH, 1 ♂ 1 ♀ HNHM, 2 ♂♂ 1 ♀ NMPC); Rancho Quemado, Pen.[insula de] Osa, x.–xi.1990, 1 ♀, B. Apu lgt., L-S-292500, 511000 (INBIO); Rancho Quemado, Pen.[insula de] Osa, i.1991, 3 ♂♂ 2 ♀♀, F. Quesada lgt., L-S-292500, 511000 (INBIO); Rancho Quemado, Pen.[insula de] Osa, iv.1991, 1 ♂, J. C. Saborio lgt., L-S-292500, 511000 (INBIO); Sirena, Corcovado Nat. Pk., Osa Penin.[sula], 5.–11.i.1981, 1 ♀, D. H. Janzen and W. Hallwachs lgt. (INBIO). **San José Province:** Est. Bijagual [ca. 9°43'43"N 84°34'09"W], Res. Biol. Carara, 500 m a.s.l., ix.1990, 1 ♂, G. Varela lgt., L-N-192250, 474760 (INBIO). – **PANAMA: Bocas del Toro Province:** 12 km W Chiriqui Grande [ca. 8°59'32"N 82°15'13"W], 10.–13.v.1999, 2 ♂♂, Morris and Wappes lgt. (JEEC). **Chiriquí Province:** Finca La Suiza, 5.3 km N Los Planes, 8°39'N, 82°12'W, 4500' [= 1372 m a.s.l.], 26.–30.v.1995, 1 ♂, B. Ratcliffe and M. Jameson lgt. (DBTC). **Coclé Province:** Rio Indio Lodge, N El Valle, 8°39'46.7"N, 80°7'7.9"W, 575 m a.s.l., 23.–27.ii.2012, 1 ♀, J. B. Heppner lgt. (FSCA). **Colón Province:** Pipeline Road, km 0, 9°7'19"N, 79°42'53"W, beating of forest vegetation along strips for boat navigation signs, 31.viii.2010, 1 ♂ 2 ♀♀, L. Sekerka lgt. (MMBC). **Panamá Province:** Campana [= Cerro Campana], 2785 ft [= 849 m a.s.l.], 8°40.920'N 79°55.731'W, 28.v.–9.vi.2008, 1 ♀, D. C. Robacker lgt. (DBTC); 10–12 km N El Llano, 3.–8.vi.1986, 1 ♀, E. Giesbert lgt. (FSCA); El Llano–Carti Rd. [= road], km 10–13 [ca. 9°17'37"N 78°58'43"W], 3.–7.vi.1984, 1 ♀, R. L. Penrose, F. T. Hovore and P. H. Sullivan lgt. (DBTC); K[m] 8–13 El Llano–Carti Rd. [= road], 10.–13.v.1996, 2 ♂♂ 1 ♀, Wappes, Huether and Morris lgt. (1 ♂ 1 ♀ DBTC, 1 ♂ JEEC); PN Chagres, Cerro Jeffe, 9°14.3' N 79°24.1' W, 700–950 m a.s.l., lower montane forest; individual collecting, 18.–19.viii.2017, 2 ♂♂, M. Seidel and L. Sekerka lgt. (NMPC). **San Blas Province:** Nusagandi [9.3489°N, 78.966°W], 18.–20.v.1993, UV light, 3 ♂♂, E. Riley lgt. (2 ♂♂ DARC, 1 ♂ DBTC); Nusagandi, at light, 250–350 m a.s.l., 26. vii.1995, 1 ♂ 3 ♀♀, C. W. and L. B. O'Brien lgt. (JEEC); San Blas, Punta Eseoses [= Escocés; 8.85°N 77.6333°W], Lt. Trap, ii.–iii.1979, 1 ♂ 1 ♀, Caroline Ash lgt., H. D. Engleman det. as *Rhyncholepta grandicallosa* (JEEC). **Veraguas Province:** Santa Fé env., Cascada Alto de Piedra, 8°31.0'N 81°07.3'W, 830 m a.s.l., lower montane forest, individual collecting, 12.ix.2017, 1 ♂, J. Hájek lgt. (NMPC). – All the paratypes are bearing the following identification label: "PARATYPUS / *RHYNCHOLEPTA* / *GRANDICALLOSA* subsp. / *CENTROAMERICANA* nov. / det. Kment, Eger, Rider 2017 [printed, yellow label]".



Figures 36–41. Genital capsule (**36, 38, 40** magnification 32×) and detail of hypandrium (**37, 39, 41** 80×) in ventral view. **36–37** *Rh. henryi* sp. n., holotype, French Guiana, Camp Caimans **38–39** *Rh. meinanderi* Becker & Grazia-Vieira, 1971, Ecuador, Yasui NP **40–41** *Rh. wheeleri* sp. n., holotype, Guyana. Scale bars: 1 mm (**36, 38, 40**); 0.5 mm (**37, 39, 41**). (micrographs P. Kment)

Diagnosis. Coloration, structure of head, thorax and pregenital abdomen, and vestiture as in other species of the genus (see redescription of *Rhyncholepta* above) except the following characters.

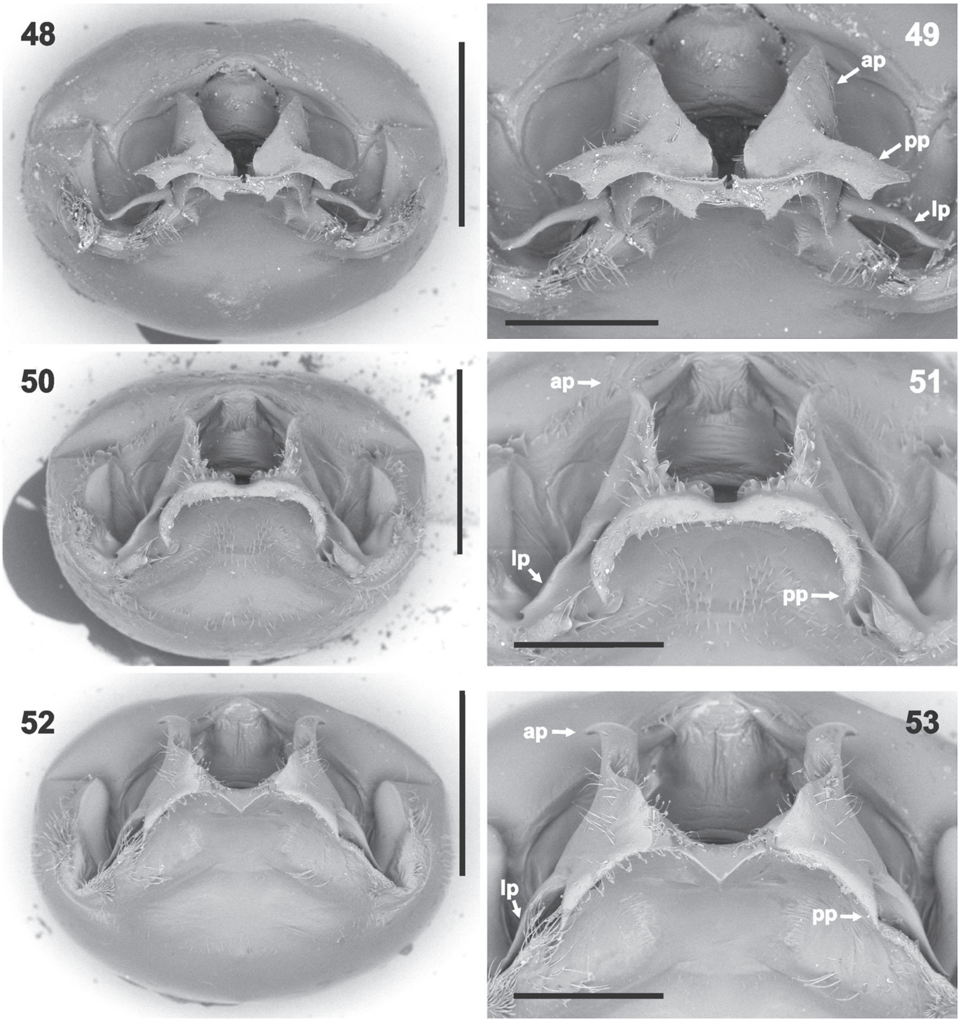
Apex of scutellum with anteapical black V-shaped stripe usually well developed, wide (Figure 20) to narrow (Figs 21–22), less frequently reduced to small black spot



Figures 42–47. Genital capsule (**42, 44, 46** magnification 45×) and detail of hypandrium (**43, 45** 80×, **47** 90×) in posterior (caudal) view. **42–43** *Rh. grandicallosa grandicallosa* Bergroth, 1911, French Guiana, Camp Caimans **44–47** *Rh. grandicallosa centroamericana* subsp. n.: **44–45** Panama, Pipeline Road; **46–47** Costa Rica, Rancho Quemado. Abbreviations: **ap** anterior hypandrial projection, **lpb** base of lateral hypandrial projection, **pp** posterior hypandrial projection. Scale bars: 1 mm (**42, 44, 46**); 0.5 mm (**43, 45, 47**). (micrographs: P. Kment)

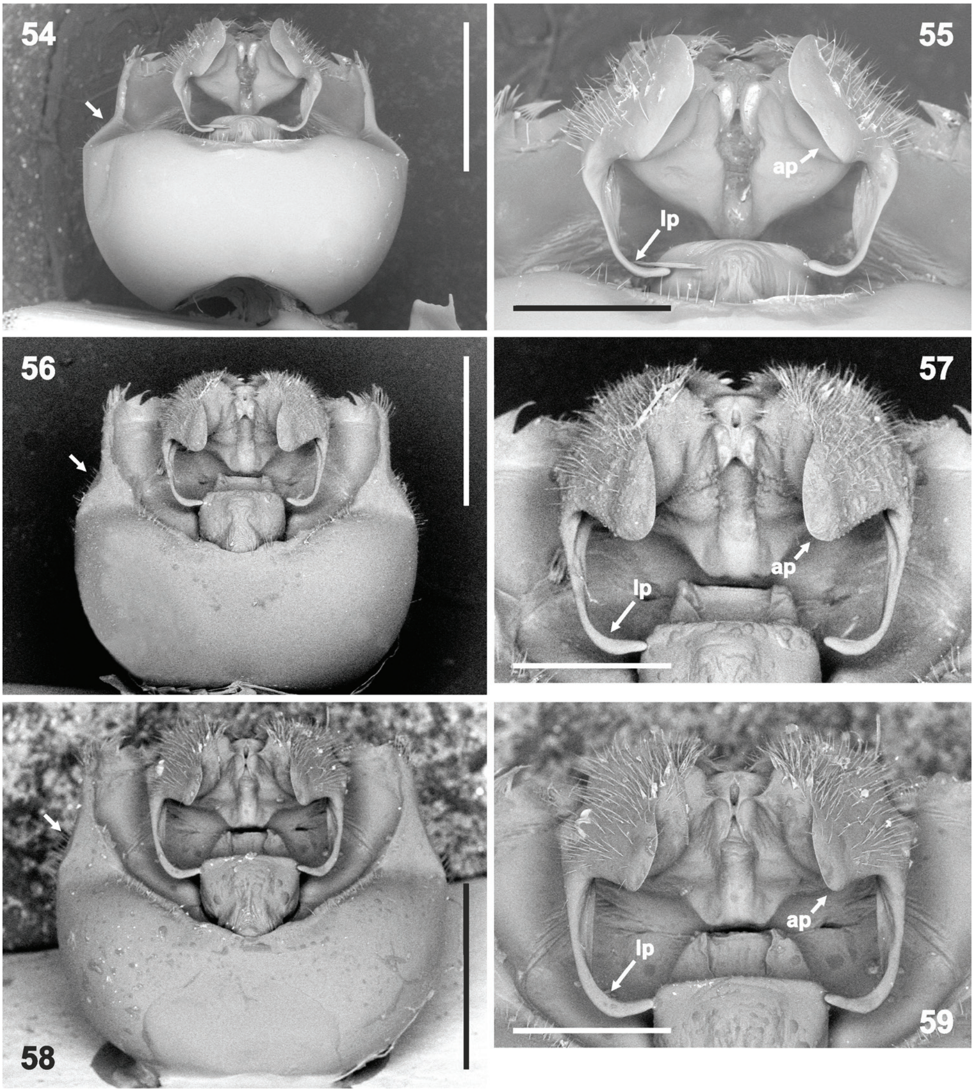
on each lateral margin at anterior end of apical V-shaped callosity (Figure 19); all color forms can be syntopic (e.g. Costa Rica, Rio Sárdinas, INBIO). Apical callosity V-shaped, robust, branches of V forming ca. one third to one half of width, tip of scutellum with distinct triangular callosity (Figs 19–22).

