

A new species of *Heser* Tuneva, 2005 (Araneae, Gnaphosidae) from the south of India

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Abstract

A new species of *Heser* Tuneva, 2005 (Gnaphosidae) is described from the south of India. A key is provided to the species of *Heser* and the importance of Gnaphosidae for the study of world spider biodiversity is briefly discussed.

Keywords

Dionycha, Karnataka, Hampi, Zelotinae, key, vijayanagara

Introduction

The genus *Heser* Tuneva, 2005 belongs in the gnaphosid subfamily Zelotinae by the presence of metatarsal preening combs on legs III and IV, and was delimited by Tuneva (2005) based on the possession of a male palp with an elongated, hook-shaped median apophysis, and with a prolateral-basally inserted embolus which has a relatively narrow base and which is extending transversally across the distal end of the palpal bulb. Moreover, the genus can be distinguished from *Zelotes* Gistel, 1848 by lacking an intercalary sclerite and terminal apophysis of the male palp, as well as by the absence of coiled median and blind paramedian vulval ducts and the presence of glands

on the insemination ducts in females, and it differs from most other zelotine genera by its large posterior median eyes. As a consequence, *Heser* resembles *Camillina* Berland, 1919 by the shape of the posterior median eyes, which are large, subtriangular and almost contiguous. However, it differs from that genus by the absence of a bifid, prolateral palpal terminal apophysis, by a different shape of the embolar base and by the absence of a subtriangular to hemicircular anterior median epigynal plate. From *Drasyllus* Chamberlin, 1922, *Heser* also differs by the absence of a bifid palpal terminal apophysis or a median epigynal plate, while it can be easily distinguished from *Setaphis* Simon, 1893 by the absence of a terminal coil on the embolus and from *Zelowan* Murphy & Russell-Smith, 2010 by its retrolateral tibial apophysis, which does not consist of two small triangular lobes. At present, *Heser* counts three species: the type species *H. malefactor* Tuneva, 2005, as well as *H. aradensis* (Levy, 1998) and *H. infumatus* (O. Pickard-Cambridge, 1872) which were transferred from *Zelotes* by Tuneva (2005). The genus has a known distribution area in the eastern Mediterranean, tropical Africa and central Asia (Murphy 2007). On an archaeological mission to the south of India in 2006 (Bosselaers and Valcke 2009), the author collected both sexes of a new species of *Heser* among the ruins of Hampi, the former capital of the Vijayanagar empire (Filliozat 2004, Fritz and Michell 2001, Verghese 2002). The new species expands the range of the genus to southern India (Fig. 20).

Material and methods

The specimens were observed, photographed and drawn under Euromex MIC 465 and Olympus SZC-X9 binocular microscopes equipped with an eyepiece grid and a Praktica DC42 digital camera. The vulva (cleared in methyl salicylate) was observed and drawn using a Wild M12 compound microscope. All measurements are in mm, unless otherwise stated. The format for leg spination follows Platnick and Shadab (1975), amended for ventral spine pairs according to Bosselaers and Jocqué (2000). Leg spination is also illustrated in a schematic representation (Figs 9, 11) where pl, do, rl and ve sides of leg articles are flattened as a folding net (Dürer 1525, Bosselaers 2009).

Abbreviations:

AER anterior eye row; **ALE** anterior lateral eyes; **ALS** anterior lateral spinnerets; **AME** anterior median eyes; **fe** femur; **MOQ** median ocular quadrangle; **mt** metatarsus; **pa** patella; **PER** posterior eye row; **PLE** posterior lateral eyes; **PLS** posterior lateral spinnerets; **PMS** posterior median spinnerets; **ti** tibia.

Abbreviation of institutional collection (curator in parentheses):

RBINS Royal Belgian Institute of Natural Sciences, Brussels (L. Baert)

Taxonomy

Heser Tuneva, 2005

Heser vijayanagara sp. n.

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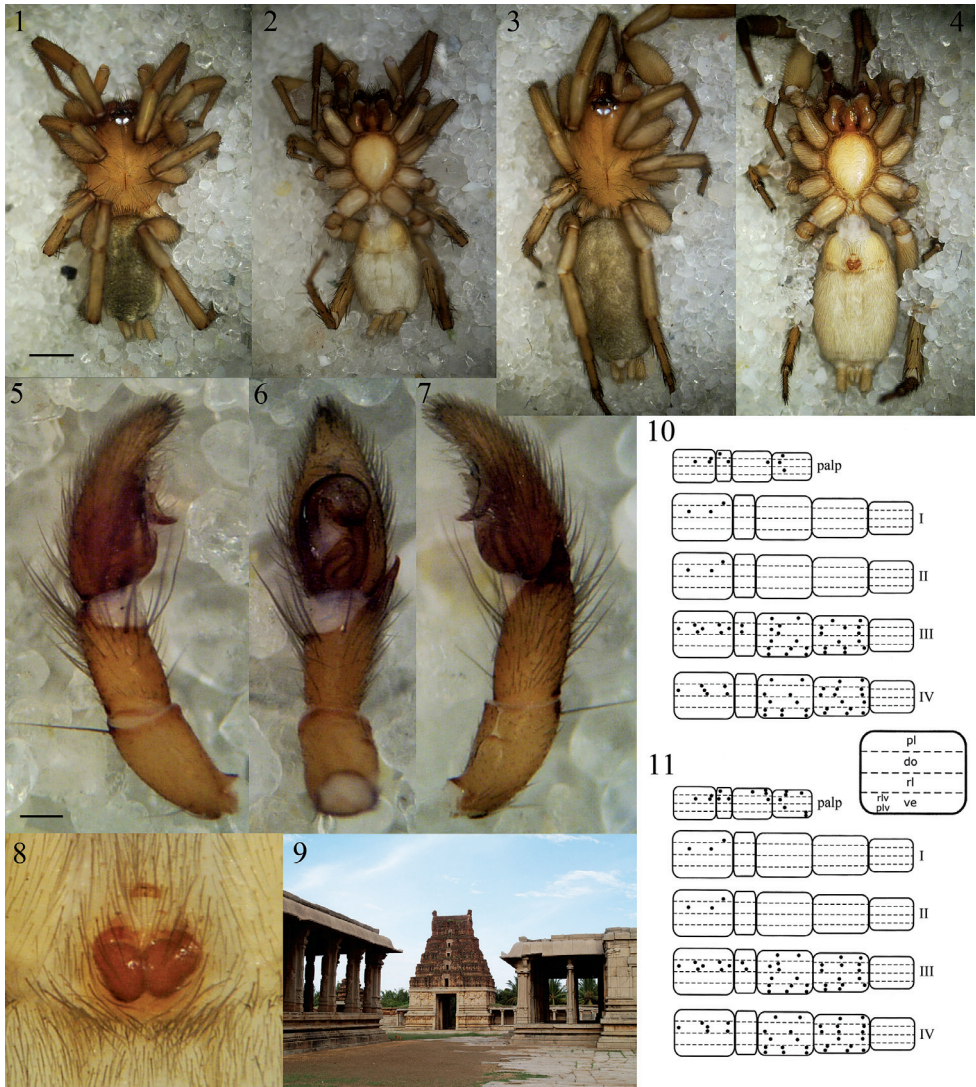
Figs 1–8, 10–11, 12–19

Type material. Holotype male: India, Karnataka, Hospet, Hampi World Heritage Site, 15°18'27.7"N 76°28'32.8"E, alt. 455 m, under stone close to archaeological office, 25 November 2006, J. Bosselaers leg. (RBINS). Allotype female, same data (RBINS).

Diagnosis. The species can be distinguished from the other three species of *Heser* by the abdominal dorsal scutum in males, the pronounced S-shaped curve of the sperm duct, the small, transversally oriented median apophysis and the hook-shaped embolus tip circling the broad membranous conductor in the male palp, as well as the narrow anterior epigynal hood, the large spermathecae and the circular insemination ducts in females.

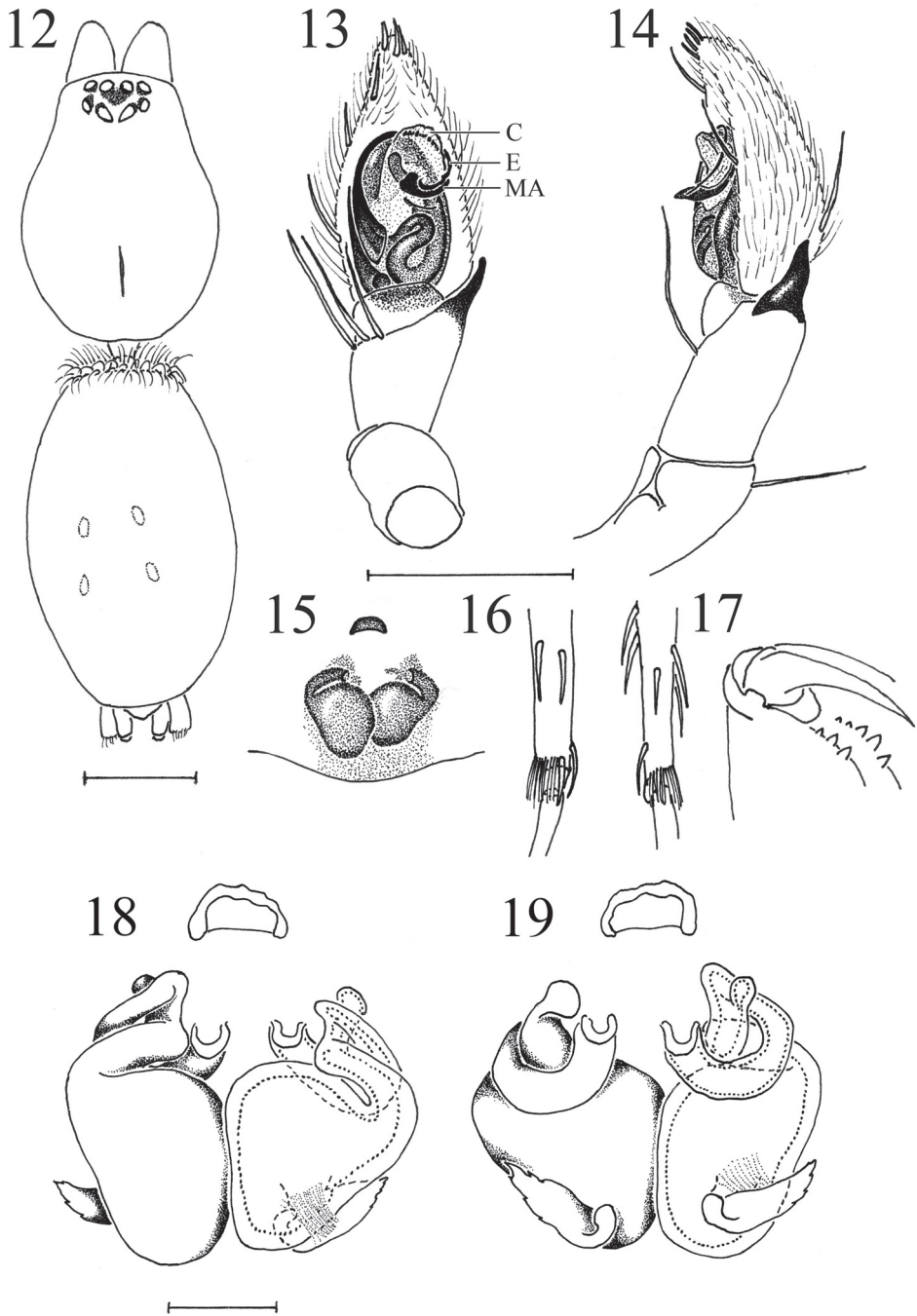
Entymology. The species epithet is a noun in apposition and refers to the imperial city of Vijayanagara (Hampi, Karnataka, India) among whose ruins the type specimens of the new species were found (Fig. 9).

Description. Male (holotype). Total length: 5.00. Carapace length: 2.24; width: 1.63. Carapace orange brown, unicolorous, with a deep and narrow fovea in the posterior half (Fig. 1). Eight eyes in two rows, ringed with black, AER width 0.47, straight from above, slightly procurved from front, PER width 0.56, procurved from above, strongly procurved from front. MOQ depth 0.35, anterior width 0.29, posterior width 0.32. Eyes of AER subequal, AME grey and circular, separated by half their diameter, ALE oval, pearly white, touching AME. PME oval to subtriangular, pearly white, touching, larger than AME (Fig. 1). PLE subquadratic, pearly white, slightly smaller than ALE, separated from PME by half the PLE diameter. Clypeus vertical, slightly larger than diameter of AME. Chilum small, sclerotised, subtriangular and single, orange-brown. Chelicerae brown, with a few scattered thin setae on anterior face, anterior cheliceral rim with two very small teeth close to fang base and three larger teeth further from fang base, posterior cheliceral rim with one very small tooth close to fang base end two medium-sized teeth further from fang base. Sternum smooth, orange-brown, shield-shaped with a thin border, length 1.32; width 1.08. No precoxal triangles (Bosselaers and Jocqué 2002: 247, fig. 1K, Penniman 1985: 16) or intercoxal sclerites (Bosselaers and Jocqué 2002: 247), pleural bars (Bosselaers and Jocqué 2002: 247, fig. 1P; Simon 1892: 11, fig. 29) yellow-brown, weakly sclerotised and isolated, not protruding between coxae. Labium brown, longer than wide, with a slightly thickened anterior rim. Endites longer than labium, dumbbell-shaped with oblique depression, and provided with an apical hair tuft (Fig. 2). Abdomen mottled grey dorsally, with a



Figures 1–11. *Hesper vijayanagara* sp. n. **1** Male holotype, dorsal **2** Male holotype, ventral **3** Female allotype, dorsal **4** Female allotype, ventral **5** Male palp, prolateral **6** Male palp, ventral **7** Male palp, retrolateral **8** Epigyne, ventral **9** Pattabhirama temple in close vicinity of the *locus typicus*, giving a good impression of the type of terrain where the type specimens were found **10** Male leg spination diagram, legend below right **11** Female leg spination diagram. Scale bars: 1–4: 1.0; 5–8: 0.25.

frontal row of curved hairs and a small, shiny, brown anterior do scutum covering less than 10% of abdominal do surface area. (Fig. 1). Lateral and ventral sides of abdomen creamy white (Figs 1, 2). ALS and PLS large and cylindrical, PMS thin and slender, shorter than PLS. Legs yellow-brown, unicolorous (Figs 1, 2). No trochanter notch, no retrocoxal hymen (Raven 1998, Bosselaers and Jocqué 2002), patellar indentation



Figures 12–19. *Heser vijayanagara* sp. n. **12** Female allotype, dorsal view of body **13** Male palp, ventral, with conductor (C), embolus (E), and median apophysis (MA) indicated **14** Male palp, retrolateral **15** Epigyne, ventral **16** Female metatarsi III (left) and IV, with ventral terminal preening comb **17** Female cheliceral teeth **18** Vulva, ventral **19** Vulva, dorsal. Scale bars: 12: 1.0; 13–17: 0.5; 18–19: 0.1.