Male genitalia. Genital capsule in ventral view more or less constricted lateroapically (Figs 32: arrow, 34: arrow, 56: arrow, 58: arrow), posterolateral angles prominent, ca.



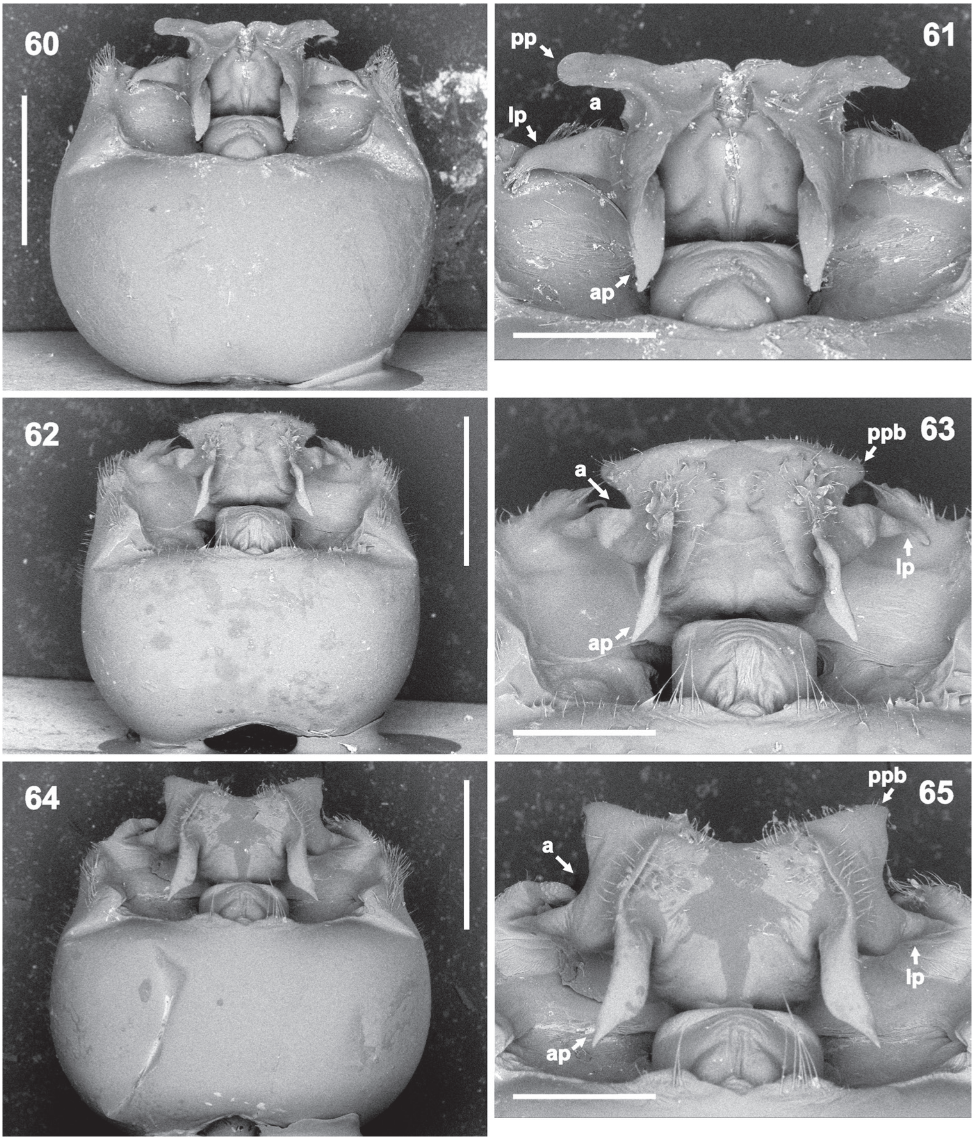
Figures 48–53. Genital capsule (**48, 50, 52** magnification 45×) and detail of hypandrium (**49, 51, 53** 80×) in posterior (caudal) view. **48–49** *Rh. henryi* sp. n., holotype, French Guiana, Camp Caimans **50–51** *Rh. meinanderi* Becker & Grazia-Vieira, 1971, Ecuador, Yasui NP **52–53** *Rh. wheeleri* sp. n., holotype, Guyana. Abbreviations: **ap** anterior hypandrial projection, **lp** lateral hypandrial projection, **pp** posterior hypandrial projection. Scale bars: 1 mm (**48, 50, 52**); 0.5 mm (**49, 51, 53**). (micrographs: P. Kment)

rectangular (Figs 32, 34, 56, 58); dorsal wall at base of posterolateral angles shallowly to deeply impressed (56: arrow, 58: arrow, 67–68). Ventral rim in ventral view bilobed apically, with shallow V-shaped notch medially (Figs 32–35); hypandrial projections not visible in ventral view (Figs 32–35). Hypandrium in posterior view with pair of large lobe-like anterior projections, apices appearing acute (Figs 44, 45: ap, 46, 47: ap) and short-pointed posterior projections directed posterolaterad (Figs 45: pp, 47: pp); lateral projections not visible in ventral view but site of their attachment apparent as obtuse angle laterally on anterior projections (Figure 45: lbp, 47: lbp). Anterior



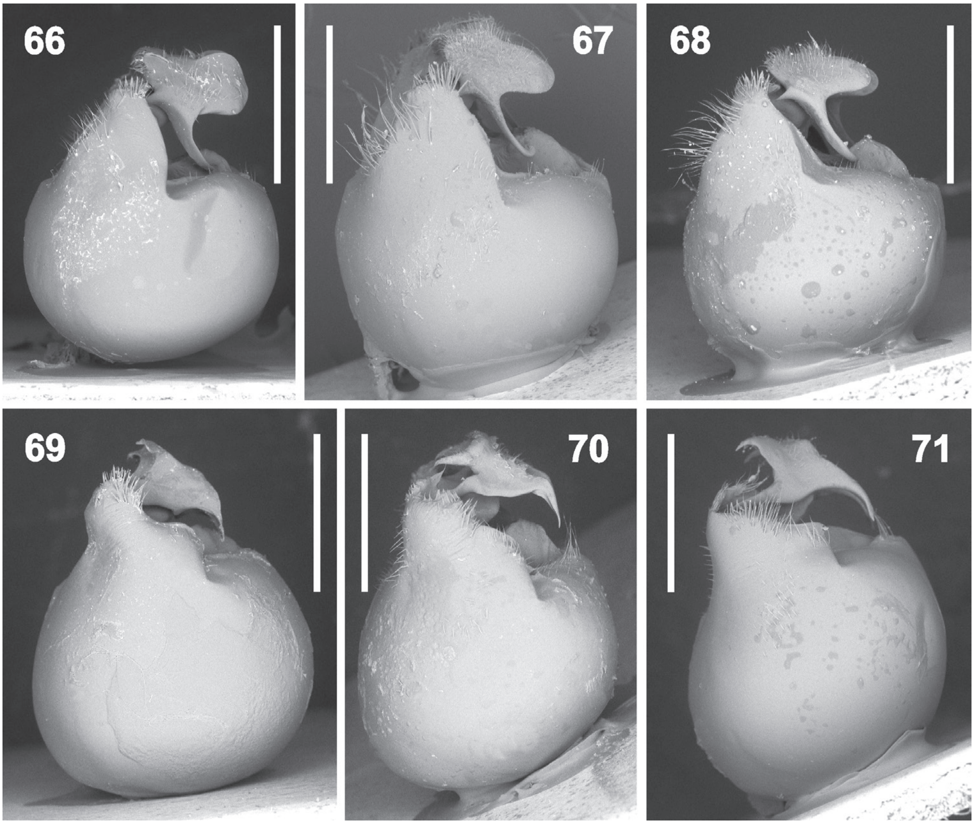
Figures 54–59. Genital capsule (**54, 56, 58** magnification 32×) and detail of hypandrium (**55, 57, 59** 80×) in dorsal view. **54–55** *Rh. grandicallosa grandicallosa* Bergroth, 1911, French Guiana, Camp Caimans **56–59** *Rh. grandicallosa centroamericana* subsp. n.: **56–57** Panama, Pipeline Road **58–59** Costa Rica, Rancho Quemado. Abbreviations: **ap** anterior hypandrial projection, **lp** lateral hypandrial projection. Scale bars: 1 mm (**54, 56, 58**); 0.5 mm (**55, 57, 59**). (micrographs: P. Kment)

hypandrial projections in most exposed (dorso-posterolateral) view smaller than in *Rh. grandicallosa grandicallosa*, parabolic, with narrowly rounded apex (Figs 73: ap, 74: ap). In dorsal view, apices of anterior hypandrial projections directed anterodorsally, median outline straight (Figs 56, 57: ap, 58, 59: ap; in *Rh. g. grandicallosa* convex); lateral hypandrial projections long (appearing longer than in *Rh. g. grandicallosa*), golf-club "handles" nearly parallel, suddenly curved inwards (ca. in right angle) apically (Figs



Figures 60–65. Genital capsule (**69, 62, 64** magnification 32×) and detail of hypandrium (**61, 63, 65** 70×) in dorsal view. **60–61** *Rh. henryi* sp. n., holotype, French Guiana, Camp Caimans **62–63** *Rh. meinanderi* Becker & Grazia-Vieira, 1971, Ecuador, Yasui NP **64–65** *Rh. wheeleri* sp. n., holotype, Guyana. Abbreviations: **a** angle between posterior and lateral hypandrial projection, **ap** anterior hypandrial projection, **lp** lateral hypandrial projection, **ppb** base of posterior hypandrial projection. Scale bars: 1 mm (**60, 62, 64**); 0.5 mm (**61, 63, 65**). (micrographs: P. Kment)

57: lp, 59: lp, 73: lp, 74: lp). *Phallus* (Figs 81–83) conjunctival sclerites (Figure 82: cjs) and aedeagus strongly S-shaped as in *Rh. g. grandicallosa* (Figure 79; Becker and Grazia-Vieira 1971: fig. 10).