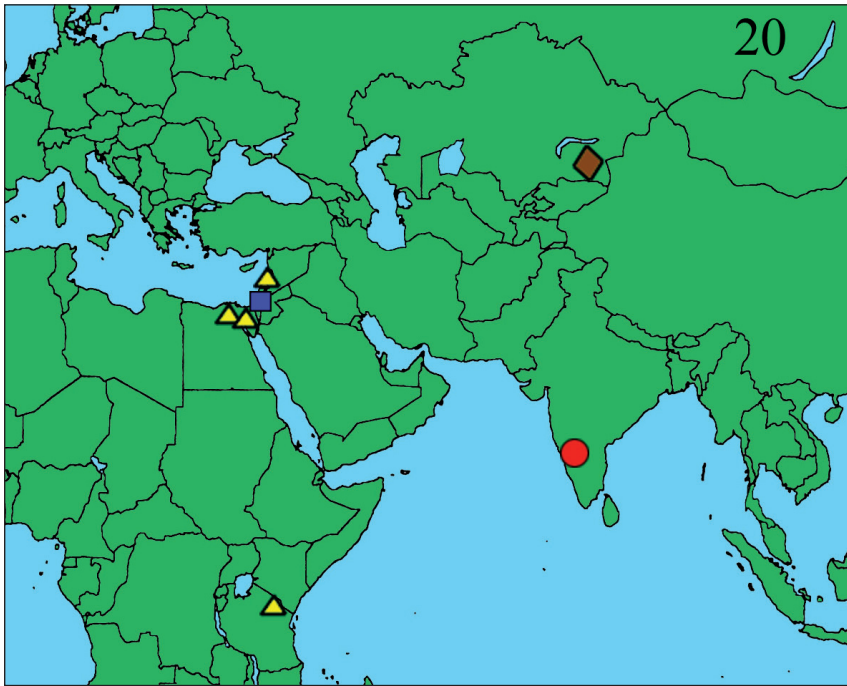


Figure 20. Distribution map of the four species of the genus *Hesper*. *H. aradensis*: blue square; *H. infumatus*: yellow triangle; *H. malefactor*: brown lozenge; *H. vijayanagara* sp. n.; red circle.

(Simon 1892: 22, Ledoux and Canard 1991: fig. 15A-15B) long and narrow, $2/3$ of pa length. Metatarsi III and IV with ventral terminal preening comb composed of stiff, black setae. Tarsi with two pectinate claws, no claw tufts. Leg formula 4123. Leg spination (Fig. 10): fe: palp do 0–1–2; I pl 0–0–1 do 1–1–0; II pl 0–0–1 do 1–1–0; III do 1–3–3; IV do 1–3–2; pa: palp pl 1–0 do 0–1; III do 0–2–0; ti: palp do 0–0–1; III pl 1–0–1 do 3–0–0 rl 1–0–1 ve 2–2–2; IV pl 1–0–1 do 1–1–0 rl 1–0–1 ve 2–2–2; mt: III pl 0–1–1 do 2–1–2 rl 0–1–1 ve 2–2–1; IV pl 0–1–1 do 2–2–2 rl 0–1–1 ve 2–2–1; ta: palp pl 1–0–0 do 1–0–0 rl 1–0–0.

Leg measurements:

	fe	pa	ti	mt	ta	Total
I	1.66	0.97	1.45	1.21	0.92	6.21
II	1.34	0.74	1.08	1.08	0.87	5.10
III	1.16	0.63	0.89	1.03	0.74	4.44
IV	1.71	0.87	1.42	1.66	1.03	6.68

Male palp with a slender, basally-prolaterally inserted embolus circling more than half of the tegulum, having a hook-shaped tip pointing in prolater direction, which is curling around the broad, membranous conductor. Median apophysis small and subtriangular, oriented transversally. Sperm duct with a pronounced, S-shaped curve in basal half of tegulum. Retrolateral tibial apophysis pointed, subtriangular (Figs 5–7, 13–14).

Female (allotype). Total length: 6.31. Carapace length: 2.37; width: 1.79. Carapace as in male (Fig. 3). Eyes as in male, AER width 0.53, PER width 0.58, MOQ depth 0.39, anterior width 0.30, posterior width 0.31. PME subtriangular, somewhat smaller than in male, almost touching (Figs 3, 12). Clypeus and chilum as in male. Cheliceral teeth as in male (Fig. 17). Sternum smooth, yellow-brown with a darker margin (Fig. 4), shield-shaped with a thin border, length 1.45; width 1.13. No precoxal triangles or intercoxal sclerites, pleural bars as in male. Labium and endites as in male (Fig. 4). Abdomen pale grey dorsally, with a frontal row of curved hairs and a number of paler chevrons in posterior half, no do scutum (Fig. 3). Ventral side of abdomen pale white (Fig. 4). Legs yellow-brown, unicolorous (Figs 3, 4). No trochanter notch, no retrocoxal hymen, patellar indentation as in male. Metatarsi III and IV with ventral terminal preening comb composed of stiff, black setae (Fig. 16). Tarsi with two pectinate claws, no claw tufts. Leg formula 4123. Leg spination (Fig. 11): fe: palp do 0-1-2; I pl 0-0-1 do 1-1-0; II pl 0-0-1 do 1-1-0; III do 1-3-3; IV do 1-3-2; pa: palp pl 1-0 do 1-1; III do 0-2-0; ti: palp pl 0-1-2 do 0-0-1; III pl 1-0-1 do 3-0-0 rl 1-0-1 ve 2-2-2; IV pl 1-0-1 do 1-1-0 rl 1-0-1 ve 2-2-2; mt: III pl 0-1-1 do 2-1-2 rl 0-1-1 ve 2-2-1; IV pl 0-1-1 do 2-2-2 rl 0-1-1 ve 2-2-1; ta: palp pl 0-2-1 do 1-0-0 rl 0-1-0 ve 0-0-2.

Leg measurements:

	fe	pa	ti	mt	ta	Total
I	1.63	0.92	1.34	1.05	0.84	5.79
II	1.37	0.79	1.00	0.87	0.74	4.76
III	1.24	0.55	0.82	0.92	0.71	4.23
IV	1.71	0.84	1.34	1.58	0.92	6.39

Epigyne simple and poorly sclerotised, with a narrow anterior hood and showing large, oval spermathecae, as well as the connected, stout, inward directed part of the looped anterior insemination ducts. Copulatory openings small and medially situated (Figs 8, 15, 18, 19). Vulva (Figs 18, 19) with two large, thick-walled, oval, posterior spermathecae, connected to the anterior, medially situated copulatory openings by an insemination duct looped over 360°. The first, hemicircular stretch of the looped insemination duct passes dorsally behind the anterior part of the spermathecae, while the second, straight, longitudinally directed stretch carries an accessory gland (Fig. 19), and the third, stout, outward directed and ventrally situated stretch connects to the large spermathecae (Fig. 18).

Key to the species of *Heser*

- 1 Males 2
- Females 5
- 2 Total length less than 4 mm. Cymbium blunt-tipped, male palpal ti longer than wide, retrolateral tibial apophysis short and blunt (Levy 1998, fig. 116) *H. aradensis*

- Total length more than 4 mm. Cymbium pointed, male palpal ti at least as long as wide, retrolateral tibial apophysis triangular and pointed.....**3**
- 3 Membranous conductor of the male palp subtriangular and more or less pointed (Levy 1998, fig. 112) *H. infumatus*
- Membranous conductor broad and blunt **4**
- 4 Embolus tip pointing towards bulbus base, median apophysis large, with a long basally oriented tip bent outwards (Tuneva 2005, fig. 10). No dorsal abdominal scutum *H. malefactor*
- Embolus tip curled around conductor, pointing in prolateral direction. Median apophysis small, triangular, directed transversally (Fig. 13). Small anterior dorsal abdominal scutum. *H. vijayanagara sp. n.*
- 5 Total length 4 mm or less..... **6**
- Total length 5 mm or more..... **7**
- 6 No anterior epigynal hood present, copulatory openings relatively small, their long axis directed transversally (Levy 1998, fig. 118)..... *H. aradensis*
- Broad anterior epigynal hood present, copulatory openings large, their long axis oriented longitudinally (Tuneva 2005, fig. 13) *H. malefactor*
- 7 Anterior epigynal hood broad, copulatory openings a transversal slit, spermatheca diameter smaller than half the longitudinal dimension of the epigyne (Levy 1998, fig. 114) *H. infumatus*
- Anterior epigynal hood narrow, copulatory openings a small oval, their long axis longitudinally oriented, spermatheca diameter about half the longitudinal dimension of the epigyne (Figs 8, 15, 18, 19) *H. vijayanagara sp. n.*

Discussion

The family Gnaphosidae is one of the largest spider families. In Platnick (2010), it is listed as the sixth largest family, with 114 genera and 2102 species. Moreover, since Araneidae and Thomisidae, which presently count more known species, have already been studied rather intensely, also in tropical regions, it is quite probable that Gnaphosidae will prove to be the fourth largest spider family known when it has been more thoroughly revised. Indeed, in spite of a number of excellent revisions being available (Platnick and Shadab 1983, Platnick and Murphy 1984), a large number of species is still awaiting description, even in well studied regions such as Spain (Melic 2004, pers. comm.). Many newly discovered species turn out to be endemisms with relatively small distribution areas, again suggesting that many more remain to be discovered (Melic and Barriga 2007, Snazell and Murphy 1997). Revisions from tropical or subtropical gnaphosid genera regularly result in a considerable number of new species, especially in the subfamily Zelotinae, the gnaphosids with metatarsal preening combs listed by Murphy (2007) as the “Zelotes-group” (Murphy and Russell-Smith 2010, Nzigidahera and Jocqué 2009, Platnick and Murphy 1996).

The Gnaphosidae of the Indian subcontinent and its surroundings have been studied by Simon (1897), Reimoser (1934), Denis (1958) and Roewer (1961), and our knowledge about them has been compiled by Tikader (1982). Additional data were later published by Gajbe (1987, 2005, 2007) and Butt and Beg (2004). *Hesper* has not yet been mentioned for the region, and none of the zelotine species illustrated by the aforementioned authors resembles the genus. It is possible that *Hesper* species are rare, as three out of the four known species are only known from the type locality. Alternatively, *Hesper* species may be frequently overlooked because of their small size and nocturnal habits (Levy 1998).

The recent progress made in the taxonomic study of ground spiders demonstrates that, for a long time to come, Gnaphosidae, and Gnaphosoidea in general, will remain a prime target for biodiversity studies within Araneae.

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Generic switch-over during ontogenesis in *Dimorphacanthella* gen. n. (Collembola, Isotomidae) with barcoding evidence

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Abstract

A new genus *Dimorphacanthella* is established for *Tetracanthella anommatos* Chen and Yin, 1984 and *Dimorphacanthella mediaseta* sp. n. from China. The new genus exhibits an unusual metamorphosis: small juveniles, previously called *Uzelia anommatos* Yue & Yin, 1999 get the second pair of anal spines resulted from moulting and become “*Tetracanthella*”. Species identity of forms with two and four anal spines is proved by barcoding analysis. The derivation of anal spines is compared among genera having four anal spines.

Keywords

Anal spines, New genus, Chinese Collembola, Barcoding analysis

Introduction

With this paper we continue our study of Collembola of family Isotomidae from China (Gao et al. 2009; Gao and Potapov in press; Huang et al. 2009, 2010). After recent revisions of the genus *Tetracanthella* Schött, 1891 one species *Tetracanthella anommatos* Chen and Yin, 1984 remained curious (Deharveng 1987; Potapov 2001). Except possessing four anal spines, this odd species has no pigment or ocelli and exhibits an uncommon number and arrangement of sensilla on the body (Chen and Yin 1984). Its generic position has not been fully decided. During our study of the family Isotomidae of China we had an opportunity to collect this species from type (Shanghai) and other localities. In several populations *T. anommatos* was mixed with another unusual blind form which was identified by us as *Uzelia anommatos* Yue & Yin, 1999, which was also described from Shanghai area. The latter one shares several important characters with *T. anommatos* and was always recorded by us in the juvenile form. This led us to re-describe these two species using the modern morphological knowledge and to test their independence by barcoding analysis. In our collection from Northwest China (Ningxia Province), another species closely related to *T. anommatos* was found. In this paper we establish a new genus, having uncommon metamorphosis during ontogenesis, re-describe *T. anommatos*, and describe a new species.

Abbreviations: **Abd. I–VI** abdominal segments; **Ant. I–IV** antennal segments; **AO** antennal organ of antennal segment 3; **bms** basal microsensillum on antennal segments; **Md, Ml** dorsal and lateral macrochaeta; **ms** microsensillum; **PAO** postantennal organ; **s** sensillum; **Th. I–III** thoracic segments; **Ti. I–III** tibiotarsi of 1–3 pairs of legs.

Taxonomy

Dimorphacanthella gen. n.

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Description. Ocelli and pigment absent. Abd. V and Abd. VI fused. Integument regularly and slightly reticulated, without pits. Middle-sized and large individuals with four anal spines set in one transversal row on posterior edge of Abd. V (Figs 1, 10), small juveniles with only two inner anal spines on Abd. V (Fig. 2) (unexamined small juveniles for *D. mediaseta*). Inner anal spines of all age stages derived from p1-setae. Setae a1 and p2 not modified to spines. Maxillary outer lobe with simple palp and 4 sublobal hairs. Prelabrum with 2 setae. In two known species labial palp lost five guards on papillae B, D, and E. Body chaetotaxy oligochaetotic. Unpaired median seta (p0) present on Abd. IV. Papilla of inner anal spine is supplied with a seta on dorsal side (absent in small juveniles). Macrosetae well differentiated, macrochaetotaxy of Th. II-Abd. III 1,1/2–3,2–3,2–3. Sensilla well differentiated, 2,1/1,1,1,2,4 (s) and 1,0/0,0,1 (ms) in number. Empodial appendage present, furca absent.

Distribution: China (Shanghai, Ningxia).

Type species: *Dimorphacanthella anommatos* (Chen & Yin), 1984, comb. n.

Remarks: Sharing four anal spines on genital segment, the new genus *Dimorphacanthella* formally resembles three genera namely *Tetracanthella*, *Blissia* Rusek, 1985 and *Sibiracanthella* Potapov & Stebaeva, 1995. All four genera also have the same derivation of inner anal spines which are, following the notation of Deharveng (1978), p1-setae modified. Outer anal spines derived from p2-setae in *Tetracanthella* (Fig. 14) and *Blissia* and a1-setae in *Sibiracanthella*. Outer anal spines of *Dimorphacanthella* are modified setae positioned in posterior part of Abd. V and between two macrosetae pp1 and pp2. Since the designation of setae of Abd. V is not developed enough we notate these setae as setae x on the schemes (Fig. 15). Seta x is a ordinary seta in late instars of *Tetracanthella*, while in *Dimorphacanthella* it is modified to a spine at later instars and absent at early instars (Figs 14–16). Seta p2 which is a lateral spine in *Tetracanthella* remains unmodified in *Dimorphacanthella* and is located anterior to and between sensilla s1 and s2. The new genus has a pair of ordinary setae in front of median spines in late instars (notated as m1 seta by us) (Figs 15). These setae were never seen in other genera having spines in p1-position. These and other differentiated characters of genera with four anal spines are presented in Table 1.

Blindness and presence of unpaired seta on Abd. IV are only shared with *Martynovella nana nana* (Martynova, 1967) described from Central Asia. This species, however, has two anal spines at all age instars, more complete sensillary set, lacking seta m1 in front of spines, and other less significant differentiating features. Another subspecies, *Martynovella nana kirgisica* (Martynova, 1967) has no unpaired seta on Abd. IV.

Table 1. Differentiating characters of genera with 4 anal spines on Abd. V and none on Abd. VI

character	<i>Tetracanthella</i>	<i>Blissia</i>	<i>Sibirocathella</i>	<i>Dimorphocanthella</i> gen. n. (adult)
medial pair of anal spines	p1	p1	p1	p1
lateral pair of anal spines	p2	p2	a1	x
cuticle	slightly to strongly reticulated without pits	slightly reticulated with numerous pits	smooth without pits	slightly reticulated without pits
s formula (ms not considered)	3,3/2,2,2,2,4	3,3/2,2,2,2,3	2-3,2-3/1-2,1-2,1-2,1-2,4	2,1/1,1,1,2,4
seta on anterior side of papilla of medial pair of anal spines (m1)	-	-	-	+
unpaired seta p0 on Abd. IV	-	-	-	+
ocelli	present	present	present	absent

The number and homology of real anal spines are of high value in generic taxonomy of Anurophorinae and appeared to be constant in the course of postembryonic ontogenesis (Deharveng 1978), except epitokous and ecomorphic forms of *Proisotoma* Börner, 1901 and *Cliforga* Wray, 1952 (Fjellberg 1988; Najt 1983). In the family, *Dimorphacanthella anommatos* is the only case where the real anal spines on high papillae appear after moulting.

Etymology: The name of the new genus refers two morphs, juvenile and adult, having different number of anal spines in at least one species of the genus.

***Dimorphacanthella anommatos* (Chen & Yin, 1984) comb. n.**

Figs 1–7

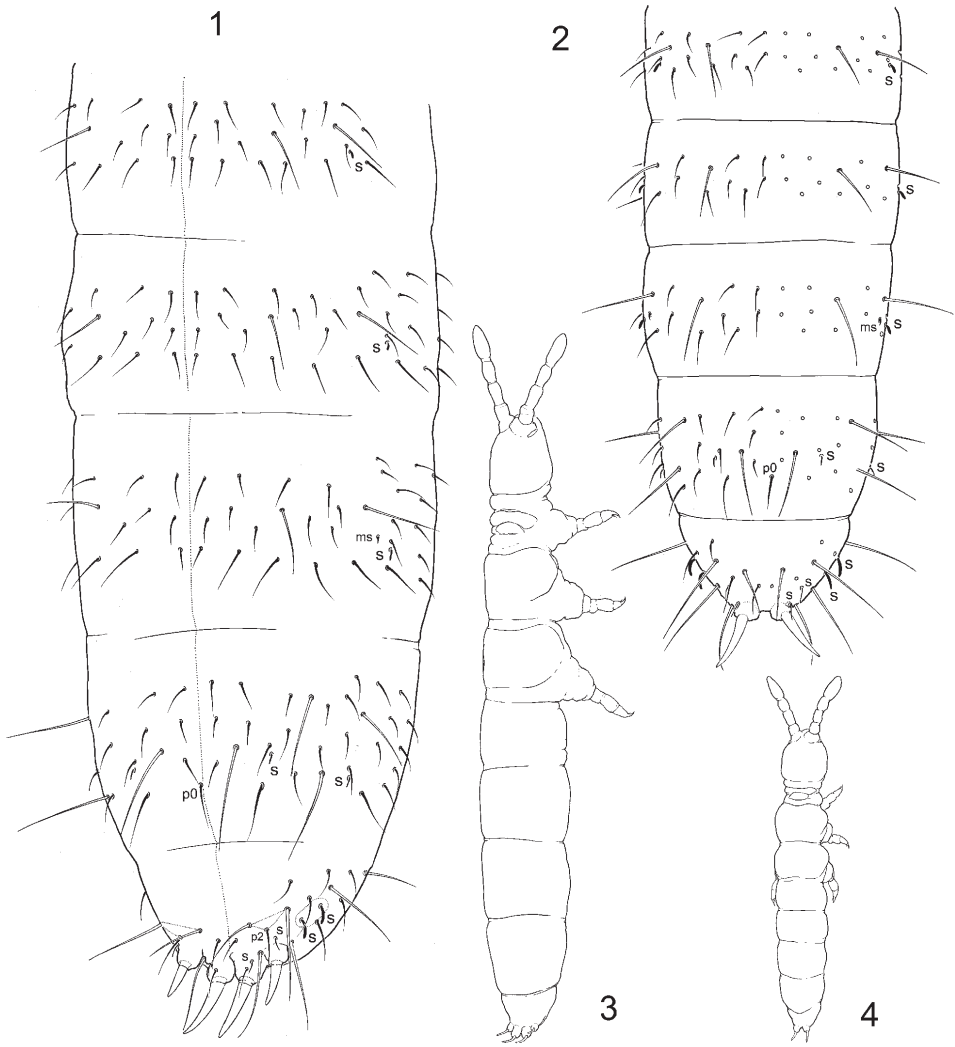
Tetracanthella anommatos Chen & Yin, 1984 (basionym)

Uzelia anommatos Yue & Yin, 1999, syn. n.

Type material. In the collection Shanghai Insect Museum, holotype and paratypes have not been designated within type series of *Tetracanthella anommatos* and *Uzelia anommatos*. Therefore, a lectotype (female) and 2 paralectotypes (females) for *T. anommatos* on slides labelled as “E China, Shanghai City, Songjiang County, Sheshan, 16. III. 1983, Y.M. Yang and B.R. Chen leg.” and a lectotype (juvenile specimen) of *U. anommatos* on slide labelled “E China, Shanghai City, Shanghai Botanical Garden, bamboo plantation, 5.XII.1997, Q.Y. Yue leg.” were designated by us.

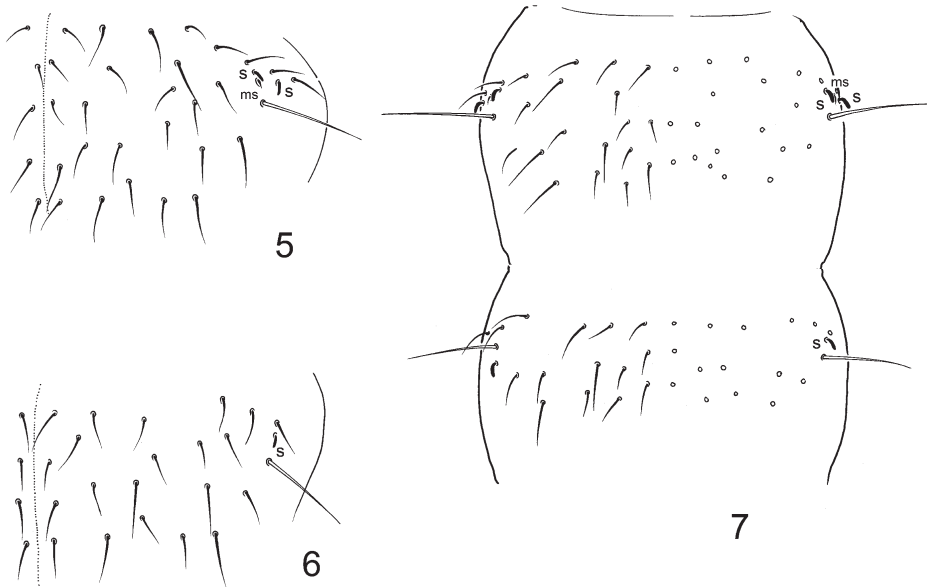
Other material. 20 adult and subadult individuals of which 15 are females, one male and four juveniles, E China, Shanghai City, Shanghai Botanical Garden, in Bamboo plantations and under *Viburnum macrocephalum*, collected in winter time of 1997, 1998 and 2007 by Y.M. Yang and Q.Y. Yue; 1 females, E China, Shanghai City, Shanghai World Exposition Site, litter and soil from 0–15cm depth, 6.IV.2006, Y.X. Luan, Y. Gao and Y. Bu leg.; 4 females, NW China, Ningxia Province, Liupan Mountain Nature Reserve, Longde, Sutai Forest Farm, Sample 7, 35°26'N, 106°11'E; 2145 m alt., grassy slope and forest litter. 21.VI.2008, 1 female, Jingyuan, Erlonghe, Xiaonanchuan Forest Protection Area, 35°23'N, 106°17'E; 2163 m alt., slope beside a ditch, under a rotten tree stump, soft soil. 10.VII.2008, Y. Bu and C.W. Huang leg.

Redescription. Body slender (Fig. 3), 1.0 to 1.3 mm long. Without ocelli and pigment. Body with well visible reticulation, no elongated polygons, the largest ones subequal to sockets of ordinary setae. Maxillary head with strong claw, lamellae not beyond its tip. Maxillary outer lobe with simple maxillary palp and with 4 sublobal hairs. Labral formula as 2/554, edge of labrum without clear papillae, beyond the tips of setae of distal row. Labium with all five papillae (A–E) present. Set of guards incomplete (11) – guards b4, d4, e3 (or e5), e4 and e7 lost. Papilla E with only four guards. Lateral process of labial palp long, at the level with or a little beyond tip of papilla



Figures 1–4. *D. anommatos*. **1–2** chaetotaxy of abdomen, **3–4** general habitus, **1, 3** adult specimen **2, 4** young juvenile specimen.

E. Hypostomal setae h1 and h2 long, seta H shorter and thicker, small extra spinule nearby seta H (as in Fig. 9). Proximal part of labium with 3 setae, basomedian field with 4 setae. Ventral side of head with 3+3 postlabial setae. Ant. I normally with 11 setae, 2 bms, dorsal and ventral, and 2 ventral s, one of which curved and 3–4 times longer than another. Ant. II normally with 16–17 setae, 3 bms and one curved s. Ant. III without bms and 5 s, inner pair of sensilla of AO much shorter and set in cuticular groove. Several sensilla on Ant. IV differentiated, subapical organite rod-like, micro-sensillum twice as long as sensilla.



Figures 5–7. *D. anommatos*. **5–6** chaetotaxy of Th. II (5) and Th. III (6) of adult specimen, **7** the same in young juvenile specimen.

Chaetotaxy of adult and juvenile individuals shown on Figs 1, 2, 5–7. Tergal sensilla well visible and thick, much shorter than ordinary setae. Sensillary formula 2,1/1,1,1,2,4 (s). Sensilla almost as wide as ordinary setae, on Abd. V sensilla of lateral pair thick and twice longer than medial one. Microsensillary formula 1,0/0,0,1 (ms). Dorsal axial chaetotaxy of Th. II–Abd. IV as 10(12),8/6,6,6,7. Macrochaetotaxy 1,1/2,2,2,4. Ml macroseta on Th. II 2.7–3.1 as long as p1-seta. Md macrosetae on Abd. IV 1.5–1.9 as long as p0-seta and 2.7–3.2 as long as unguis 3. Sternum of Th. I, II and III with 0+0, 1(2)+1(2), 3(2–4)+3(2–4) setae, respectively. Ti. I–III with 21, 21, 22 setae, respectively. One seta modified (thinner) on inner side of Ti. III. Ventrum of Abd. II with 4 to 5 medial setae, 2 (rarely 3) anterior and 2 (rarely 1 or 3) posterior. Retinacular field with 2 (rarely 3) setae. Furcal subcoxa with 9–10 setae, including a pair of macrosetae in posterior position. Manubrial field with 3 pairs of setae. Setulae on anal lobes not seen. Inner anal spines 1.3–1.6 times longer than outer spines. In populations, males much more rare than females.

Age dependent morphology: Small individuals with up to 0.65 mm length have fewer axial setae, 2 postlabial setae, and two anal spines so then corresponding to morphology of *Uzelia anommatos*. General appearance of fully grown and young individuals is shown in Figs 3–4.

Remarks. For the difference from *D. mediaseta* see the remarks section.