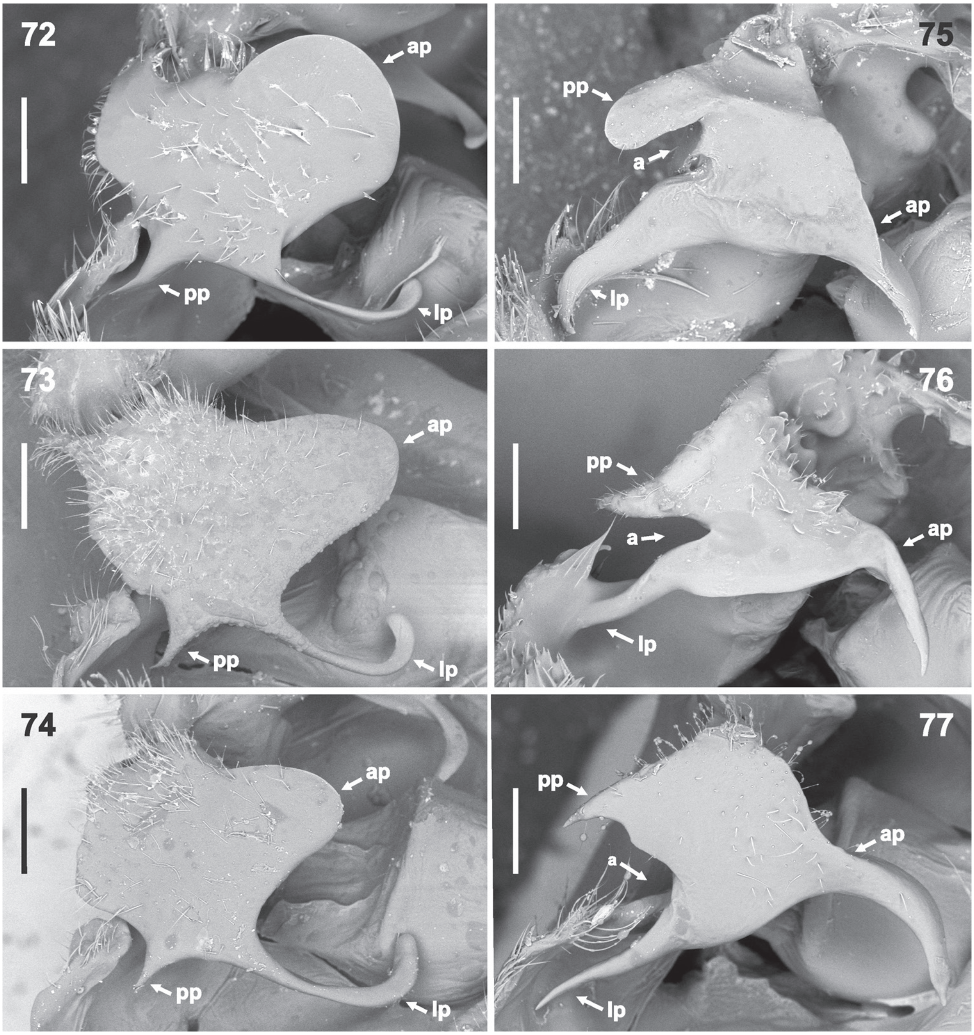


Figures 66–71. Genital capsule and hypandrium in lateral view (magnification 35×). **66** *Rh. grandicallosa grandicallosa* Bergroth, 1911, French Guiana, Camp Caimans **67–68** *Rh. grandicallosa centroamericana* subsp. n.: **67** Panama, Pipeline Road **68** Costa Rica, Rancho Quemado **69** *Rh. henryi* sp. n., holotype, French Guiana, Camp Caimans **70** *Rh. meinanderi* Becker & Grazia-Vieira, 1971, Ecuador, Yasui NP **71** *Rh. wheeleri* sp. n., holotype, Guyana. Scale bars: 1 mm. (micrographs P. Kment)

Female genitalia. Posterior edges of laterotergites VIII posteriorly as long as or slightly more prominent compared with laterotergites IX (Figure 91) (within variation of *Rh. g. grandicallosa*).

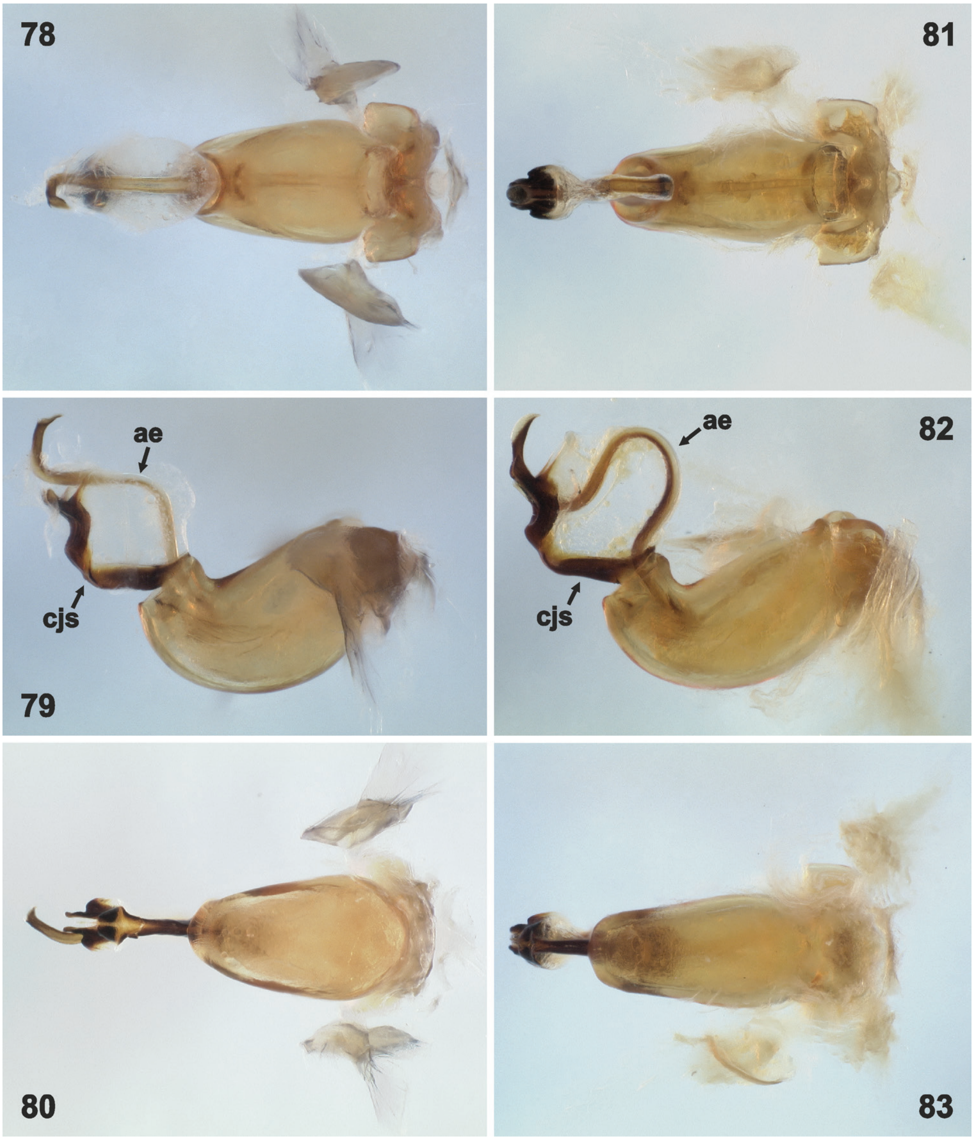
Measurements. Table 1. Measurements of holotype (in mm): Body length 13.19, body length to segment VII 11.64, head length 2.56, head width 2.41, interocular width 1.11, length of antennomeres: I – 0.84, IIa – 1.43, IIb – 2.73, III – 3.44, IV – 2.73, pronotum length 2.71, pronotum width 7.88, scutellum length 4.65, scutellum width 3.83.

Variability. Besides the usual variation in coloration and structure within *Rhyncholepta* species, we observed some variability of *Rh. g. centroamericana* in the structure of the genital capsule and hypandrium, as illustrated in two males. One is from Panama, Pipeline Road (Figs 32–33, 44–45, 56–57, 67, 73; namely genital capsule slightly constricted posterolaterally [Figs 32, 56], anterior hypandrial projection longer, with apex



Figures 72–77. Hypandrial processes in dorso-posterolateral (most exposed) view (magnification 110×). **72** *Rh. grandicallosa grandicallosa* Bergroth, 1911, French Guiana, Camp Caimans **73–74** *Rh. grandicallosa centroamericana* subsp. n.: **73** Panama, Pipeline Road **74** Costa Rica, Rancho Quemado **75** *Rh. henryi* sp. n., holotype, French Guiana, Camp Caimans **76** *Rh. meinanderi* Becker & Grazia-Vieira, 1971, Ecuador, Yasui NP **77** *Rh. wheeleri* sp. n., holotype, Guyana. Abbreviations: **a** angle between posterior and lateral hypandrial projection, **ap** anterior hypandrial projection, **lp** lateral hypandrial projection, **pp** posterior hypandrial projection. Scale bars: 0.2 mm. (micrographs: P. Kment)

more prominent, and median margin slightly less concave medially [Figs 45: ap, 57: ap, 73: ap]). The second male is from Costa Rica, Rancho Quemado (Figs 34–35, 46–47, 58–59, 68, 74; namely genital capsule hardly constricted posterolaterally [Figs 34, 58], anterior hypandrial projection shorter, with apex less prominent, and median margin slightly more concave medially [Figs 47: ap, 59: ap, 74: ap]). The posterolateral constric-



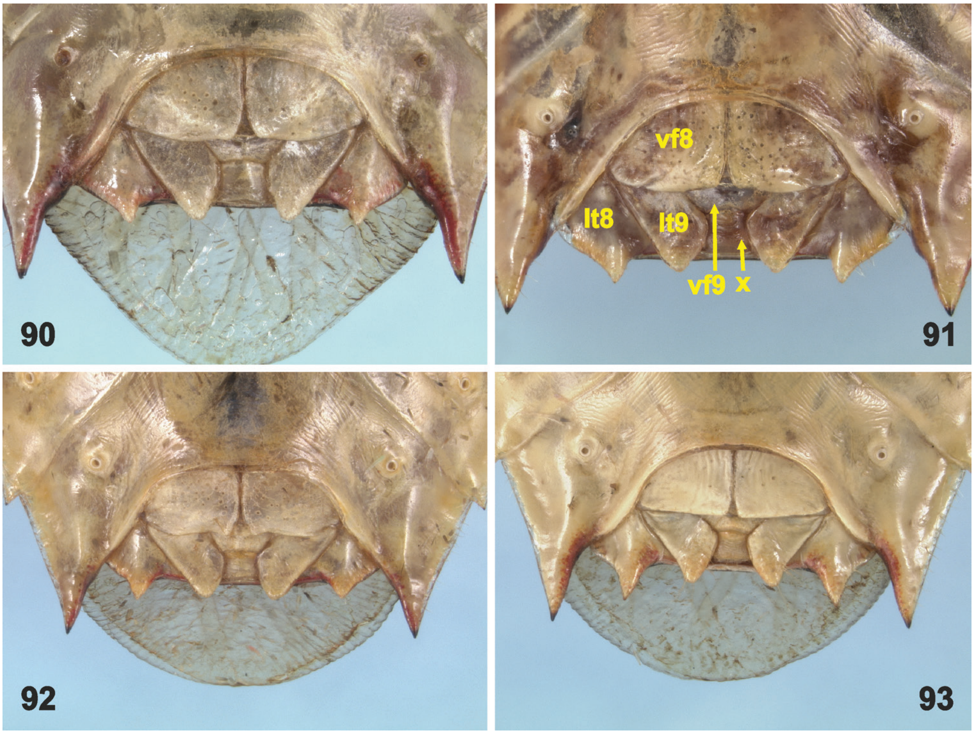
Figures 78–83. Phallus in dorsal (**78, 81**), lateral (**79, 82**) and ventral (**80, 83**) view. **78–80** *Rh. grandicallosa grandicallosa* Bergroth, 1911, French Guiana, Amazone Nature Lodge; **81–83** *Rh. grandicallosa centroamericana* subsp. n., Panama, Punta Eseoses. Not to scale. Abbreviations: **ae** aedeagus (= vesica), **cjs** conjunctiva sclerites. (photographs: J.E. Eger)

tion of the genital capsule in the specimen from Panama, Pipeline Road (Figs 32, 56: arrow) is somewhat intermediate between the typical *Rh. g. grandicallosa* (see Figs 30, 54: arrow) and the population from Costa Rica, Rancho Quemado (Figs 34, 58: arrow).

Etymology. The subspecies name is a Latin adjective *centroamericanus* (*-a*, *-um*) referring to its Central American distribution.

Figures 84–89. Phallus in dorsal (**84, 87**), lateral (**85, 88**) and ventral (**86, 89**) view. **84–86** *Rh. henryi* sp. n., French Guiana, 33 km SE Roura on Kaw Rd. **87–89** *Rh. meinanderi* Becker & Grazia-Vieira, 1971, Brazil, near Fzda. Rancho Grande. Not to scale. Abbreviations: **ae** aedeagus (= vesica), **cjs** conjunctiva sclerites. (photographs: J.E. Eger)

Bionomics. Most specimens were collected by various types of light traps (UV light, mercury vapor light, metal halide light, black light) in or adjacent to dense forests. According to JE Eger, it has never been collected by hand catching, sweeping, or beating vegetation during the day or night. In Panama, three specimens were collected by "beating of forest vegetation along strips for boat navigation signs" (J Sekerka, pers. comm.) and one in "lower montane forest, [by] individual collecting" (J Hájek, pers. comm.) but without detailed information. Collection dates indicate that *Rh. g. centroamericana* occurs year round, though most specimens were collected between May and October (Figure 95) (Becker and Grazia-Vieira 1971, Arismendi and Thomas 2003; present paper).