***Dimorphacanthella mediaseta*, sp. n.**

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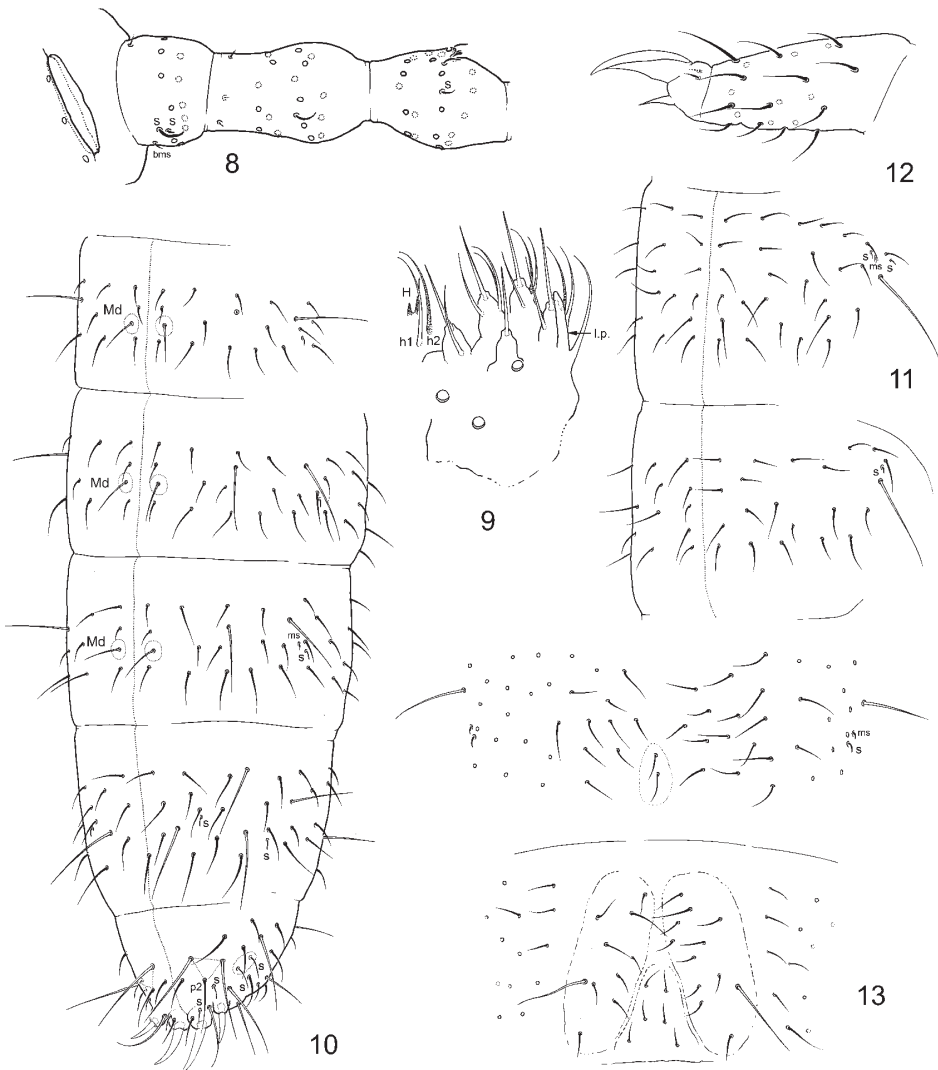
Figs 8–13

Material. Holotype: Subadult female with an aperture but not fully developed, body length 0.81mm, NW China, Ningxia Province, Longde County, Shatang Town, Shatang Nanshan Mt. (a little mountain belongs to LiuPan Mountain), 35°20'N 105°50'E, 1900 m alt., sparse shrubs and birch, 1.VI.2006, Y. Bu, Y. Gao and Y.X. Luan leg.

Paratypes: All from the same area as holotype (Ningxia Province, Liupan Mountain Nature Reserve,), from different localities, all collected by Y. Bu and C.W. Huang. 1 subadult female, body length 0.83mm, same date of Holotype; 1 subadult female, 2 juveniles, Jingyuan, Dongshanpo Forest Farm, Sam 11, 35°37'N, 106°13'E; 2297 m alt., valley, beside a stream, black soil, shrubbery. 24.VI.2008, 1 subadult female, 1 juvenile, Jingyuan, Qiuqianjia Forest Farm, Sam 2; 35°33'N, 106°24'E; 1868 m alt., slope beside a stream, clinisol with many dull leaves, moist soils. 06.VII.2008, 1 subadult female, 4 juveniles, Jingyuan, Woyangchuan Forest Protection Area, 35°39'N, 106°23'E; 1762 m alt., one place is slope, clinisol with dull leaves and humus, another one at the foot of the hill, forest litter, yellow and dry soils with many dull leaves. 29.VI.2008, 3 subadult females, 1 subadult male, 3 juveniles, Longde, Fengtai Forest Farm, 35°35'N, 106°13'E; 2399 m alt., valley, forest litter. 25.VI.2008, 2 juveniles, Longde, Heshangpu Forest Farm (Sam 2; 35°40'N, 106°13'E; 2300 m alt.), valley, forest litter, moist soils. 27.VI.2008, 1 subadult female, Jingyuan, Erlonghe, Xiaonan-cuan Forest Protection Area, 35°23'N, 106°17'E; 2163 m alt., slope beside a ditch, under a rotten tree stump, crumbly soils. 10.VII.2008, 5 subadult females, 5 males, Jingyuan, Dongshanpo Forest Farm, 35°36'N, 106°15'E; 2125 m alt., foot of cliff, moist soils and moss on the stone. 23.VI.2008.

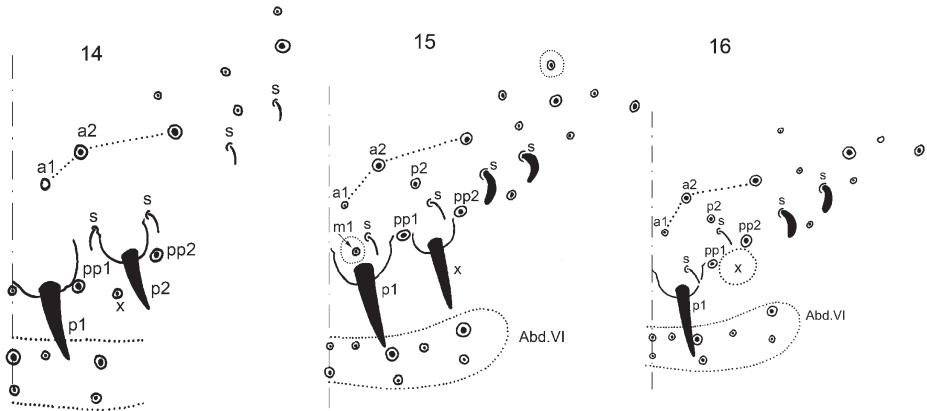
Holotype and the most paratypes are deposited in Shanghai Institute of Plant Physiology and Ecology, Shanghai Institutes for Biological Sciences, CAS (China), except 3 paratypes are kept in Moscow State Pedagogical University (Russia).

Description. Size of adult males and subadult females up to 1.0 mm (adult female not seen). Body shape slender, general appearance somewhat that of the genus *Stenaphorura* (Absolon, 1900) (Onychuridae). No pigmentation. Body with well visible reticulation, no elongated polygons. With 4 strongly chitinized anal spines arranged almost in one transversal row at the end of abdomen. Inner anal spines 1.1–1.4 times longer than outer spines. Ocelli absent. PAO narrowly elliptical, with weak constriction, 1.8–2.2 as long as unguis 3. Outer mouth parts as in previous species, labial palp shown in Fig. 9. Maxillary claw strong, lamellae not beyond its tip. Ventral side of a head with 3+3 postlabial setae. Ant. I with 11 (rarely with 10) setae, 2 bms, dorsal and ventral, and 2 ventral s, one of them curved and 3–4 times longer than another. Ant. II normally with 17 setae, 3 bms and one curved s. Ant. III without bms and with 5 s, inner pair of sensilla of AO much shorter and set in cuticular groove (Fig. 8). Several differentiated sensilla on Ant. IV, subapical organite small, subapical microsensillum short.



Figures 8–13. *D. mediaseta* sp. n. **8** postantennal organ and three antennal segments **9** labial palp **10–11** chaetotaxy of abdomen (10) and thorax (11) **12** apical part of Leg 3 **13** ventrum of Abd. III and IV. H, h1, h2 - hypostomal setae, l.p. - lateral process.

Chaetotaxy of body shown on Figs 10–11. Tergal sensilla well visible, much shorter than ordinary setae. Sensillary formula 2,1/1,1,1,2,4 (s). In one individual 2 sensilla on one side of Th. III. Sensilla thinner than ordinary setae, on Abd. V sensilla of lateral pair thin and twice as long as the medial ones. Microsensilla large, set near sensilla, microsensillary formula 1,0/0,0,1 (ms). Tergites with a sparse cover of ordinary setae. Dorsal axial chaetotaxy of Th. II–Abd. IV as 12(14),10(9)/8,8,8,7 (including macro-



Figures 14–16. Arrangement of setae, spines and sensilla on dorsal side of Abd. V–VI in *Tetracanthella* and *Dimorphacanthella*. **14** *Tetracanthella pilosa* **15–16** *Dimorphacanthella anommatos*, adult (15) and young juvenile (16) specimens. In Fig. 15 setae of Abd. V missing in young juveniles are encircled.

setae Md). Macrochaetotaxy 1,1/2+1,2+1,2+1,4. In axial group of Abd. I–III a pair of small Md macroseta present (notated as ‘+1’ in formula and encircled on Fig. 10). Short Md macroseta appears to be also present in axial group of Th. II and III but hardly differentiated. Ml macroseta on Th. II 2.6–3.1 as long as p1-seta. Md macroseta on Abd. IV 1.7–2.2 as long as p0-seta and 2.5–3.3 as long as unguis 3. Sternum of Th. I without setae, sternums of Th. II and III with 1+1 and 3(2)+3(2) setae, respectively.

Unguis without inner and lateral teeth. Unguiculus simple, without lamella, 0.4–0.5 as long as unguis 3. Ti. I–III with 21, 21, 22 setae, without additional setae (Fig. 12). Only one seta slightly modified on inner side of Ti. III in both sexes. Tibiotarsal tenent setae weakly developed. Ventral tube with 4+4 laterodistal and 4 posterior setae in one transversal row. Ventrum of Abd. I with four medial setae, two anterior and two posterior. Furca and tenaculum completely absent. Furcal subcoxa with 9–11 setae, of which two longer setae, macrosetae in posterior position and anterior slightly enlarged seta (Fig. 13). Manubrial field normally with 3 pairs of setae. Retinacular field with 2 setae. Each anal lobe with 2 rudimentary setulae, not always distinct. Males present.

Remarks. The new species differs from *D. anommatos* by presence of medial pair of macrosetae on the first three abdominal tergites. Sensilla on tergites, especially lateral pair on Abd. V, are thinner than in *D. anommatos*. Seta p2 on Abd. V also sharply discriminates these two species (in more posterior position in *D. mediaseta*, Figs 1 and 10). Number of anal spines in small juvenile individuals is unknown.

Name derivation. The name refers to medial macrosetae on body differentiating the new species.

Barcoding analysis. DNA barcoding sequence was proved very efficient for characterising Collembolan species (Hogg and Hebert 2004). Here, we used barcode in order to validate those two forms of *D. anommatos* are really belong to the same species, in spite of strong morphological differences.

Collembolan specimens. Collembolan species for DNA barcoding analysis were collected from Zhongjia Mountain, 31°05'N, 121°09'E, 25 m alt., Songjiang county, Shanghai city in 75% ethanol by the Tullgren funnel method. They were stored in 100% ethanol at -20°C after morphological identification. We barcoded separately 2 individuals of '*T. anommatos*' with four anal spines and 4 individuals of '*U. anommatos*' with two anal spines.

DNA extraction, amplification and sequencing. Genomic DNA was extracted from one individual using the Wizard SV Genomic DNA Purification System (# 2361). The mitochondria COI gene sequence was amplified (658 bp) by primer pair LCO (5' - GGTCACAAATCATAAAGATATTGG-3') / HCO (5' - TAAACTTCAGGGT-GACCAAAAAATCA-3') (modified from Folmer et al. 1994). We use the following profile: 94°C initial denaturing for 4 min; 10 cycles of 94°C denaturing for 30 s, 45°C annealing for 30 s, and 72°C extension for 1 min and 30 s; then, with 25 cycles of 94°C denaturing for 30 s, 50°C annealing for 30 s, and 72°C extension for 1 min and 30 s; and a final extension at 72°C for 8 min. PCR products were purified and then were sequenced directly using both of the amplification primers.

Results. Six sequences (length 658 bp) were obtained from 6 individuals. The two individuals of the four-spined form showed the same sequence, as the four individuals of the two-spined form. This suggested that the two forms are a same species in agreement with our morphological result. GenBank Accession number of barcoding sequences are HM366600 and HM366601.

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Taxonomic revision of *Ectyphus* Gerstaecker, 1868 and *Parectyphus* Hesse, 1972 with a key to world Ectyphinae (Insecta, Diptera, Mydidae)

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Abstract

The Afrotropical Mydidae genera *Ectyphus* Gerstaecker, 1868 and *Parectyphus* Hesse, 1972 are revised. Six species of *Ectyphus* are recognised (*E. abdominalis* Bezzi, 1924, *E. armipes* Bezzi, 1924, *E. capillatus* Hesse, 1969, *E. pinguis* Gerstaecker, 1868, and *E. pretoriensis* Bezzi, 1924), of which one is newly described from Kenya, *E. amboseli* **sp. n.** Two species, *E. bitaeniatus* Hesse, 1969 and *E. flavidorsalis* Hesse, 1969, are newly synonymised with *E. pinguis*. The monotypic genus *Parectyphus* Hesse, 1972 and the male of its type species *P. namibiensis* Hesse, 1972 are re-described while the female is described for the first time. Comments on the distribution of all species within biodiversity hotspots are given. A dichotomous identification key to the genera and species of world Ectyphinae is provided and illustrated keys to the world Ectyphinae are made available online in both dichotomous and multi-access, matrix-based formats.

Keywords

Mydidae, Ectyphinae, Afrotropical, *Ectyphus*, *Parectyphus*, world key

Introduction

Mydidae is one of the smaller families of Diptera, with 471 species currently described in 66 genera world-wide. Mydids are infrequently collected, so little is known about the life history and seasonality of these interesting flies. Current knowledge of the Mydidae fauna indicates that most of the species diversity occurs in the Afrotropical Region, specifically in Namibia and western South Africa. To this day, the subfamily Ectyphinae is represented by two groups of geographically isolated genera: *Heteromydas* Hardy, 1944 and *Opomydas* Curran, 1934 from western North America (Mexico: Baja California Norte, Baja California Sur, Sonora and the USA: Arizona, California, Nevada, New Mexico, Texas), and *Ectyphus* Gerstaecker, 1868 and *Parectyphus* Hesse, 1972 from southern Africa (Namibia and South Africa). The objective of this study is the revision of the two Afrotropical genera, including the description of the first species to be collected in eastern Africa (Fig. 1). The revision of *Ectyphus* and *Parectyphus* is based on 131 and 11 specimens, respectively, entails the presentation of identification keys and descriptions of all species of the two genera, and summarises what is known about their biology and distribution. In addition, keys for the identification of all known genera and species are provided. For regularly updated distribution maps for all Mydidae species based on specimen occurrence data see http://www.mydidae.tdvia.de/mydidae_specimen_map.

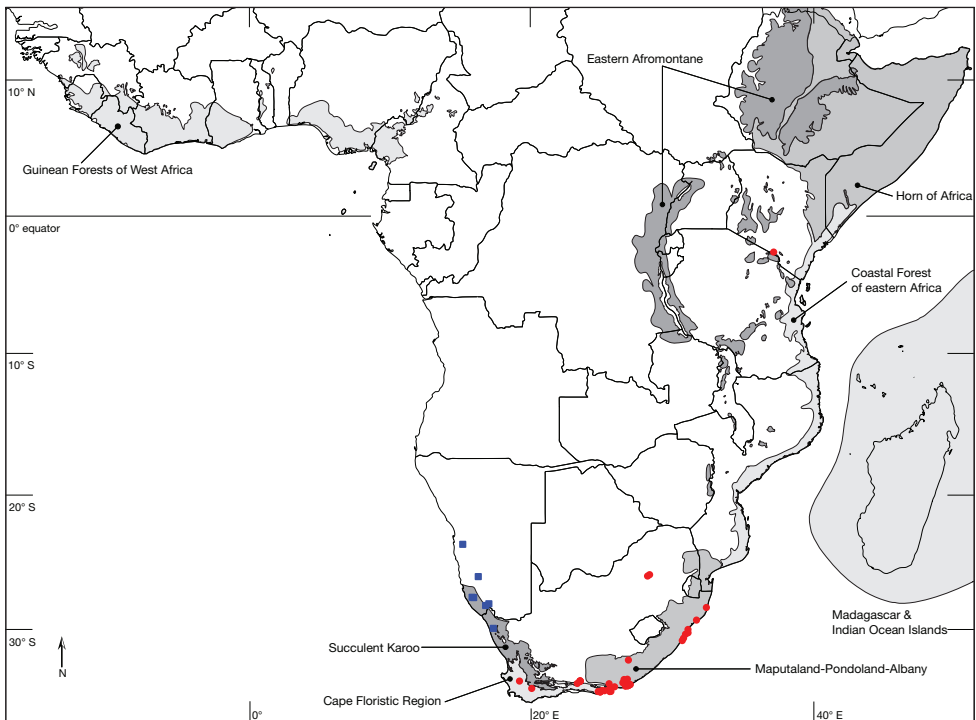


Figure 1. Map of the Afrotropical Region with biodiversity hotspots *sensu* Conservation International showing distribution of *Ectyphus* (red circles) and *Parectyphus* (blue squares). Note the distribution of *Ectyphus* in south-eastern Kenya.

Taxonomic history of *Ectyphus* and *Parectyphus*

Gerstaecker (1868) erected the genus *Ectyphus* and described the type species *E. pinguis* from 'Africa australis'. His diagnosis of the genus was based on the presence of a small 'posterior crossvein' (= $M_3 + CuA_1$) on the wing, a circlet of spurs on the female ovipositor (acanthophorite spurs), and a reduced, rudimentary proboscis. These characters are not autapomorphies for *Ectyphus*, but are also found in genera of other subfamily taxa.

Williston (1886, 1898) described *E. limbatus* Williston, 1886 from Arizona and *E. townsendi* Williston, 1898 from New Mexico, USA, and Séguy (1928) described *E. athamas* from 'Basse California' (= Lower California) in present-day Baja California Norte state, Mexico. Bezzi (1924), when studying the southern African Mydidae, suggested that the North American *Ectyphus* belong to a separate genus based on the lack of a metathoracic tibial spine in females. Curran (1934) then erected the genus *Opomydas* to include these North American species, leaving only African species in *Ectyphus*. Kondratieff and Fitzgerald (1996) provide a recent revision of the North American species.

Bezzi (1924) described two new South African species of *Ectyphus*, i.e., *E. abdominalis* from Montagu (Western Cape) and *E. armipes* from Stellabush (KwaZulu-Natal), as well as the subspecies *E. armipes pretoriensis* from Pretoria (Gauteng). Hesse (1969) re-described *Ectyphus* with the addition of three new South African species all from the Eastern Cape: *E. bitaeniatus* from Resolution, *E. capillatus* from Brakkloof, and *E. flavidorsalis* from Willowmore. Also described were three varieties of *E. pinguis*: *litoralis* from the coastal Eastern Cape, and *ceramiiformis* and *karooensis* from Willowmore and surroundings. Hesse (1969) established *E. armipes pretoriensis* as a distinct species *E. pretoriensis*. Interestingly, *E. capillatus* was described only from two male specimens, *E. flavidorsalis* from two female specimens, and *E. bitaeniatus* from a single female. The status of the species and varieties described by Hesse (1969) is discussed below.

In 1972, Hesse described a new genus, *Parectyphus* from a single male specimen collected in Gobabeb, Erongo, Namibia. Illustrations of the antennae and hypopygium of the type species *P. namibiensis* Hesse, 1972 were provided. He postulated that *Parectyphus* was closely related to *Ectyphus* based on similar morphology, with one major difference being the elongation of the 'stump vein' extending from wing vein R_4 to connect with R_{2+3} . Bowden (1980) catalogued 7 species for *Ectyphus*, *E. abdominalis*, *E. armipes*, *E. bitaeniatus*, *E. capillatus*, *E. flavidorsalis*, *E. pinguis*, and *E. pretoriensis*, and 1 species for *Parectyphus*, *P. namibiensis*.

Based on morphological similarity among *Ectyphus*, *Opomydas*, and the North American genus *Heteromydas*, Wilcox and Papavero (1971) erected the subfamily Ectyphinae. The taxon was based primarily on characters of the male terminalia: a free hypandrium, an aedeagus with a single tube, and 'dististyli' on the gonocoxites. The term 'dististyli' suggests that these novel appendages are gonostyli, which are absent in Mydidae (van Emden and Hennig 1970, Yeates and Irwin 1996, Dikow 2009). We, therefore, propose the term palp-like lateral appendage *sensu* Hesse (1969) to replace this term. Other characters diagnostic of Ectyphinae are the presence of macrosetae

on the median surface of the metathoracic trochanters and metathoracic tarsomere 1 about five times as long as broad. Wilcox and Papavero (1971) list the Oriental Region along with the south-western USA, northern Mexico, and southern Africa as being inhabited by Ectyphinae, but later (Papavero and Wilcox 1974) the authors did not include this particular record from Asia. The genus *Parectyphus* was classified as *incertae sedis* by Papavero and Wilcox (1974) in their comprehensive study of the world Mydidae, but Bowden (1980), in the Catalogue of the Diptera of the Afrotropical Region, placed it within Ectyphinae.

Materials and methods

Morphological terminology follows the Manual of Nearctic Diptera (McAlpine 1981) and Dikow (2009). Abdominal tergites and sternites are referred to as 'T' and 'S' respectively. The terms prothoracic, mesothoracic, and metathoracic are abbreviated 'pro', 'mes', and 'met', respectively. The term pubescence (adjective 'pubescent') refers to the short, fine microtrichia densely covering certain body parts. Other generalised terms refer to the Torre-Bueno Glossary of Entomology (Nichols 1989).

Species descriptions are based on all available specimens. Well-preserved specimens exhibiting intraspecific variation were selected for description. The descriptions are compiled from a character matrix of 145 features assembled with Lucid Builder (v.3.5) and exported as natural language descriptions. When available, species are fully described in the male sex while females are only described with those features that differ (except for characters relating to the terminalia/genitalia). All specimens examined were dry-mounted on pins. Regarding the specimens selected for dissection, the female genitalia and male terminalia were excised and macerated in 10% potassium hydroxide at 55°C and rinsed in distilled H₂O. The terminalia were stored in 70% ethanol for examination and illustration, but permanently stored in 100% glycerine. Morphological features were illustrated using a *camera lucida* on a Leica stereo-microscope and digitally re-drawn in Adobe Illustrator®. The vestiture/setation of the male terminalia was not illustrated. Wing length was measured from the tegula to the apex of the wing. Photographs of the specimens were taken using a Microptics ML Macro XLT digital system with a Canon EOS 40D camera. All photographs were deposited in Morphbank (<http://www.morphbank.net>) and permanent links to the full-size images are included in the figure captions.

In recording data for type specimens as well as non-type specimens, information is given (where available) in a standard manner, *i.e.*, locality, geographic co-ordinates, elevation, date of collection (month indicated in lower case Roman numerals where hyphens indicate missing entries for day, month, year), habitat information, collector, and depository. Female (♀) and male (♂) symbols indicate the sex while a question mark (?) refers to specimens of indeterminable sex (*i.e.*, with broken or missing abdomen). Each specimen (other than type specimens of already described species, which are sufficiently identified by their type status), is listed with a unique AAM specimen

number that is attached as a white label and will allow the re-investigation as well as provide a unique identifier (LSID <http://lsids.sourceforge.net>) in databases like GBIF (<http://www.gbif.org>) in the future. AAM is an abbreviation for 'Apiceridae Asilidae Mydidae' and identifies a record in the specimen database used by T. Dikow in this format: AAM-000000. The distribution of all studied specimens is illustrated in distribution maps created in ArcMap (v.9). The electronic shape-files of the Biodiversity Hotspots were obtained from Conservation International (2005). The electronic keys were deposited in the IdentifyLife (<http://www.identifylife.org>) project.

Institutions providing specimens are listed below, along with the abbreviations used in the text and the people who kindly assisted: AMGS - Albany Museum, Grahamstown, Eastern Cape, South Africa (A. Kirk-Spriggs, S. Gess); BMNH - The Natural History Museum, London, UK (E. McAlister,); CAS - California Academy of Sciences, San Francisco, California, USA (C. Griswold); CNC - Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario, Canada (J. Skewington); DEIC - Senckenberg Deutsches Entomologisches Institut, Müncheberg, Brandenburg, Germany (F. Menzel); ISNB - Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium (P. Grootaert); MNHN - Museum national d'Histoire naturelle, Paris, France (C. Daugeron, E. Delfosse); MZLU - Museum of Zoology, Lund University, Lund, Sweden (R. Danielsson); NMNW - National Museum of Namibia, Windhoek, Namibia (A. Kirk-Spriggs); NMSA - Natal Museum, Pietermaritzburg, KwaZulu-Natal, South Africa (B. Muller, M. Mostovski); SAMC - South African Museum, Cape Town, Western Cape, South Africa (M. Cochrane); SANC - South African National Collection of Insects, Pretoria, Gauteng, South Africa (R. Urban); SMNS - Staatliches Museum für Naturkunde, Stuttgart, Baden-Württemberg, Germany (H.-P. Tschorsnig); USNM - United States National Museum, Smithsonian Institution, Washington, DC, USA (F.C. Thompson); ZMHB - Museum für Naturkunde, Berlin, Germany (J. Ziegler, J. Pohl); ZSMC - Zoologische Staatssammlung, München, Bayern, Germany (M. Kotrba).

Taxonomy

Genus *Ectyphus* Gerstaecker, 1868

Ectyphus Gerstaecker 1868: 92. Type species: *Ectyphus pinguis* Gerstaecker 1868, by monotypy.

Diagnosis: *Ectyphus* is distinguished from other Afrotropical Mydidae by the distinctly clubbed metathoracic femur, the presence of a ventral keel on the metathoracic tibia terminating into a well-developed apical spine, and veins M_3+CuA_1 terminate together into C on the posterior wing margin. Other features include the presence of 3 spermathecae in females and a free, square, and more or less flat hypandrium in males.

***Ectyphus abdominalis* Bezzi, 1924**

Figs 2, 45

Ectyphus abdominalis Bezzi 1924: 198; Hesse 1969: 378; Bowden 1980: 326.

Diagnosis: The species is distinguished from congeners by the broad, reddish stripe covering most of the dorsal abdomen (Fig. 2), the light brown setation on the head and scutum, the lack of a yellow posterior margin on the abdominal tergites, and its apparent distribution in the western Western Cape Province.

Re-description female: Head: brown, facial gibbosity yellow, in general white pubescent; width distinctly greater than thorax, interocular distance on vertex larger than at ventral eye margin, vertex between compound eyes slightly depressed, parafacial area very narrow, facial gibbosity nearly touching median eye margin; facial gibbosity distinct, well-developed and discernible in lateral view; mystax light brown, covering entire facial gibbosity; frons predominantly white pubescent (only narrow median area apubescent), vertex entirely white pubescent, postgena white pubescent; setation: vertex light brown, frons light brown, ocp setae brown, pocl setae brown; ocellar triangle apubescent; proboscis brown, short, about $\frac{1}{2}$ length of oral cavity; labellum small, as wide as prementum, about $\frac{1}{2}$ length of prementum, unsclerotised laterally; maxillary palpus cylindrical, light brown, longer than $\frac{1}{2}$ length of proboscis.

Antenna: brown, scape and pedicel brown setose dorsally and ventrally; postpedicel cylindrical in proximal $\frac{1}{2}$, symmetrically bulbous in distal $\frac{1}{2}$, ≥ 5.0 times as long as combined length of scape and pedicel; apical 'seta-like' sensory element situated apically in cavity on postpedicel.

Thorax: brown, predominantly yellow pubescent; scutum medially bluish-black, laterally brown, surface entirely smooth, lightly grey pubescent, scutal setation comprised of distinct rows of short dorsocentral setae and lateral scutal setae; dc setae pre- and postsuturally light brown, acr setae absent, lateral scutal setae brown, npl, spal, and pal setae absent; postpronotal lobe light brown, partly silver pubescent; proepisternum, lateral postpronotum, and postpronotal lobe long brown setose; scutellum entirely silver pubescent, short brown setose, apical scutellar setae absent; mesopostnotum, anatergite, and katatergite grey pubescent, asetose; katatergite elevated and smoothly convex; anterior anepisternum asetose, supero-posterior anepisternum asetose; posterior anepimeron long white setose, katepimeron asetose; metepimeron evenly elevated, same colour as T1, silver pubescent, asetose; metepisternum silver pubescent, asetose.

Leg: brown, setation predominantly white; pro, mes, and met coxa grey pubescent, white setose; met trochanter macrosetose medially; femur brown, met femur evenly clubbed in distal $\frac{3}{4}$, in distal $\frac{1}{2}$ macrosetose, 1 antero-ventral and 1 postero-ventral row of macrosetae; pro, mes, and met tibia straight, met tibia cylindrical with distinct ventral keel terminating into a sharp spine; pro and mes tarsomere 1 as long as combined length of tarsomeres 2–3, pulvillus well-developed, as long as well-developed claw, and as wide as base of claw; empodium absent.