Figures 90–93. Female external genitalia in ventro-posterior view. **90** *Rh. grandicallosa grandicallosa* Bergroth, 1911 **91** *Rh. grandicallosa centroamericana* subsp. n. **92** *Rh. henryi* sp. n. **93** *Rh. meinanderi* Becker & Grazia-Vieira, 1971. Not to scale. Abbreviations: **lt8–9** laterotergites VIII and IX, **vf8–9** valvifers VIII and IX, **x** segment X. (photographs: J.E. Eger)

Distribution (Figure 98). Mexico: Chiapas (new country record); Belize (new country record); Guatemala (new country record); Honduras (Arismendi 2002, Arismendi and Thomas 2003, both as *Rh. grandicallosa*); Costa Rica (Arismendi 2002, as *Rh. grandicallosa*); Panama (Becker and Grazia-Vieira 1971, Froeschner 1999, Arismendi 2002, Cambra et al. 2018, all as *Rh. grandicallosa*).

The subspecific identity of *Rh. grandicallosa* population from Chocó, Colombia requires revision.

Rhyncholepta henryi sp. n.

http://zoobank.org/DF08B4F4-0B65-4A2C-98FD-C299E534174B

Figs 6, 23, 36–37, 48–49, 60–61, 69, 75, 84–86, 92, 96

Type locality. French Guiana, Roura Commune, Route de Kaw, Camp Caimans, 4°34'09.8"N 52°13'05.5"W, 320 m a.s.l.

Type material. Holotype: ♂ (Figs 6, 23, 36–37, 48–49, 60–61, 69, 75), "GUYANE FR., Rt. de Kaw / Camp Caimans, 320 m a.s.l. / 04.5694N, 52.2182W / 11.-

19.i.2016, S. MURZIN lgt. [printed, white label] // COLLECTIO / NATIONAL MUSEUM / Praha, Czech Republic [printed, white label] // ♂ [printed, white label] // HOLOTYPUS / *RHYNCHOLEPTA* / *HENRYI* / sp. nov. / det. Kment, Eger, Rider 2017 [printed, red label]" (NMPC). The holotype is card-mounted, with the detached left distiflagellum glued on the same piece of card and the detached genital capsule and abdominal segment VIII glued separately on a small piece of card.

Paratypes: **FRENCH GUIANA: Cayenne Arrondissement: Kourou Commune:** Montagne des Signes near Kourou [ca. 5.091899°N 52.699481°W], collected at mercury vapor light, 3.vi.1986, 2 ♂♂, E. C. Riley and D. A. Rider lgt. (DARC). **Roura Commune:** 27 km SE Roura on Kaw Rd., 4°34.116'N, 52°12.614'W, MV Light, 5.ii.2010, 1 ♂, J. E. Eger lgt. (JEEC); 32 km SE Roura on Kaw Rd., 4°33.612'N, 52°11.350'W, 287 m a.s.l., MV Light, 15.ii.2010, 1 ♂, J. E. Eger lgt. (JEEC); 33 km SE Roura on Kaw Rd., 4°34.135'N, 52°11.150'W, 227 m a.s.l., MV Light, 12.–13. iv.2007, 6 ♂♂, D. G. Hall and J. E. Eger lgt. (JEEC); Amazone Nature Lodge, 30 km SE Roura on Kaw Rd., 4°33.570'N, 52°12.433'W, 300 m a.s.l., UV Light, 10.–18. iv.2007, 1 ♂, D. G. Hall and J. E. Eger lgt. (JEEC); the same locality, MV Lights, 4.–15.i.2016, 4 ♂♂, J. Eger, R. Morris and J. Wappes lgt. (JEEC); Camp Caiman, 4.569°N 52.218°W, 260 m a.s.l., 8.–31.i.2018, 3 ♂♂, S. Murzin lgt. (NMPC); Entomotech Lodge, 30 km SE Roura on Kaw Rd., 4°33.570'N 52°12.433'W, 300 m a.s.l., MV Light, 17.xi.2004, 1 ♂, xi.2004–ii.2005, 2 ♂♂, 17.i.2005, 1 ♂, F. Goubert lgt. (JEEC); Highway N2 to Regina, 45 km S of Cayenne [ca. 4°31'53"N 52°22'20"W], collected at mercury vapor light, 31.v.1986, 2 ♂♂, E. G. Riley and D. A. Rider lgt. (DARC); Montagne des Chevaux RN2 km 22 [ca. 4.7216°N 52.3073°W], automatic light trap (white LED), 3.i.2013, 1 ♂, SEAG leg. (MNHN). **Saint-Laurent-du-Maroni Arrondissement: Mana Commune:** Réserve Trinité [ca. 4°04'18"N 52°33'18"W], Drop Zone Aya, UV light trap, 30.v.2012, 1 ♂, SEAG leg. (RLFF). **Saül Commune:** Belvédère [ca. 2.41°N 53.1°W], automatic light trap (blue LED), 5.vii.2017, 1 ♂, SEAG leg. (RLFF). – All the paratypes are bearing the following identification label: "PARATYPUS / *RHYNCHOLEPTA* / *HENRYI* / sp. nov. / det. Kment, Eger, Rider 2017 [printed, yellow label]".

Additional material examined (females tentatively identified as *Rh. henryi*). FRENCH GUIANA: Cayenne Arrondissement: Kourou Commune: Montagne des Signes near Kourou [ca. 5.091899°N 52.699481°W], collected at mercury vapor light, 3.vi.1986, 1 ♀, E. C. Riley and D. A. Rider lgt. (DARC). **Montsinéry-Tonnegrande Commune:** 8 km W of Risquetout, 4°55.097'N 52°33.121'W, 45 m a.s.l., MV Light, 15.iv.2007, 3 ♀♀, D. G. Hall and J. E. Eger lgt. (JEEC). **Roura Commune:** 21 km SE Roura on Kaw Rd., 4°36.115'N, 52°15.972'W, MV Light, 6.–7.ii.2010, 1 ♀, J. E. Eger lgt. (JEEC); 28 km SE Roura on Kaw Rd., 4°34.252'N, 52°12.797'W, 306 m a.s.l., MV Light, 17.ii.2010, 1 ♀, J. E. Eger lgt. (JEEC); 32 km SE Roura on Kaw Rd., 4°33.612'N, 52°11.350'W, 287 m a.s.l., MV Light, 15.ii.2010, 1 ♀, J. E. Eger lgt. (JEEC); 33 km SE Roura on Kaw Rd., 4°34.135'N, 52°11.150'W, 227 m a.s.l., MV Light, 12.–13.iv.2007, 7 ♀♀, D. G. Hall and J. E. Eger lgt. (JEEC); Amazone Nature Lodge, 30 km SE Roura on Kaw Rd., 4°33.570'N, 52°12.433'W, 300 m a.s.l., UV

Light, 4.–15.i.2016, 1 ♀, J. Eger, R. Morris and J. Wappes lgt. (JEEC); Camp Caiman, 4.569°N 52.218°W, 260 m a.s.l., 8.–31.i.2018, 1 ♀, S. Murzin lgt. (NMPC); Entomotech Lodge, 30 km SE Roura on Kaw Rd., 4°33.570'N 52°12.433'W, 300 m a.s.l., MV Light, 1.–12.xii.2002, 1 ♀, J. E. Eger lgt. (DARC); Highway D6 to Kaw, 33.5 km SE of Roura [ca. 4°32'47"N 52°08'41"W], 10.ii.1986, 1 ♀, G. Tavakilian lgt. (DARC).

Diagnosis. Coloration, structure of head, thorax and pregenital abdomen, and vestiture as in other species of the genus (see redescription of *Rhyncholepta* above) except for the following characters.

Apex of scutellum with anteapical black V-shaped stripe well developed (Figure 23). Apical V-shaped callosity thin, narrowly delineating margins of scutellum apex, branches forming more than half of length, tip of scutellum lacking conspicuous triangular callosity (Figure 23).

Male genitalia. Genital capsule in ventral view only slightly constricted lateroapically, posterolateral angles prominent (Figs 36, 60); dorsal wall at base of posterolateral angles shallowly impressed (Figs 60, 69). Ventral rim in ventral view truncate apically, slightly notched medially (Figs 36–37), posterior hypandrial projections visible and caudal, together with ventral rim forming wide T (Figs 36–37); bases of lateral projections also visible (Figure 37). Hypandrium in posterior view with three pairs of projections: posterior ones caudal, short, flat, narrowly rounded apically with small rounded projection anteapically on posterior margin (Figs 48–49); lateral projections very narrow, directed posterolaterad, apices spinose, curved upwards (Figs 48–49); anterior projections steeply sloping downwards, appearing narrowly triangular in dorsal view, acutangulate apically (Figs 48–49). Anterior hypandrial projections in most exposed (dorso-posterolateral) view appearing nearly triangular with dorsal margin nearly straight, apically with sharp, straight, flattened spine (Figure 75: ap); posterior and lateral projections forming acute angle (Figure 75: a); posterior projection appearing straight, wide, widely rounded apically in this view (Figure 75: pp); lateral projection narrowing, shortly bent downwards apically (Figure 75: lp). Anterior hypandrial projections narrowing anteriad towards apices in dorsal view, apices straight, each forming large claw-like spine curved downwards (Figs 60, 61: ap), posterior projections short, flat, apically rounded (Figs 60, 61: pp); lateral projections directed laterad, each narrowing to sharp spine, curved anteriad apically (Figs 60, 61: lp). *Phallus* (Figs 84–86) with basal conjunctival sclerite drop-shaped (Figure 85: cjs) and aedeagus only slightly sinuate apically (Figure 85: ae), very similar to that of *Rh. meinanderi*.

Female genitalia. Posterior edges of laterotergites VIII suddenly attenuated apically, posteriorly about as long as laterotergites IX (Figure 92), indistinguishable from *Rh. grandicallosa*.

Measurements. Table 1. Measurements of holotype (in mm): Body length 12.39, body length to segment VII 10.91, head length 2.55, head width 2.27, interocular width 1.15, length of each antennomeres: I – 0.86, IIa – 1.34, IIb – 2.61, III – 3.46, IV – 2.95, pronotum length 2.47, pronotum width 8.05, scutellum length 4.37, scutellum width 3.62.

Differential diagnosis. See above key. All specimens differing from the majority of specimens of *Rh. g. grandicallosa* by complete black V-shaped band anteapically on scutellum (character does not work for all specimens of *Rh. g. grandicallosa*).

Etymology. We are pleased to dedicate the new species to our colleague, Thomas J. Henry, an excellent specialist in Heteroptera and curator of the USNM, on the occasion of his 70th birthday. We much appreciate his generosity in helping visitors with literature or specimens in the USNM, including hosting colleagues in his home when they visited the collection.

Bionomics. Most specimens were collected by various types of light traps (UV light, mercury vapor light, white and blue LED) in or adjacent to dense forests. This species has never been collected by hand catching, sweeping or beating vegetation during the day or night (JE Eger, pers. observ.). *Rhyncholepta henryi* was found from November to February and from April to June, with most specimens collected in April (Figure 96).

Distribution (Figs 99–100). French Guiana (present paper).

Rhyncholepta meinanderi Becker & Grazia-Vieira, 1971

Figs 7, 24, 38–39, 50–51, 62–63, 70, 76, 87–89, 93, 97

Rhyncholepta grandicallosa (misidentification): Pirán (1956): 29 (record, invalid allotype designation), 35: fig. 1 (line drawing of apex of male abdomen in ventral view).

Rhyncholepta meinanderi Becker & Grazia-Vieira, 1971: 394, 397–399, figs 4–5, 8–9, 11, 13, 15, 17 (description, illustrations of morphological details, distribution).

Rhyncholepta meinanderi: Grazia (1984): 79 (record); Arnold (2011): 104 (record).

Type locality. Venezuela, Bolívar, Karnakuni, 450 m a.s.l., ca. 4°26'N 64°08'W.

Type material (not examined). Holotype: ♂, "Kanarakuni, Bolivar, Venezuela, 450 m, 4-II-1967, F. Fernandez Y. and A. D. Ascoli col." (IZAV).