Figures 2–5. Photographs of *Ectyphus* species. **2** *E. abdominalis* (♀ holotype, SAMC, [Morphbank](#)); **3–4** *E. amboseli* sp. n. (♂ holotype, AAM-000191, CAS) **3** dorsal ([Morphbank](#)) **4** lateral ([Morphbank](#)) **5** *E. armipes* (♂ holotype, SAMC, [Morphbank](#)). Scale lines = 5 mm.

Wing: length = 13.2 mm; hyaline throughout, slightly brown stained along veins, veins light brown, microtrichia absent; cells r_1 , r_4 , r_5 , m_3 , + *cup* closed; C well-developed, around entire wing; R_4 terminates in R_1 ; R_5 terminates in R_1 ; stump vein (R_3) at base of R_4 present, long but not reaching R_2 ; R_4 and R_5 widest apart medially; r-m distinct, R_{4+5} and M_1 apart, connected by crossvein; M_1 straight at r-m (not curving anteriorly), M_1 (or M_1+M_2) terminates in C; CuA_1 and CuA_2 split proximally to m-cu (cell m_3 narrow proximally); M_3+CuA_1 terminate together in C; A_1 undulating, cell a_1 wide, A_1 and wing margin further apart proximally than distally; alula well-developed; halter brown.

Abdomen: brown and yellow; setation comprised of sparsely scattered short brown setae, surface entirely smooth; T1 brown, T2 brown with yellow anterior and posterior margin, T3–7 brown laterally and yellow medially; T1–3 sparsely brown setose; T predominantly apubescent; S1–7 light brown; S1–3 asetose; S predominantly apubescent; T2–4 parallel-sided and not constricted waist-like; bullae on T2 black, transversely elongate, surface entirely smooth, T2 surface anterior to bullae smooth.

Female genitalia: densely arranged anteriorly directed setae absent, only few on T7–8 and S7–8; T10 divided into 2 heavily sclerotised acanthophorite plates. Specimen not further dissected to preserve the unique, already damaged holotype.

Re-description male: male unknown.

Material examined: **South Africa:** Western Cape Province: 1♀ Montagu, 33°47'12"S 20°06'42"E, -.i.1876, R. Turner (holotype, SAMC).

Type locality, distribution, and biodiversity hotspot: Montagu (33°47'12"S 20°06'42"E), Western Cape, South Africa. Cape Floristic Region biodiversity hotspot.

Remarks: Although we were able to study some 131 specimens of *Ectyphus*, many of them new records since the last review by Hesse (1969), we were unable to identify any additional specimen of *E. abdominalis*. The unique female holotype is in poor condition and originates from a unique locality from where no other *Ectyphus* have ever been collected (Fig. 45). It is possible that this species represents another junior synonym of *E. pinguis* as this species, which is primarily known from the Eastern Cape, occurs even further west in the Western Cape than the type locality of *E. abdominalis* (see Remarks under *E. pinguis*). Only when male specimens from the type locality become available can the status of this species be confirmed.

***Ectyphus amboseli* sp. n.**

urn:lsid:zoobank.org:act:482F4960-9312-4110-ADF2-51402FC2642F

Figs 1, 3–4, 11–13

Etymology: Noun in apposition that refers to the type locality Amboseli Lodge, Kenya.

Diagnosis: The species is distinguished from congeners by the yellow colour and pubescence of the thorax (Fig. 3), the yellow abdominal sternites (Fig. 3), and its apparent distribution in Kenya (Fig. 1).

Description male: Head: brown, facial gibbosity yellow, in general grey pubescent; width distinctly greater than thorax, interocular distance on vertex larger than at ventral eye margin, vertex between compound eyes slightly depressed, parafacial area very narrow, facial gibbosity nearly touching median eye margin; facial gibbosity distinct, well-developed and discernible in lateral view; mystax white, covering entire facial gibbosity; frons entirely grey pubescent, vertex medially apubescent, laterally grey pubescent, postgena white pubescent; setation: vertex white, frons white, ocp setae white, pocl setae white; ocellar triangle apubescent; proboscis brown, short, about ½ length of oral cavity; labellum small, as wide as prementum, as long as prementum, unsclerotised laterally; maxillary palpus cylindrical, light brown, about ½ length of proboscis.

Antenna: brown, scape and pedicel white setose dorsally and ventrally; postpedicel cylindrical in proximal ½, symmetrically bulbous in distal ½, ≥ 6.0 times as long as combined length of scape and pedicel; apical ,seta-like' sensory element situated apically in cavity on postpedicel.

Thorax: yellow, predominantly yellow pubescent; scutum yellow, broad brown median presutural stripe and brown paramedial postsutural stripes, surface entirely smooth, predominantly yellow pubescent, paramedial and sublateral stripes apubescent, scutal setation comprised of distinct rows of short dorsocentral setae and lateral scutal setae; dc setae pre- and postsuturally white, acr setae absent, lateral scutal setae white, npl, spal, and pal setae absent; postpronotal lobe yellow, partly white pubescent; proepisternum, lateral postpronotum, and postpronotal lobe long white setose;

scutellum apubescent, asetose medially, laterally yellow setose, apical scutellar setae absent; mesopostnotum, anatergite, and katatergite silver pubescent, asetose; katatergite elevated and smoothly convex; anterior anepisternum asetose, supero-posterior anepisternum asetose; posterior anepimeron long white setose, katepimeron asetose; metepimeron evenly elevated, same colour as T1, silver pubescent, asetose; metepisternum silver pubescent, asetose.

Leg: yellow, setation predominantly white; pro, mes, and met coxa grey pubescent, white setose; met trochanter macrosetose medially; femur yellow, met femur evenly clubbed in distal $\frac{3}{4}$, in distal $\frac{1}{2}$ macrosetose, 1 antero-ventral and 1 postero-ventral row of macrosetae; pro, mes, and met tibia straight, met tibia cylindrical with distinct ventral keel terminating into a sharp spine; pro and mes tarsomere 1 longer than tarsomere 2, but less than combined length of tarsomeres 2–3, met tarsomere 1 as long as combined length of tarsomeres 2–3; pulvillus well-developed, as long as well-developed claw, and as wide as base of claw; empodium absent.

Wing: length = 9.8–10.3 mm; hyaline throughout, veins light brown, microtrichia absent; cells r_1 , r_4 , r_5 , m_3 , + *cup* closed; C well-developed, around entire wing; R_4 terminates in R_1 ; R_5 terminates in R_1 ; stump vein (R_3) at base of R_4 present, short not reaching R_2 ; R_4 and R_5 widest apart medially; r-m distinct, R_{4+5} and M_1 apart, connected by crossvein; M_1 straight at r-m (not curving anteriorly), M_1 (or M_1+M_2) terminates in C; CuA_1 and CuA_2 split proximally to m-cu (cell m_3 narrow proximally); M_3+CuA_1 terminate together in C; A_1 undulating, cell a_1 wide, A_1 and wing margin further apart proximally than distally; alula well-developed; halter light yellow.

Abdomen: brown and yellow; setation comprised of scattered white setae, surface entirely smooth; T1–7 brown, yellow posterior margin; T1 long white setose, T2–T3 sparsely white setose; T predominantly apubescent; S1–7 yellow; S1 asetose, S2–3 sparsely white setose; S predominantly apubescent; T2–4 parallel-sided and not constricted waist-like; bullae on T2 black, transversely elongate, surface entirely smooth, T2 surface anterior to bullae smooth.

Male terminalia: T1–7 well-developed, entirely sclerotised, T8 postero-medially weakly sclerotised, with anterior transverse sclerotised bridge connecting lateral sclerites; T7–8 anteriorly with 2 lateral apodemes; S6 regular, without any special setation postero-medially, S8 well-developed and simple, fused to T8 dorso-laterally, entire (undivided) ventro-medially; epandrium formed by single sclerite (fused medially \pm entirely), pointed postero-laterally; subepandrial sclerite without lateral or median protuberances; hypandrium \pm flat, rectangular to square sclerite, entirely fused with gonocoxite, forming a gonocoxite-hypandrial complex; gonocoxite dorso-ventrally flattened in distal $\frac{1}{2}$, higher in proximal $\frac{1}{2}$, with palp-like lateral appendage, gonocoxal apodeme present, short (at most slightly extending hypopygium anteriorly); 1 functional aedeagal prong, aedeagal epimere absent; lateral ejaculatory process absent; ejaculatory apodeme formed by single dorso-ventrally oriented plate; ventro-median margin of dorsal aedeagal sheath heavily sclerotised (appearing entirely closed); dorsal aedeagal sheath long, sperm sac entirely covered; sperm sac appearing \pm heavily sclerotised.

Description female: female unknown.

Material examined: Kenya: Rift Valley Province: 3♂ 1? Amboseli Lodge, 2°39'59"S 37°17'00"E, 28.ix.1972, W. Middlekauff (holotype AAM-000191, paratypes AAM-000190, AAM-000192–AAM-000193, CAS).

Type locality, distribution, and biodiversity hotspot: Amboseli Lodge (2°39'59"S 37°17'00"E), Kenya. Does not occur in any currently recognised biodiversity hotspot.

Ectyphus armipes Bezzi, 1924

Figs 5–6, 14–16, 45

Ectyphus armipes Bezzi 1924: 196; Hesse 1969: 381; Wilcox and Papavero 1971: 59; Bowden 1980: 326.

Diagnosis: The species is distinguished from congeners by the long proboscis that is slightly longer than the oral cavity, the large labellum that occupies nearly the entire oral cavity, brown facial gibbosity and postpronotal lobe, and the dorso-ventrally flattened ‘palp-like’ appendage on the gonocoxite in males.

Re-description male: black, facial gibbosity light brown, in general predominantly apubescent, yellow pubescent on median eye margin; width distinctly greater than thorax, interocular distance on vertex larger than at ventral eye margin, vertex between compound eyes slightly depressed, parafacial area very narrow, facial gibbosity nearly touching median eye margin; facial gibbosity distinct, well-developed and discernible in lateral view; mystax white, covering entire facial gibbosity, sparse; frons predominantly apubescent, vertex apubescent, postgena lightly silver pubescent; setation: vertex white, frons white, ocp setae white, pocl setae white; ocellar triangle apubescent; proboscis light brown, long, reaching fronto-clypeal suture; labellum large, much wider than prementum, longer than prementum and as long as oral cavity, unsclerotised laterally; maxillary palpus cylindrical, light brown, about ½ length of proboscis.

Antenna: brown, scape and pedicel white and yellow setose dorsally and ventrally; postpedicel cylindrical in proximal ½, symmetrically bulbous in distal ½, ≥ 6.0 times as long as combined length of scape and pedicel; apical ‘seta-like’ sensory element situated apically in cavity on postpedicel.

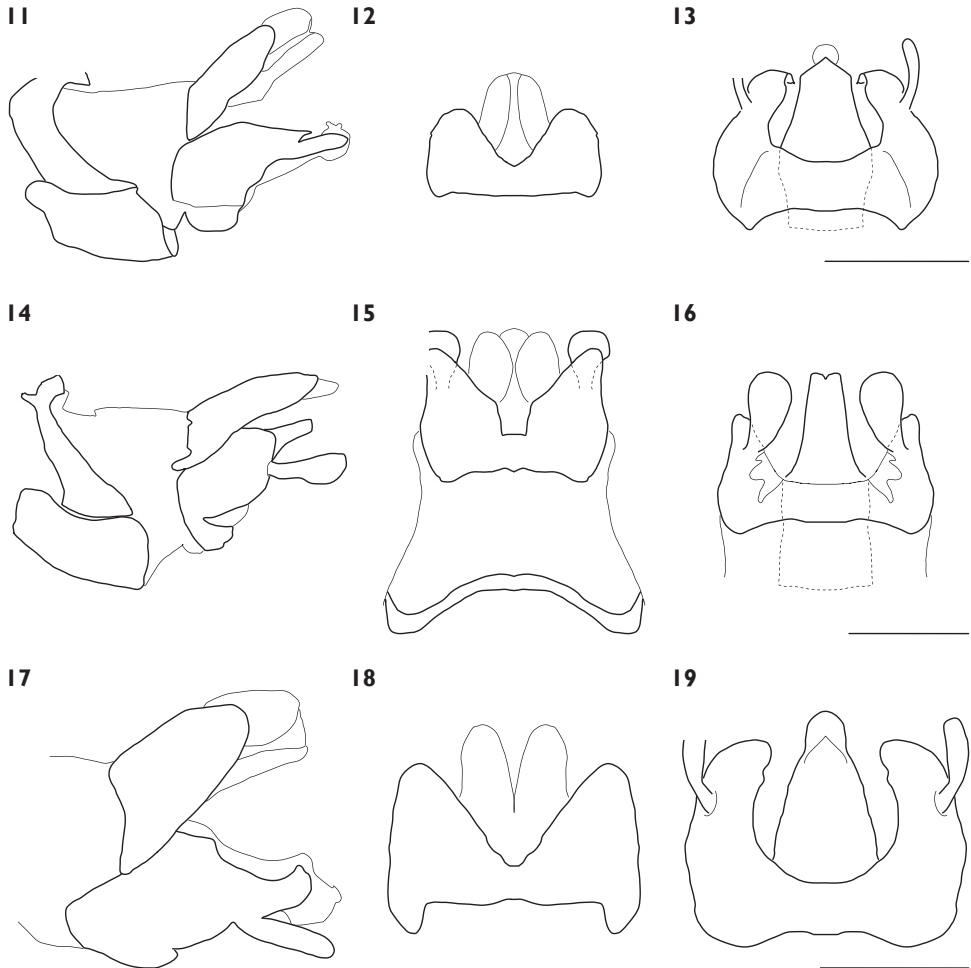
Thorax: dark brown to bluish-black, predominantly apubescent; scutum medially dark brown, laterally brown, surface entirely smooth, predominantly apubescent, only extreme lateral margin grey pubescent, scutal setation comprised of distinct rows of short dorsocentral setae and lateral scutal setae; dc setae pre- and postsuturally white, acr setae absent, lateral scutal setae white, npl, spal, and pal setae absent; postpronotal lobe light brown, partly silver pubescent; proepisternum, lateral postpronotum, and postpronotal lobe long white setose; scutellum apubescent, asetose medially, laterally yellow setose, apical scutellar setae absent; mesopostnotum, anatergite, and katatergite silver pubescent, asetose; katatergite elevated and smoothly convex; anterior anepisternum



Figures 6–10. Photographs of *Ectyphus* species. **6** *E. armipes* (♀ paratype, SAMC, [Morphbank](#)); **7–8** *E. capillatus* (♂, AAM-003502, AMGS) **7** dorsal ([Morphbank](#)) **8** lateral ([Morphbank](#)) **9** *E. pretoriensis* (♂ lectotype, SAMC, [Morphbank](#)) **10** *E. pretoriensis* (♀ paralectotype, SAMC, [Morphbank](#)). Scale lines = 5 mm.

num asetose, supero-posterior anepisternum asetose; posterior anepimeron long white setose, katepimeron asetose; metepimeron evenly elevated, same colour as T1, silver pubescent, asetose; metepisternum silver pubescent, asetose.

Leg: brown, setation predominantly white; pro, mes, and met coxa apubescent, long white setose; met trochanter macrosetose medially; femur brown, met femur evenly clubbed in distal $\frac{3}{4}$, in distal $\frac{1}{2}$ macrosetose, 1 antero-ventral and 1 postero-ventral row of macrosetae; pro, mes, and met tibia straight, met tibia cylindrical with distinct ventral keel terminating into a sharp spine; pro and mes tarsomere 1 as long as combined length of tarsomeres 2–3, met tarsomere 1 as long as combined length of tarsomeres 2–4; pulvillus well-developed, as long as well-developed claw, and as wide as base of claw; empodium absent.



Figures 11–19. Male terminalia of *Ectyphus* species. **11–13.** *E. amboseli* sp. n. **11** lateral **12** dorsal **13** ventral; **14–16** *E. armipes* **14** lateral **15** dorsal **16** ventral; **17–19** *E. capillatus* **17** lateral **18** dorsal **19** ventral. Scale lines = 1 mm.

Wing: length = 12.2–14.1 mm; slightly brown stained, darker brown around veins, veins light brown, microtrichia absent; cells r_1 , r_4 , r_5 , m_3 , + $cu\phi$ closed; C well-developed, around entire wing; R_4 terminates in R_1 ; R_5 terminates in R_1 ; stump vein (R_3) at base of R_4 present, long but not reaching R_2 ; R_4 and R_5 widest apart medially; r-m distinct, R_{4+5} and M_1 apart, connected by crossvein; M_1 straight at r-m (not curving anteriorly), M_1 (or M_1+M_2) terminates in C; CuA_1 and CuA_2 split proximally to m-cu (cell m_3 narrow proximally); M_3+CuA_1 terminate together in C; A_1 undulating, cell a_1 wide, A_1 and wing margin further apart proximally than distally; alula well-developed; halter light brown.

Abdomen: brown; setation comprised of scattered white setae, surface entirely smooth; T1 brown, T2–7 brown with yellow posterior margin; T1 long white setose,

T2–T3 sparsely white setose; T predominantly apubescent; S1–7 brown, yellow posterior margin; S1 asetose, S2–3 sparsely white setose; S predominantly apubescent; T2–4 parallel-sided and not constricted waist-like; bullae on T2 brown, transversely elongate, surface entirely smooth, T2 surface anterior to bullae smooth.

Male terminalia: T1–7 well-developed, entirely sclerotised, T8 postero-medially weakly sclerotised, with anterior transverse sclerotised bridge connecting lateral sclerites; T7–8 anteriorly with 2 lateral apodemes; S6 regular, without any special setation postero-medially, S8 well-developed and simple, fused to T8 dorso-laterally, entire (undivided) ventro-medially; epandrium formed by single sclerite (fused medially ± entirely), pointed postero-laterally; subepandrial sclerite without lateral or median protuberances; hypandrium ± flat, rectangular to square sclerite, entirely fused with gonocoxite, forming a gonocoxite-hypandrial complex; gonocoxite dorso-ventrally flattened in distal ½, higher in proximal ½, with palp-like lateral appendage, gonocoxal apodeme present, short (at most slightly extending hypopygium anteriorly); 1 functional aedeagal prong, aedeagal epimere absent; lateral ejaculatory process absent; ejaculatory apodeme formed by single dorso-ventrally oriented plate; ventro-median margin of dorsal aedeagal sheath heavily sclerotised (appearing entirely closed); dorsal aedeagal sheath long, sperm sac entirely covered; sperm sac appearing ± heavily sclerotised.

Re-description female: Head: proboscis brown; maxillary palpus brown.

Antenna: postpedicel ≥ 5.0 times as long as combined length of scape and pedicel.

Thorax: light brown, predominantly grey pubescent; scutum yellow, broad brown median presutural stripe and brown paramedial postsutural stripes; scutum lightly grey pubescent.

Leg: yellow; pro, mes, and met coxa grey pubescent, white setose; femur yellow.

Wing: length = 14.1–14.5 mm; hyaline throughout, slightly brown stained along veins.

Abdomen: T1–7 brown, yellow posterior margin; T1–3 sparsely white setose; S1–7 brown; bullae on T2 black, transversely elongate.

Female genitalia: densely arranged anteriorly directed setae absent, only few on T7–8 and S7–8; T8 with broad anterior rectangular apodeme; T9 formed by wide, rectangular sclerite with median protuberance; T9+10 entirely fused, T10 divided into 2 heavily sclerotised acanthophorite plates, 11 acanthophorite spurs per plate; 3 spermathecae, all equally large, formed by ± expanded weakly sclerotised ducts; individual spermathecal duct long; S9 (furca) formed by 2 sclerites, separated anteriorly and posteriorly, anterior furcal apodeme present, 2 lateral projections forming divided apodeme, lateral furcal apodeme absent, median furcal bridge absent.

Material examined: **South Africa:** KwaZulu-Natal: 1♂ St. Lucia Lake, 27°56'43"S 32°26'11"E, 4.xi.1920, H. Bell Marley (AAM-003454, NMSA); 1♀ 1♂ Mtunzini, 28°57'00"S 31°45'00"E, 1.xii.1980, R. Oberprieler (AAM-003490–AAM-003491, SANC); 2♂ Tongaat, 29°34'12"S 31°07'06"E, -.ix.1908, H. Burnup (AAM-003452–AAM-003453, NMSA); 1♂ Tongaat, -.1908–1909, H. Burnup (AAM-003476, BMNH); 1♀ 1♂ Tongaat River, 29°34'13"S 31°10'47"E, -.1908–1909, H. Burnup (AAM-003474–AAM-003475, BMNH); 2♀ Stella-bush (= Pigeon Valley Nature Reserve), 29°51'00"S 30°59'00"E, -.1915, H. Bell

Marley (AAM-003457–AAM-003458, NMSA); 1♀ 1♂ Stellabush (= Pigeon Valley Nature Reserve), -.i.1915, H. Bell Marley (holotype and paratype, SAMC); 1♀ Stellabush (= Pigeon Valley Nature Reserve), -.i.1915, H. Bell Marley (AAM-003511, SAMC); 5♂ Durban, 29°51'00"S 31°01'00"E, -.i-iii.1959, C. Booth (AAM-003513–AAM-003517, SAMC); 1♀ 1♂ Durban, 13.ii.1963, G. Heinrich (AAM-003483–AAM-003484, CNC); 1? Natal (= Durban), -.iv.1868, W. Saunders (AAM-003477, BMNH); 1♂ Natal (= Durban), -.i.1904, J. Gregoe (AAM-003480, BMNH); 1♂ Natal (= Durban), -.vii.1942, (AAM-003488, SAMC); 1♀ Port-Natal (= Durban), -.i., Plant (AAM-003479, BMNH); 1♂ Bluff, Durban, 29°53'00"S 31°03'00"E, 18.i.1904, C. Barker (AAM-003456, NMSA); 1♂ Amanzimtoti, 30°03'00"S 30°53'00"E, -.i.1950, (AAM-003455, NMSA); 1♀ Widenham, 30°12'57"S 30°47'47"E, 2.i.1915, E. Chubb (AAM-003481, BMNH); 1♂ Widenham, 20.xii.1914, (AAM-003512, SAMC); **No locality information:** 1♂, Plant (AAM-003478, BMNH); 1♀ (AAM-003482, BMNH).

Type locality, distribution, and biodiversity hotspot: Stellabush (now Pigeon Valley Nature Reserve, 29°51'51"S 30°59'13"E), Durban, KwaZulu-Natal, South Africa. Maputaland-Pondoland-Albany biodiversity hotspot.

Remarks: Three specimens, two from Tongaat River (AAM-003474–AAM-003475) and one from Tongaat (AAM-003476), all collected in 1908–1909 exhibit a long stump vein (R_3) entirely connecting veins R_2 and R_4 (e.g., Fig. 38). The presence of this connecting stump vein is otherwise only known from and diagnostic for the genus *Parectyphus* (see below). *Ectyphus armipes*, however, does not show any of the other diagnostic features of *Parectyphus* and the male terminalia exhibit the usual *Ectyphus* configuration so that we view the presence of this stump vein as a morphological anomaly.

Ectyphus capillatus Hesse, 1969

Figs 7–8, 17–19, 45

Ectyphus capillatus Hesse 1969: 376; Bowden 1980: 326.

Diagnosis: The species is distinguished from congeners by the yellow facial gibbosity, the distinctly yellow metepimeron, and the dense and long white setae on abdominal tergites 5–7.

Re-description male: Head: black, facial gibbosity yellow, in general lightly silver pubescent; width distinctly greater than thorax, interocular distance on vertex larger than at ventral eye margin, vertex between compound eyes slightly depressed, parafacial area very narrow, facial gibbosity nearly touching median eye margin; facial gibbosity distinct, well-developed and discernible in lateral view; mystax white, covering only lateral facial gibbosity (asetose medially); frons medially apubescent, laterally grey pubescent, vertex predominantly apubescent, only lateral margin grey pubescent, postgena lightly silver pubescent; setation: vertex white, frons white, ocp setae white, pocl

setae white; ocellar triangle apubescent; proboscis brown, short, about $\frac{1}{2}$ length of oral cavity; labellum small, as wide as prementum, as long as prementum, unsclerotised laterally; maxillary palpus cylindrical, brown, longer than $\frac{1}{2}$ length of proboscis.

Antenna: brown, scape and pedicel white and yellow setose dorsally and ventrally; postpedicel cylindrical in proximal $\frac{1}{2}$, symmetrically bulbous in distal $\frac{1}{2}$, ≥ 7.0 times as long as combined length of scape and pedicel; apical 'seta-like' sensory element situated apically in cavity on postpedicel.

Thorax: brown, lightly grey pubescent; scutum yellow, broad brown median presutural stripe and brown paramedial postsutural stripes, surface entirely smooth, predominantly yellow pubescent, paramedial and sublateral stripes apubescent, scutal setation comprised of distinct rows of long dorsocentral setae and lateral scutal setae; dc setae pre- and postsuturally light brown, acr setae absent, lateral scutal setae white, npl, spal, and pal setae absent; postpronotal lobe yellow, partly white pubescent; proepisternum, lateral postpronotum, and postpronotal lobe long white setose; scutellum apubescent, asetose, apical scutellar setae absent; mesopostnotum, anatergite, and katatergite grey pubescent, asetose; katatergite elevated and smoothly convex; anterior anepisternum asetose, supero-posterior anepisternum asetose; posterior anepimeron long white setose, katepimeron asetose; metepimeron evenly elevated, yellow, lightly silver pubescent, asetose; metepisternum silver pubescent, asetose.

Leg: light brown, setation predominantly white; pro, mes, and met coxa apubescent, long white setose; met trochanter macrosetose medially; femur light brown, met femur evenly clubbed in distal $\frac{3}{4}$, in distal $\frac{1}{2}$ macrosetose, 1 antero-ventral and 1 postero-ventral row of macrosetae; pro, mes, and met tibia straight, met tibia cylindrical with distinct ventral keel terminating into a sharp spine; pro and mes tarsomere 1 longer than tarsomere 2, but less than combined length of tarsomeres 2–3, met tarsomere 1 as long as combined length of tarsomeres 2–3; pulvillus well-developed, as long as well-developed claw, and as wide as base of claw; empodium absent.

Wing: length = 10.7–13.1 mm; hyaline throughout, slightly brown stained along veins, veins light brown, microtrichia absent; cells r_1 , r_4 , r_5 , m_3 , + $cu\bar{p}$ closed; C well-developed, around entire wing; R_4 terminates in R_1 ; R_5 terminates in R_1 ; stump vein (R_3) at base of R_4 present, long but not reaching R_2 ; R_4 and R_5 widest apart medially; r-m distinct, R_{4+5} and M_1 apart, connected by crossvein; M_1 straight at r-m (not curving anteriorly), M_1 (or M_1+M_2) terminates in C; CuA_1 and CuA_2 split proximally to m-cu (cell m_3 narrow proximally); M_3+CuA_1 terminate together in C; A_1 undulating, cell a_1 wide, A_1 and wing margin further apart proximally than distally; alula well-developed; halter light yellow.

Abdomen: brown; setation comprised of dense long white setose, surface microrugose; T1 brown, T2–7 brown with yellow posterior margin broadly interrupted medially; T1–3 densely long white setose; T entirely grey pubescent; S1 light brown, S2–5 yellow, brown anteriorly, S6–7 brown with yellow posterior margin; S1 asetose, S2–3 sparsely white setose; S predominantly apubescent; T2–4 parallel-sided and not constricted waist-like; bullae on T2 black, transversely elongate, surface entirely smooth, T2 surface anterior to bullae smooth.

Male terminalia: T1–7 well-developed, entirely sclerotised, T8 postero-medially weakly sclerotised, with anterior transverse sclerotised bridge connecting lateral sclerites; T7–8 anteriorly with 2 lateral apodemes; S6 regular, without any special setation postero-medially, S8 well-developed and simple, fused to T8 dorso-laterally, entire (undivided) ventro-medially; epandrium formed by single sclerite (fused medially \pm entirely), rounded postero-laterally; subepandrial sclerite without lateral or median protuberances; hypandrium \pm flat, rectangular to square sclerite, entirely fused with gonocoxite, forming a gonocoxite-hypandrial complex; gonocoxite dorso-ventrally flattened in distal $\frac{1}{2}$, higher in proximal $\frac{1}{2}$, with palp-like lateral appendage, gonocoxal apodeme present, short (at most slightly extending hypopygium anteriorly); 1 functional aedeagal prong, aedeagal epimere absent; lateral ejaculatory process absent; ejaculatory apodeme formed by single dorso-ventrally oriented plate; ventro-median margin of dorsal aedeagal sheath heavily sclerotised (appearing entirely closed); dorsal aedeagal sheath long, sperm sac entirely covered; sperm sac appearing \pm heavily sclerotised.