Material examined. BOLIVIA: Santa Cruz Department: Prov.[incia] del Sara [ca. 17°02'16"S 63°32'47"W], C M Acc 5068, xi.1913, 1 ♀, Steinbach lgt. (DARC). – **BRAZIL: Amazonas:** Barcelos, Rio Aracá, comunidade Bacuquara, 00°09'17"N 63°10'35"W, 12.–14.vi.2010, 1 ♂, C. Schwertner lgt. and det. (INPA). **Rondônia:** 62 km SW Ariquemes near Fzda. [= farm] Rancho Grande [10°17'51"S 62°52'08"W], MV and Black Lights, 5.–17.x.1993, 3 ♂♂ 1 ♀, J. E. Eger lgt. (JEEC). 62 km SW Ariquemes near Fzda. Rancho Grande, BLT, 25.xi.1993, 1 ♀, 15.ix.1994, 1 ♀, 25.xi.1994, 1 ♀, U. Schmitz lgt. (JEEC). – **ECUADOR: Orellana Province:** Yasuni National Park, 00°40.478'S 76°23.866'W, 29.iv.2005, 1 ♂ 1 ♀, C. R. Bartlett, N. Nazdrowicz and D. Chang lgt. (DARC). **Napo Province:** Puerto Mis[a]hualli env., 1650–1900 ft [= 503–582 m a.s.l.], 1°2'49.2"S 77°39'49.2"W, Mercury vapor and Ultraviolet lights, 6.–19.ix.1998, 1 ♂ 4 ♀♀, J. E. Eger lgt. (JEEC). **Pastaza Province:** Arajuno env. [ca. 1°14'25"S 77°40'53"W], 3.–10.

xii.2000, 1 ♂, V. Kabourek lgt. (ZJPC). – **PERU: San Martín Province:** Lejias, 59 km N. Tarapoto, 6°18.123'S 76°43.588'W, 1110 m a.s.l., 5.ii.2005, 1 ♂, D. B. Thomas, Warfield, R. Cave, D. Robacker and H. Panduro-Salas lgt. (DBTC). Moyabamba, vic. Ecologica "Rumipata", 6°04'32.0"S 76°58'07.5"W, 970 m a.s.l., MV and UV Light, 13.–18.x.2012, 1 ♂, J. E. Eger lgt. (JEEC). **Madre de Dios Province:** Rio Tambopata Res., 30 km (air) SW Pto. [= Puerto] Maldonado, 12°50'S 69°17'W, 290 m a.s.l., 2.v.1984, 1 ♀, Smithsonian Institution Canopy Fogging Project (02/03), T. L. Erwin et al. lgt. (USNM).

Diagnosis. Coloration, structure of head, thorax and pregenital abdomen, and vestiture as in other species of the genus (see redescription of *Rhyncholepta* above) except the following characters.

Apex of scutellum with anteapical black V-shaped stripe on scutellum reduced to small black spot or single black puncture on each lateral margin at anterior end of the apical V-shaped callosity (Figure 24). Apical V-shaped callosity wide, its branches one third or less of its length, tip of scutellum with distinct triangular callosity (Figure 24).

Male genitalia. Genital capsule in ventral view slightly constricted lateroapically, posterolateral angles obtusangulate, not prominent (Figs 38, 62); dorsal wall at base of posterolateral angles shallowly impressed (Figs 62, 70). Ventral rim in ventral view broadly convex apically, posterior hypandrial projections lateral on projected portion of ventral rim, pointed and directed ventrally (Figs 38–39); only basal portions of lateral projections visible in this view (Figs 38–39). Hypandrium in posterior view with three pairs of projections: posterior ones caudal, short, spinose, curved, apices directed ventrally (Figs 50, 51: pp); lateral projections very narrow, directed posterolaterad, apices spinose, nearly straight (Figs 50, 51: lp); anterior projections steeply sloping downwards, appearing narrowly triangular, acutangulate apically, apices directed dorsolaterad (Figs 50, 51: ap). Anterior hypandrial projections in most exposed (dorso-posterolateral) view appearing roughly quadrangular, dorsal margins slightly convex, apically each with sharp spine bent downwards (Figure 76: ap); bases of posterior and lateral projections forming acute angle (Figure 76: a); posterior projection narrowing towards acute apex (Figure 76: pp); lateral projection narrowing, apically straight (Figure 76: lp). In dorsal view, anterior hypandrial projections narrowing triangularly in basal half, apical half narrow, parallel-sided, slightly divergent, apices acute (Figs 62, 63: ap); only bases of posterior projections visible (Figure 63: ppb); lateral projections directed laterad, each narrowing to sharp spine, apically curved slightly anteriad (Figure 63: lp). *Phallus* (Figs 87–89; described in detail by Becker and Grazia-Vieira 1971: figs 8, 9, 11) with basal conjunctival sclerite cylindrical (Figure 88: cjs), aedeagus only slightly sinuate apically (Figure 88: ae), very similar to that of *Rh. henryi.*

Female genitalia (Figure 93). Laterotergites VIII triangularly produced apically, posteriorly distinctly more prominent than posterior margins of laterotergites IX. Internal female genitalia described in detail by Becker and Grazia-Vieira (1971: figs 15, 17).

Measurements. Table 1.

Differential diagnosis. See above key. Females with laterotergites VIII triangularly produced apically, distinctly more produced posteriorly (Figure 93). From *Rh. henryi* sp. n. it also differs by reduced V-shaped black band anteapically on scutellum.

Etymology. The species was dedicated to Dr. Martin Meinander, former curator of Hemiptera in the Finnish Museum of Natural History, Helsinki (Becker and Grazia-Vieira 1971).

Bionomics. Specimens mainly were collected by various types of light traps (UV light, mercury vapor light, black light) in or adjacent to dense forests. This species has never been collected by hand catching, sweeping, or beating vegetation during the day or night (JE Eger, pers. observ.). Adults have been collected in February, April–June, and August–December, with most in September and October (Figure 97) (Becker and Grazia-Vieira 1971; present paper).

Distribution (Figs 99–100). Bolivia (Pirán 1956, as *Rh. grandicallosa*; this paper); Brazil: Amazonas, Rondônia (new country record); Ecuador (new country record); Peru (Arnold 2011; present paper); Venezuela (Becker and Grazia-Vieira1971, Grazia 1984).

Rhyncholepta wheeleri sp. n.

http://zoobank.org/CE334038-04E5-4140-8863-D1E18BE26578
Figs 8, 25, 40–41, 52–53, 64–65, 71, 77

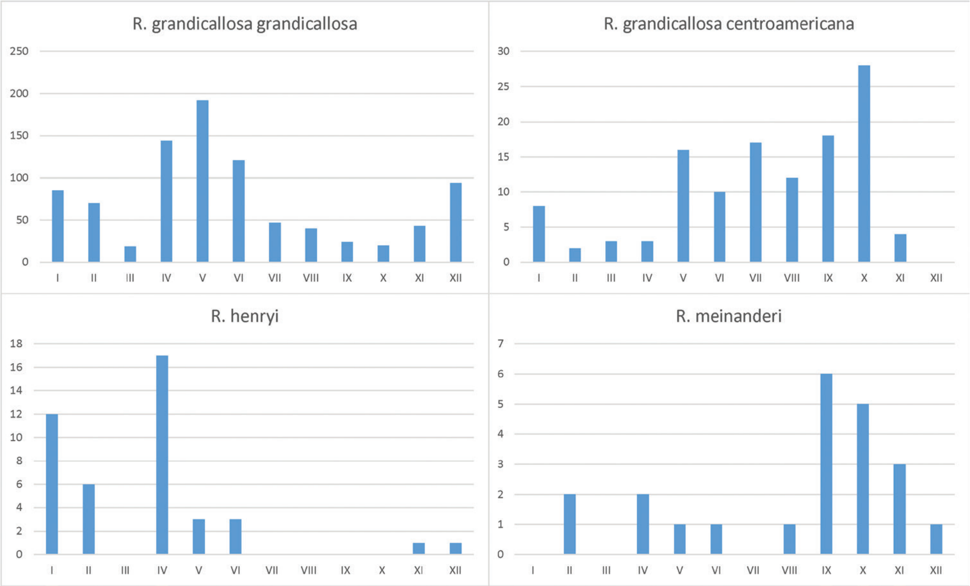
Type locality. Guyana, sources of Oronoque and New River (ca. 1°46'N 57°56'W).

Type material. Holotype: ♂ (Figs 8, 25, 40–41, 52–53, 64–65, 71, 77), "BRITISH GUIANA: / Oronoque & New / River Heads. 1938. / H. Beddington. / B.M. 1938-346 [printed, white label] // ♂ [printed, white label] // HOLOTYPUS / *RHYNCHOLEPTA* / *WHEELERI* / sp. nov. / det. Kment, Eger, Rider 2017 [printed, red label]" (BMNH). The holotype is pinned through scutellum, antennomeres IIb to IV of both antennae, both middle legs and left hind leg missing; detached dissected abdomen + basi- (IIa) and distipedicellite (IIb) of one antenna, and genital capsule + abdominal segment VIII are glued on two separate pieces of card attached to the same pin.

Diagnosis. Coloration, structure of head, thorax and pregenital abdomen, and vestiture as in other species of the genus (see redescription of *Rhyncholepta* above) except for the following characters.

Apex of scutellum with anteapical black V-shaped stripe on scutellum reduced to few black punctures anteapically near each lateral margin (Figure 25). Apical V-shaped callosity very narrow, concolorous with surrounding surface of scutellum, hardly apparent in the single specimen examined (Figure 25).

Male genitalia. Genital capsule in ventral view slightly constricted lateroapically, posterolateral angles obtusangulate, not prominent (Figs 40, 64); dorsal wall at base of posterolateral angles shallowly impressed (Figs 64, 71). Ventral rim in ventral view with wide M-shaped projection apically, shallow V-shaped incision medially; posterior hypandrial projections situated posterolaterally, short, pointed, directed ventrally (Figs 40–41); basal portions of posterior projections not visible in this view. Hypandrium in posterior view with three pairs of projections: posterior ones caudal, very



Figures 94–97. Annual distribution of collected *Rhyncholepta* specimens. **94** *Rh. grandicallosa grandicallosa* Bergroth, 1911 (899 specimens with dates analysed) **95** *Rh. grandicallosa centroamericana* subsp. n. (121 specimens) **96** *Rh. henryi* sp. n. (43 specimens) **97** *Rh. meinanderi* Becker & Grazia-Vieira, 1971 (22 specimens).

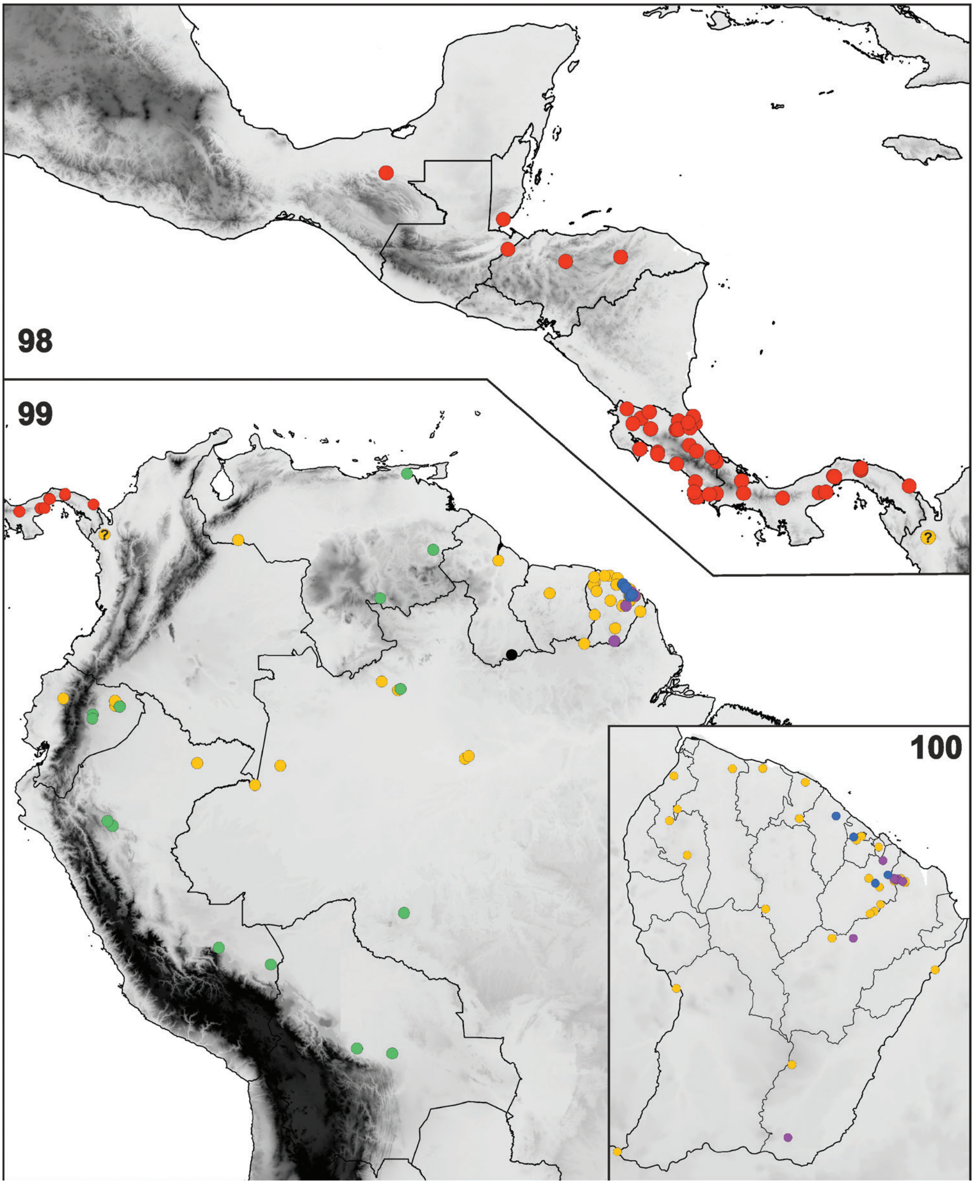
short, acute but not spinose, directed ventrolaterad (Figs 52, 53: pp); lateral projections very narrow, directed posterolaterad, apices spinose, straight (Figs 52, 53: lp); anterior projections steeply sloping downwards, appearing narrowly parallel-sided, acutangulate apically, apices directed laterad (Figs 52, 53: ap). Anterior hypandrial projections in most exposed (dorso-posterolateral) view appearing roughly quadrangular, dorsal margins slightly concave, each apically with sharp spine strongly curved downwards (Figure 77: ap); bases of posterior and lateral projections widely separated, both projections parallel (Figure 77: a); posterior projection short, narrowing towards acute apex (Figure 77: pp); lateral projection long, spinous, nearly straight (Figure 77: lp). Anterior hypandrial projections in dorsal view parallel, each parallel-sided, abruptly sharpened apically, apices slightly divergent (Figs 64, 65: ap); posterior projections visible as acute angles (Figure 65: ppb); lateral projections directed laterad, narrowing to sharp spine, not curved apically (Figure 65: lp). *Phallus* not dissected in unique specimen available.

Female. Unknown.

Measurements of the holotype (see Table 1).

Differential diagnosis. See above key.

Etymology. The species is dedicated to Alfred G. Wheeler, Jr. (Department of Plant and Environmental Sciences, Clemson University, Clemson, South Carolina, USA), our friend and colleague, and excellent specialist in systematics and biology of Hemiptera. We feel it is appropriate that Tom Henry and Al Wheeler, long-time friends and co-authors of many papers, also share two species of the same genus.



Figures 98–100. Distribution maps of *Rhyncholepta* species-group taxa. **98** Central America **99** South America **100** French Guiana. Color symbols: *Rhyncholepta grandicallosa grandicallosa* Bergroth, 1911 (orange circles), *Rh. grandicallosa centroamericana* subsp. n. (red circles), *Rh. henryi* sp. n. (blue circles), syntopic occurrence of *Rh. g. grandicallosa* and *Rh. henryi* (purple circles), *Rh. meinanderi* Becker & Grazia-Vieira, 1971 (green circles), *Rh. wheeleri* sp. n. (black circle). Record of *Rh. grandicallosa* from Colombia with uncertain subspecies identity is marked by "?".

Collecting circumstances. Unknown.

Distribution (Figure 99). Guyana (present paper).

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Claviplatys henryi, a new genus and species of Plataspidae from southern India (Hemiptera, Heteroptera)

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Abstract

Claviplatys **gen. n.** and its type species *C. henryi* **sp. n.** (Hemiptera: Heteroptera: Plataspidae: Plataspinae) are described from Kerala, India. The new genus is related to the Indomalayan genera *Heterocrates* Amyot & Serville, 1843, *Cratoplatys* Montandon, 1894, and *Cronion* Bergroth, 1891, but differs from them and all other plataspid genera by the peculiarly modified antenna. The morphological characters and systematic relationships of the above genera are discussed.

Keywords

Heteroptera, Indomalaya, new genus, new species, Plataspidae, taxonomy

Introduction

The family Plataspidae (Hemiptera: Heteroptera) is restricted to the Old World and currently contains in the region 66 genera and 600 species (Rider et al. 2018). With approximately 33 genera and 270 species, Indomalaya accounts for roughly half of the family's diversity. Faunal study of the region underwent an active period during the late

19th and early 20th centuries; the most prolific authors were A.L. Montandon and W.L. Distant. During the 20th century, only the Chinese fauna was thoroughly explored, due mainly to the activity of W.I. Yang, T.Y. Hsiao and coauthors. The only available comprehensive treatments focusing on larger areas in the region are an outdated revision of the fauna of the former British India, including Ceylon and Burma (Distant 1902, 1908, 1918); two still-usable revisions of the fauna of China (Yang 1934, Hsiao and Jen 1977); and a problematic review of the fauna of Pakistan and neighboring countries, replete with taxonomic confusion (Ahmad & Moizuddin 1992). The fauna of the Indian subcontinent, Indo-China, and Malesia remains in need of a modern revision, with numerous new taxa waiting description.

The purpose of the present paper is to describe a new genus and new species of Plataspidae from southern India. This contribution is dedicated to Thomas J. Henry on the occasion of his 70th birthday, in recognition of his fundamental contributions to a broad variety of heteropteran groups.

Materials and methods

The specimens on which the present study is based are preserved in the Hungarian Natural History Museum (**HNHM**) and in Zdeněk Jindra's personal collection, currently deposited at the Department of Plant Protection, Czech University of Agriculture, Prague, Czech Republic (**ZJPC**). External structures and genitalia were examined using a stereoscopic microscope (Zeiss Discovery V8). Drawings were made with the aid of a camera lucida. Genitalia of both sexes were dissected after careful heating in hypertonic KOH solution, cleared with lactophenol, and slightly stained with Chlorazole Black E. Measurements were taken using a micrometer eyepiece. Digital photographs were taken with a Nikon D90 camera equipped with AF-S Micro Nikkor 60mm f/2.8G ED macro lens. Morphological terminology mainly follows Tsai et al. (2011), Rédei and Jindra (2015), and Rédei (2016, 2017a).

Taxonomy

Claviplatys gen. n.

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Figures 1–9

Type species by present designation. *Claviplatys henryi* sp. n.

Diagnosis. Medium-sized plataspids with weakly convex dorsum and flat venter (Figs 1–4); head strongly broadened and flattened, width ca. 70% of width of pronotum, strongly sexually dimorphic, mandibular plates of male produced much anteriad of apex of anteclypeus, not adjacent, separated by V-shaped interspace, those of female produced slightly anteriad of apex of clypeus, narrowly overlapping, forming evenly

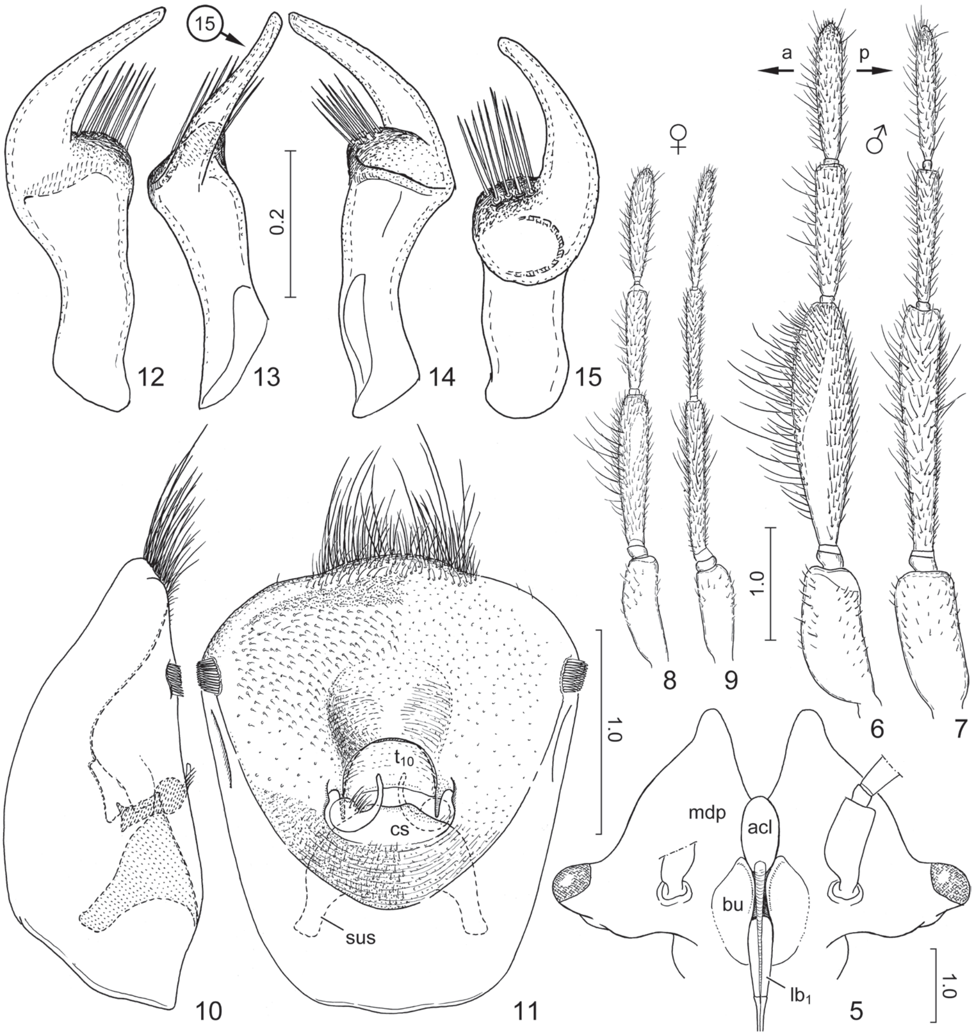
Figures 1–4. *Claviplatys henryi* gen. et sp. n. **1** holotype (male), dorsal view **2** same, ventral view **3** paratype (female), dorsal view **4** same, ventral view. Scale bar in mm.

rounded outline anteriorly; interocellar distance distinctly shorter than (♂) or subequal to (♀) distance between ocellus and ipsilateral eye; scape thick, distipedicellite strikingly (♂) or considerably (♀) broadened and flattened, anterior surface with long, erect hairs (some longer than diameter of segment), basi- and distiflagellum much thinner than distipedicellite (Figs 6–9). The unique, peculiarly modified antenna is diagnostic for the genus.

Description. ***Body*** (Figs 1–4) medium sized (approx. 10–12 mm), broadly oval, dorsum relatively weakly convex, venter flat; dull black with ochraceous markings. ***Integument and vestiture.*** Body at most with fine, dense, superficial, inconspicuous punctation, occasionally finely rugose on some body parts; virtually glabrous dorsally and ventrally, appendages with short, inconspicuous, adpressed or semierect pilosity, distiflagellum with several conspicuously long and erect setae on anterior surface (Figs 6–9).

Structure. *Head and cephalic appendages. Head* much broader than long, 0.7 times as broad as width of pronotum; eyes strongly transverse, strikingly protruding from outline of head laterally (♂) or more rounded, less protruding (♀) in dorsal view; anteclypeus dorsally rather flat, very slightly elevated above plane of mandibular plates; mandibular plates of male (Figure 5: mdp) flattened, strongly produced anteriad far surpassing apex of anteclypeus but not adjacent anteriad of it, portion anteriad of apex of anteclypeus strongly curved upwards (♂), those of female produced slightly anteriad of apex of clypeus, narrowly overlapping, forming evenly rounded outline anteriorly; ocelli close to midline, interocellar distance distinctly longer than (♂) or subequal to (♀) distance between lateral margin of ocellus and mesal margin of ipsilateral eye; antennae inserted on strongly protruding ring-like tubercle slightly closer to base of labium than to mesal margin of eye; bucculae (Figure 5: bu) broad, dorsoventrally flattened. *Antenna* (Figs 6–9): scape thick, cylindrical, subequal in length to the two segments of flagellum; basipedicellite very short; distipedicellite strikingly (♂) or distinctly (♀) broadened and dorsoventrally flattened, basi- and distiflagellum much thinner than distipedicellite, subequal in length, dorsoventrally flattened. *Labium* inserted slightly posteriad of middle of buccula, posteriad of level of posterior margin of eyes; without peculiar modifications, labiomere I (Figure 5: lb_1) thicker than remaining segments but not conspicuously thickened, labiomere II distinctly flattened laterally, remaining labiomeres subcylindrical.

Thorax and thoracic appendages. *Pronotum* moderately declivous anteriorly; anterior collar narrow, weakly demarcated; lateral margin broadly, laminately explanate, anterior margin of explanated portion almost straight, slightly produced anteriorly at anterolateral angles, lateral margin evenly convex, gradually broadened posteriad; humeri with small, inconspicuous tubercle; posterior margin broadly rounded, posterolateral angle obsolete. *Scutellum* rather evenly rounded without conspicuous angulations, basal tumescence not elevated and not demarcated by furrow, dorsal outline of scutellum continuous in lateral view; area around basolateral angle not delimited by furrow; with fine submarginal impression along almost entire length except extreme base; posterior margin slightly emarginate above genital capsule. *Thoracic pleura and sterna.* Proepisternum broadly elevated anteriad of proacetabula, prothorax deeply depressed along meson; mesosternum elevated, forming broad, obtuse carina, posterior margin V-shaped and produced between mesacetabula; metapleurite with well-developed, elongate scent gland ostiole closer to dorsal margin of metapleurite than to base of mesocoxa, associated with elongate, slightly anteriorly curved peritreme; metasternum flat, metacoxae close to each other; evaporatorium occupying almost entire ventral surface of thorax except extreme lateral margin of prothorax and small subtriangular area at posterodorsal angle of metapleuron. *Fore wing.* Exocorium and adjacent elongately triangular basal portion of mesocorium exposed at rest. *Legs* short, femora thick, tibiae with distinct, broad, deep dorsal furrow along almost entire length, terminating subapically.



Figures 5–15. *Claviplatys henryi* gen. et sp. n., holotype. **5** head, ventral view **6** left antenna of male, ventral surface **7** same, anterior surface **8** left antenna of female, ventral surface **9** same, anterior surface **10** genital capsule, left lateral view **11** same, morphological posterior surface in most exposed view **12–15** left paramere, four different aspects. Arrows in Fig. 6 indicate anterior (a) and posterior (p) direction, that in Fig. 13 shows aspect of Fig. 15. Abbreviations: acl = anteclypeus; bu = buccula; cs = cuplike sclerite; lb_1 = labiomere I; mdp = mandibular plate; sus = suspensory apodeme; t_{10} = tergite X. Scale bars in mm.

Pregenital abdomen much broader than long; dorsal laterotergites fused into single, undivided synlaterotergite; ventral laterotergites and sternites (= mediosternites) distinctly separated, intersegmental sutures extending to lateral margin of abdomen; ventral laterotergites separated from sternites by deep longitudinal furrow, highly obliquely elevated anteriorly, gradually becoming lower posteriorly, in segment VII coplanar with sternite; spiracles at lateral margin of ventrites; trichobothria in longitudinal furrow between ventral laterotergites and meditergites, posteriad of spiracle of same segment, arranged longitudinally; anterior margin of sternite VII deeply, subtriangularly produced anteriad, reaching anterior margin of ventrite VI medially, thus completely bisecting ventrite VI into two hemiventrites (♂) or only slightly invading ventrite VI posteriorly, with mesal length of ventrite VI approx. two thirds of that of ventrite V (♀).

External male genitalia. Genital capsule relatively small (width approx. one third of width of head), posterior aperture directed ventrad.

External female genitalia. Exposed portions of ovipositor directed ventrad (Figure 21).

Etymology. The generic name alludes to the peculiarly modified antenna of the male, which is diagnostic for this new genus; it is composed of the Latin noun *clava* meaning a club, cudgel, knotty branch or stick and the Greek adjective πλατύς (Latinized as *platys*) meaning wide, broad, a component occurring in several generic names in the family Plataspidae. Gender masculine; stem *Claviplate-*.

Diversity and distribution. The single included species occurs in the Malabar region of southern India.

Claviplatys henryi **sp. n.**

http://zoobank.org/01387685-0D74-469F-BA86-71B07E377C5B
Figs 1–23

Type material. Holotype (Figs 1–2): ♂, India: Kerala, Pompa [= Pamba], Sabramila [= Sabarimala], 09°24.9'N, 77°03.9'E, 3.v.2005, leg. M. Halada; mounted on card, intact, genitalia detached, preserved in plastic microvial with glycerol; deposited in ZJPC. **Paratypes**: South India: Kerala, Cardamom Hills, 50 km NW of Pathanamthitta, near Pambaiyar River, 9°25'N, 77°05'E, 6–9.v.1994, leg. Z. Kejval (1 ♀ ZJPC, 1 ♀ HNHM).

Diagnosis. *Claviplatys henryi* sp. n., the single known species of the genus, can be recognized by the diagnostic characters provided for the genus.

Description. Male (Figs 1–2, 5–7, 10–20).

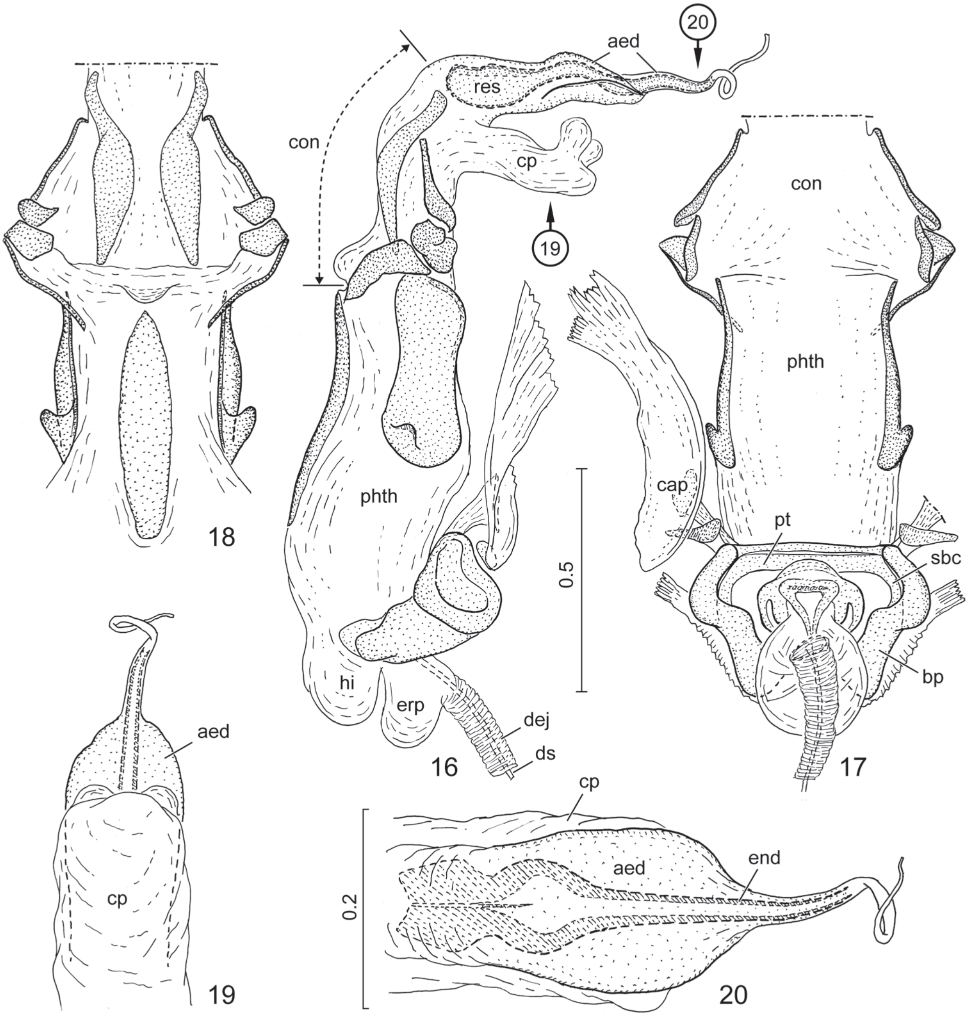
Color. Dorsum and venter dull black, with ochraceous markings as follows: pair of longitudinal vittae submarginally along mesal margin of mandibular plates (indistinct around middle), and small spot between proximal extremities of above-mentioned vittae; pair of short, obliquely transverse streaks before mesal angles of eyes; proximomesal portion of ventral surface of clypeus; bucculae and surrounding areas between antennal insertions and basal neck-like portion of head ventrally; pair of small submedian spots on callar lobe of pronotum; pair of narrow submarginal vittae along lateral margin of pronotum, terminating slightly anteriad of humeral tubercle; undulating vitta connecting lateral extremities of anterior collar with humeral tubercles, following mesal margin of lateral explanate lobe of pronotum (indistinct around middle); pair of small sublateral spots on scutellum very close to anterior margin; narrow submarginal vitta around scutellum except extreme base; patch on metapleuron immediately anteriad of scent gland ostiole; distal (= lateral) portion of peritreme; small, rounded spot at posterolateral angle of metapleurite; dorsal laterotergites and adjacent lateral margins of ventral laterotergites of abdominal segments III–VII; pair of longitudinally elongate spots on each mediosternite of segments III–VII marginally (surrounding respective spiracles), and pair of smaller spots posteriad of the above ones on segments III–VI. Scape ochraceous, irregularly suffused with brown especially in distal half, pedicel, basi- and distiflagellum blackish brown; labrum ochraceous. Legs ochraceous, coxae with large dark brown patch on mesal surfaces; trochanters broadly suffused with dark brown distally, femora with several rounded brown patches on (morphological) anterior and posterior surfaces, with blackish brown longitudinal streak dorsoapically and black patches on anterior and posterior surfaces ventroapically, tibiae with few small, rounded, brown patches and longitudinal streak on nearly entire length of dorsal (furrowed) surface, tarsal segments suffused with brown apically.

Integument and vestiture generally as in generic description. Sternite VI with pair of fringes of long setae arranged along curved line following posterior margin of segment; dorsum of mandibular plates irregularly rugose, pronotum and scutellum with fine, dense, superficial, inconspicuous punctation, abdominal ventrites finely longitudinally wrinkled.

Structure. *Head* 1.85 times as broad as medial length (from base to imaginary line connecting tips of mandibular plates), 1.5 times as broad as interocular distance; mandibular plates (Fig. 5: mdp) produced anteriad as pair of subtriangular, apically narrowly rounded plates, mesal margins almost straight; distance between ocellus and ipsilateral eye 1.2 times as long as interocellar distance. *Antenna* (Figs 6–7): distipedicellite approx. four times longer than greatest width, 1.75 and 1.65 times longer than basipedicellite and distipedicellite, respectively. *Labium* reaching base of abdominal sternite V.

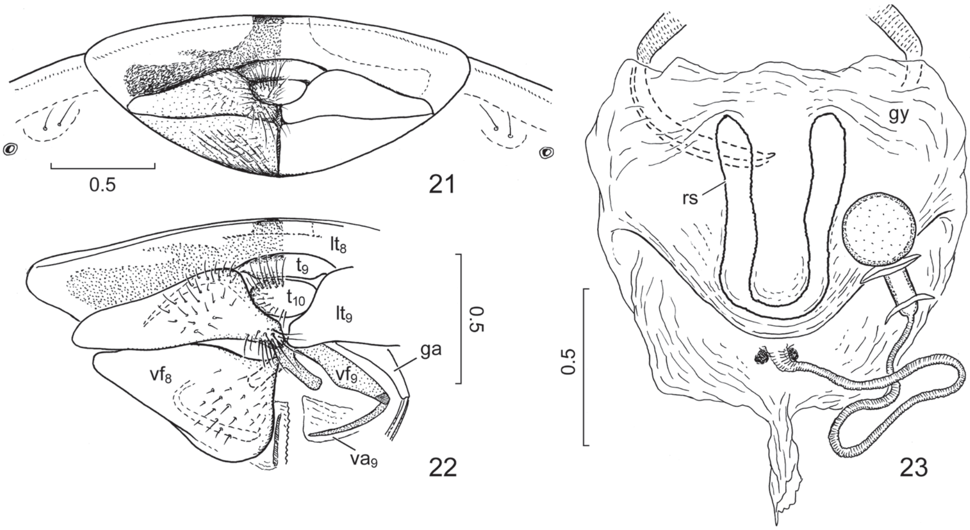
Thorax and ***pregenital abdomen*** as described for genus. Prothorax 2.2 times, scutellum 1.5 times broader than median lengths of respective sclerites.

External male genitalia. *Genital capsule* (Figs 10–11) broadly oval, posterior margin broadly rounded, slightly protruded posteriorly in mesal third, protruded part with tuft of several long, erect setae; lateral margin with pair of small, compact, brush-like clusters of strong, stiff setae subapically; morphological posterior surface weakly concave, infolding of dorsal rim broad, broadly and deeply impressed medially immediately dorsad of posterior aperture; infolding of ventral rim relatively broad; posterior aperture small, dorsal sinus broadly rounded, completely occupied by tergite X (Figure 11: t_{10}); cuplike sclerite (Figure 11: cs) completely fused with infolding of ventral rim of genital capsule without trace of fusion line, provided with pair of thick suspensory apodemes (Figure 11: sus). *Paramere* (Figs 12–15) sickle-shaped, with short crown comprising broad stem and elongate, narrow apical process. *Phallus* (Figs 16–20): basal plates (Figure 17: bp), robust, fused with support bridge complex (Figure 17: sbc) by leaving pair of window-like interspaces open at two sides of median portion of support bridge complex, support bridge complex with broad ponticulus transversalis (Figure 17: pt); phallotheca (Figs 16–17: phth) elongate, greatly membranous, with protruding, diverticulum-like hinge (Figure 16: hi) proximoventrally, with pair of dorsolateral and single ventromedian sclerite distally, each dorsolateral sclerite with blunt,



Figures 16–20. *Claviplatys henryi* gen. et sp. n., holotype. **16** phallus, lateral view **17** same, dorsal view (conjunctival process omitted, aedeagus not shown) **18** same, ventral view (articulatory apparatus and aedeagus not shown) **19** conjunctival process and aedeagus, morphological dorsal view **20** same, morphological ventral view. Arrows in Fig. 16 show aspect of Figs 19 and 20. Abbreviations: aed = aedeagus; bp = basal plates; cap = capitate process; con = conjunctiva; cp = conjunctival process; dej = ductus ejaculatorius; ds = ductus seminis; end = endophallic duct; erp = erection fluid pump; hi = hinge; phth = phallotheca; pt = ponticulus transversalis; res = endophallic reservoir; sbc = support bridge complex. Scale bars in mm.

rounded, posteriorly directed tubercle at proximal part; conjunctiva elongate, wall of proximal portion with 4 pairs of sclerites: pair of elongate sclerites submedially, and three pairs of sclerites (derivatives of conjunctival processes?) laterally, apparently forming complex articulation for supporting proximal part of conjunctiva; distal portion with single elongate, membranous, tubular process dorsally (Figs 16, 19, 20: cp) provided with pair of very short, rounded, membranous diverticula subapically on poste-



Figures 21–23. *Claviplatys henryi* gen. et sp. n., external female genitalia. **21** terminalia, ventral view **22** same, dissected, right valvifer VIII removed (drawn after macerated preparatum) **23** gynatrium and spermatheca, dorsal view after removal of abdominal dorsum. Abbreviations: ga = gonangulum; gy = gynatrium; lt_8, lt_9 = laterotergites VIII and IX; rs = ring sclerite; t_9, t_{10} = tergites IX and X; va_9 = valvula IX; vf_8, vf_9 = valvifers VIII and IX. Scale bars in mm.

rior surface; aedeagus (Figs 16, 19, 20: aed) indistinctly demarcated from conjunctiva, weakly sclerotized, somewhat dorsoventrally compressed, produced into pair of flattened, fin-like expansions laterally, abruptly narrowed around middle, gradually tapering towards apex; endophallic reservoir elongate, endophallic duct thin, tubular, rather weakly sclerotized, gradually tapering to distal third, then desclerotized and closely surrounded by fine, transparent outer wall of aedeagus, forming thin, flexible tube.

Female (Figs 2–3, 21–23). ***Color, integument, and vestiture*** as in male. Terminalia brown, with long hairs on laterotergite IX and tergite X forming conspicuous, brush-like tuft around midline.

Structure. *Head* 2.3 times as broad as medial length, 1.5 times as broad as interocular distance; anterior outline evenly rounded, mandibular plates narrowly overlapping anteriad of apex of clypeus; distance between ocellus and ipsilateral eye subequal to interocellar distance. *Antenna* (Figs 8–9): distipedicellite 5.5 times longer than greatest width, 1.35–1.5 and 1.2–1.25 times longer than basipedicellite and distipedicellite, respectively. *Labium* reaching base of abdominal sternite V.

Thorax and ***pregenital abdomen*** as in male. Prothorax 2.2 times, scutellum 1.4 times broader than median lengths of respective sclerites.

External female genitalia (Figs 21–23). Laterotergites VIII (Figure 22: lt_8) not separated along midline, forming broad transverse plate posteriad of laterotergites IX; valvifers VIII (Figure 22: vf_8) relatively short, subequal in length along midline as laterotergites IX (Figure 22: lt_9); valvifers IX (Figure 22: vf_9) obliquely elongate, with pair of shorter, finger-like, oblique processes mesally; gynatrium (Figure 23: gy) simple, saccular, lacking distinct pouches, with broad fold immediately proximad of orifice of spermatheca, contralateral ring sclerites fused along midline into single clearly sclerotized and easily traceable U-shaped sclerite (Figure 23: rs); with pair of small, rounded sclerites at two sides of spermathecal orifice; spermathecal duct simple, thin, intermediate part of spermatheca relatively short, apical receptacle globose.

Measurements (in mm). Male (n = 1) / female (n = 2): Body length measured along meson from imaginary line connecting tips of mandibular plates to apex of scutellum (♂) 11.6, to apex of genital capsule in dorsal view (♂) 12.2, from apex of head to apex of scutellum (♀) 10.0–10.1; length of head measured along meson from base to imaginary line connecting tips of mandibular plates (♂) 3.00, from base to anterior margin (♀) 2.06–2.08, greatest width across eyes 5.55 / 4.75–4.80, interocular distance 3.75 / 3.20–3.23, interocellar distance 1.05 / 1.00–1.02, distance between mesal margin of eye and ipsilateral ocellus 1.25 / 1.00–1.00; length of scape 1.13 / 0.93–0.95, greatest width 0.50 / 0.26–0.28, length of basipedicellite 0.18 / 0.09–0.10, greatest width 0.27 / 0.15–0.16, length of distipedicellite 2.00 / 1.20–1.20, greatest width 0.50 / 0.20–0.22, length of basiflagellum 1.13 / 0.80–0.90, greatest width 0.21 / 0.15–0.16, length of distiflagellum 1.20 / 0.96–1.00, greatest width 0.20 / 0.16–0.17; length of labiomere I 1.10 / 0.98–1.00, II 2.00 / 1.74–1.85, III 1.48 / 1.32–1.40, IV 1.13 / 1.10–1.15; length of pronotum along meson 3.62 / 3.15–3.17, greatest width 7.94 / 7.06–7.08, length of scutellum along meson 5.73 / 5.36–5.54, greatest width 8.51 / 7.50–7.56.

Etymology. Patronymic, dedicated to Thomas J. Henry.

Distribution. Known only from the Malabar Subregion of southern India. The holotype and the two paratypes were collected at two localities around Pamba station below Sabarimala, a Hindu pilgrimage center, in Pathanamthitta District, Kerala State, separated by a distance of ca. 2 km.

Discussion

Claviplatys gen. n. is placed in Plataspinae, more precisely in the narrowly defined Plataspinae corresponding with the *Brachyplatys* group of authors (Jessop 1983, Rider et al. 2018). It is a member of a well-recognizable, presumably monophyletic group of genera (herein, "*Heterocrates* group"), including *Heterocrates* Amyot & Serville, 1843 (Malay Archipelago), *Cratoplatys* Montandon, 1894 (Indo-China), and *Cronion* Bergroth, 1891 (Malay Peninsula). *Codronchus* Distant, 1901, from the Andaman Islands, not examined during the present study, potentially belongs to this group. The *Heterocrates* group can be defined by the combination of the following characters (supposed synapomorphies marked by an asterisk):

(1) ground color black, usually decorated by ochraceous spots and strikes at least along lateral margins of prothorax and abdomen and costal margin of fore wing,

(2) body strongly flattened, dorsum weakly convex, venter flat,
(3*) head sexually dimorphic,
(4*) head greatly broadened, width at least approx. 70% of that of prothorax,
(5*) postocular margin of head nearly straight between level of ocellus and eye,
(6*) mandibular plates strongly flattened, laminate, surpassing tip of anteclypeus anteriorly,
(7*) eyes small, placed strongly laterally,
(8*) ocelli close to midline and far removed from mesal margins of compound eyes (distance between ocellus and ipsilateral eye distinctly greater than interocellar distance),
(9*) antennal insertion far from compound eyes,
(10*) anterior margin of pronotum weakly emarginate,
(11*) basal tumescence of scutellum not elevated and not demarcated by furrow, dorsal outline of scutellum continuous in lateral view,
(12*) posterior aperture of genital capsule (♂) and ovipositor (♀) directed ventrally.

The *Heterocrates* group apparently is related to *Brachyplatys* Boisduval, 1835 (Afrotropical, Indomalayan and Australian Regions). The latter genus is more generalized than are members of this group, and it shares most of the characters listed above, except characters 3 (head not sexually dimorphic) and 8 (ocelli much closer to eyes than to each other). Furthermore, in the majority of *Brachyplatys* species the head is narrower (approx. 60% of width of prothorax), although in some species this value is > 70%; a few species of *Brachyplatys* (e.g. *B. raffrayi* Montandon, 1897 and *B. macrosignatus* Yang, 1932) also are differently colored. *Neocratoplatys* Miller, 1955 (Indo-China) is also superficially similar to members of the *Heterocrates* group, but it is also more generalized because the basal tumescence of the scutellum is delimited by a rather distinct furrow.

Within the *Heterocrates* group, the genera most similar and probably phylogenetically most closely related to *Claviplatys* gen. n. are *Cronion* and *Cratoplatys*; these genera exhibit a particularly striking sexual dimorphism in shape of the head. *Cronion* (recently treated by Rédei 2017b) and *Cratoplatys* share the posteriorly displaced labial insertion and the dorsally flat anteclypeus (both are apparently plesiomorphies in the clade as they also are found in *Brachyplatys* and *Heterocrates*), but in *Cronion* the antenna is relatively slender, the scape and the distipedicellite are subequal in length, the distipedicellite is only slightly thicker than the flagellomeres, and the distipedicellite and flagellomeres are only feebly flattened in both sexes. *Cratoplatys* differs from both genera in having the labium inserted at the anterior extremity of the buccula and the dorsally convex anteclypeus elevated above the plane of the mandibular plates; the antenna in the latter genus is similar to the condition found in *Cronion*, but the scape is distinctly longer than the distipedicellite. The head of both *Cronion* and *Cratoplatys* is broader than in *Claviplatys* gen. n.; in males the width of the head is approx. 80% of the width of the pronotum.

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