Description female: female unknown.

Material examined: South Africa: Eastern Cape Province: 1♂ Double Drift, Andries Vosloo Kudu Reserve, 33°06'00"S 26°47'00"E, 14.xii.1988, A. Weaving (AAM-003502, AMGS); 1♂ Resolution, 33°10'00"S 26°37'00"E, 4.i.1928, A. Walton (paratype, NMSA); 1♂ Brakkloof, 33°12'00"S 26°50'00"E, --.1907, G. White (holotype, SAMC).

Type locality, distribution, and biodiversity hotspot: Brakkloof (33°12'00"S 026°50'00"E), Eastern Cape, South Africa. Maputaland-Pondoland-Albany biodiversity hotspot.

Remarks: The ♂ paratype specimen was collected at Resolution, which is also the type locality of *Ectyphus bitaeniatus* Hesse, 1969 (synonymised with *Ectyphus pinguis* below). *Ectyphus bitaeniatus* is known from the ♀ holotype only. Although both specimens from Resolution were collected by the same collector (A. Walton), the specimens originate from separate collecting events although during the same summer of 1927–1928 and were collected only some 12 days apart. Hesse (1969: 377) mistakenly lists the *E. capillatus* paratype to be collected in January 1924 while the label indicates January 1928 (B. Muller pers. comm.). As *E. capillatus* is still only known in the ♂ sex and no other species of *Ectyphus* has ever been collected at Resolution, it is possible that *E. bitaeniatus* represents the ♀ of *E. capillatus*. Until more specimens from this area north-east of Grahamstown, in which all three collecting localities of *E. capillatus* are situated, become available we cannot definitely provide confirmation of the possible synonymy. *E. capillatus* would take priority by page number.

***Ectyphus pinguis* Gerstaecker, 1868**

Figs 20–22, 29, 31–37, 45

Ectyphus pinguis Gerstaecker 1868: 92; Bezzi 1924: 196; Hesse 1969: 369; Bowden 1980: 326.

Ectyphus pinguis var. *litoralis* Hesse 1969: 372. unavailable name

Ectyphus pinguis var. *karooensis* Hesse 1969: 374. unavailable name

Ectyphus pinguis var. *ceramiiformis* Hesse 1969: 375. unavailable name

Ectyphus bitaeniatus Hesse 1969: 380. syn. n.

Ectyphus flavidorsalis Hesse 1969: 378. syn. n.

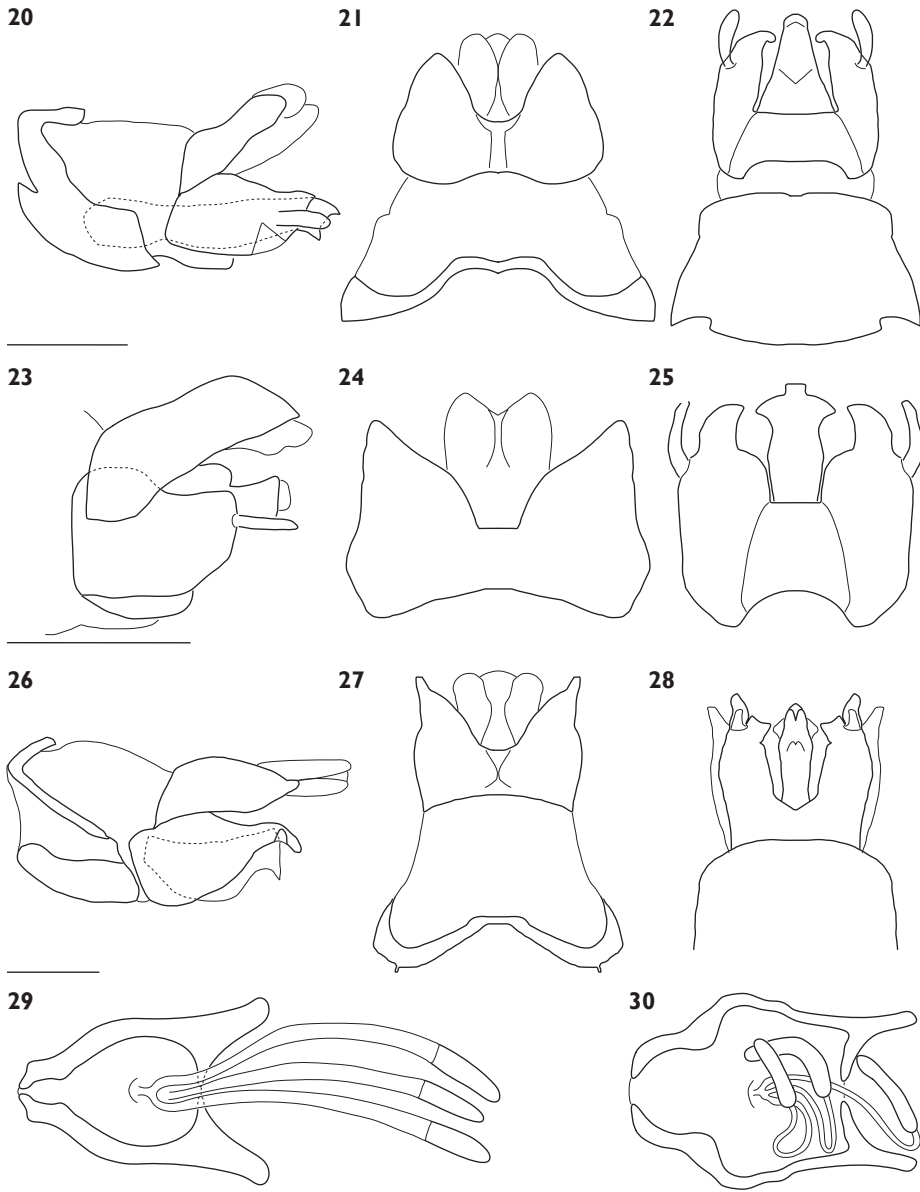
Diagnosis: The species is distinguished from congeners by the enlarged yellow facial gibbosity, the yellow posterior margin of the abdominal tergites that are widened laterally and interrupted medially, and the distinctly yellow metepimeron.

Re-description male: Head: black, facial gibbosity yellow, in general lightly silver pubescent; width distinctly greater than thorax, interocular distance on vertex larger than at ventral eye margin, vertex between compound eyes slightly depressed, parafacial area very narrow, facial gibbosity nearly touching median eye margin; facial gibbosity distinct, well-developed and discernible in lateral view; mystax white, covering only lateral facial gibbosity (asetose medially); frons medially apubescent, laterally grey pubescent, vertex apubescent, postgena lightly silver pubescent; setation: vertex white, frons white, ocp setae white, pocl setae white; ocellar triangle apubescent; proboscis light brown, short, about $\frac{1}{2}$ length of oral cavity; labellum small, as wide as prementum, as long as prementum, unsclerotised laterally; maxillary palpus cylindrical, brown, longer than $\frac{1}{2}$ length of proboscis.

Antenna: brown, scape and pedicel white and yellow setose dorsally and ventrally; postpedicel cylindrical in proximal $\frac{1}{2}$, symmetrically bulbous in distal $\frac{1}{2}$, ≥ 8.0 times as long as combined length of scape and pedicel; apical 'seta-like' sensory element situated apically in cavity on postpedicel.

Thorax: dark brown to bluish-black, predominantly grey pubescent; scutum medially brown, laterally dark yellow, surface entirely smooth, lightly grey pubescent, scutal setation comprised of distinct rows of short dorsocentral setae and lateral scutal setae; dc setae pre- and postsuturally white, acr setae absent, lateral scutal setae white, npl, spal, and pal setae absent; postpronotal lobe yellow, partly white pubescent; proepisternum, lateral postpronotum, and postpronotal lobe long white setose; scutellum apubescent, asetose medially, laterally yellow setose, apical scutellar setae absent; mesopostnotum, anatergite, and katatergite silver pubescent, asetose; katatergite elevated and smoothly convex; anterior anepisternum asetose, supero-posterior anepisternum asetose; posterior anepimeron long white setose, katepimeron asetose; metepimeron evenly elevated, yellow, lightly silver pubescent, asetose; metepisternum silver pubescent, asetose.

Leg: light brown, setation predominantly white; pro, mes, and met coxa apubescent, long white setose; met trochanter macrosetose medially; femur brown, met femur evenly clubbed in distal $\frac{3}{4}$, in distal $\frac{1}{2}$ macrosetose, 1 antero-ventral and 1 postero-ventral row of macrosetae; pro, mes, and met tibia straight, met tibia cylindrical with distinct ventral keel terminating into a sharp spine; pro and mes tarsomere 1 longer than tarsomere 2, but less than combined length of tarsomeres 2–3, met tarsomere 1 as long as combined length of tarsomeres 2–3; pulvillus well-developed, as long as well-developed claw, and as wide as base of claw; empodium absent.



Figures 20–30. Male terminalia and female genitalia of *Ectyphus* and *Parectyphus* species. Male terminalia: **20–22** *E. pinguis* **20** lateral **21** dorsal **22** ventral; **23–25** *E. pretoriensis* **23** lateral **24** dorsal **25** ventral; **26–28** *P. namibiensis* **26** lateral **27** dorsal **28** ventral; Female genitalia in dorsal view: **29** *E. pinguis* **30** *P. namibiensis*. Scale lines = 1 mm.

Wing: length = 10.2–13.3(–14.2) mm; hyaline throughout, slightly brown stained along veins, veins light brown, microtrichia absent; cells r_1 , r_4 , r_5 , m_3 , + *cup* closed; C well-developed, around entire wing; R_4 terminates in R_1 ; R_5 terminates in R_1 ; stump vein (R_3) at base of R_4 present, long but not reaching R_2 ; R_4 and R_5 widest apart medi-

ally; r-m distinct, R_{4+5} and M_1 apart, connected by crossvein; M_1 straight at r-m (not curving anteriorly), M_1 (or M_1+M_2) terminates in C; CuA_1 and CuA_2 split proximally to m-cu (cell m_3 narrow proximally); M_3+CuA_1 terminate together in C; A_1 undulating, cell a_1 wide, A_1 and wing margin further apart proximally than distally; alula well-developed; halter light yellow.

Abdomen: brown; setation comprised of scattered white setae, surface entirely smooth; T1 brown, narrow yellow posterior margin, T2–7 brown, broad yellow posterior margin, expanding antero-laterally particularly on T2–3; T1 long white setose, T2–3 sparsely white setose; T predominantly apubescent; S1 yellow, S2–7 yellow with brown areas medially and laterally; S1–3 asetose; S predominantly apubescent; T2–4 parallel-sided and not constricted waist-like; bullae on T2 black, transversely elongate, surface entirely smooth, T2 surface anterior to bullae smooth.

Male terminalia: T1–7 well-developed, entirely sclerotised, T8 postero-medially weakly sclerotised, with anterior transverse sclerotised bridge connecting lateral sclerites; T7–8 anteriorly with 2 lateral apodemes; S6 regular, without any special setation postero-medially, S8 well-developed and simple, fused to T8 dorso-laterally, entire (undivided) ventro-medially; epandrium formed by single sclerite (fused medially \pm entirely), pointed postero-laterally; subepandrial sclerite without lateral or median protuberances; hypandrium \pm flat, rectangular to square sclerite, entirely fused with gonocoxite, forming a gonocoxite-hypandrial complex; gonocoxite dorso-ventrally flattened in distal $\frac{1}{2}$, higher in proximal $\frac{1}{2}$, with palp-like lateral appendage, gonocoxal apodeme present, short (at most slightly extending hypopygium anteriorly); 1 functional aedeagal prong, aedeagal epimere absent; lateral ejaculatory process absent; ejaculatory apodeme formed by single dorso-ventrally oriented plate; ventro-median margin of dorsal aedeagal sheath heavily sclerotised (appearing entirely closed); dorsal aedeagal sheath long, sperm sac entirely covered; sperm sac appearing \pm heavily sclerotised.

Re-description female: Head: brown, facial gibbosity yellow; mystax white, sparse short setae covering entire facial gibbosity; vertex predominantly apubescent, only lateral margin grey pubescent; maxillary palpus light brown.

Thorax: brown; scutum surface entirely smooth, scutal setation comprised of distinct rows of long dorsocentral setae and lateral scutal setae.

Leg: femur light brown.

Wing: length = 12.0–13.7 mm.

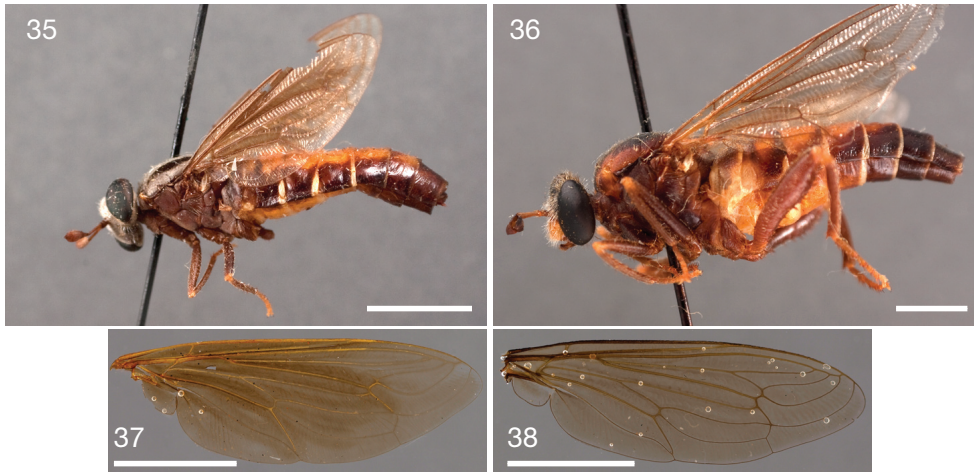
Female genitalia: densely arranged anteriorly directed setae absent, only few on T7–8 and S7–8; T8 with broad anterior rectangular apodeme; T9 formed by wide, rectangular sclerite with median protuberance; T9+10 entirely fused, T10 divided into 2 heavily sclerotised acanthoporphite plates, 11 acanthoporphite spurs per plate; 3 spermathecae, all equally large, formed by \pm expanded weakly sclerotised ducts; individual spermathecal duct long; S9 (furca) formed by 2 sclerites, separated anteriorly and posteriorly, anterior furcal apodeme present, 2 lateral projections forming divided apodeme, lateral furcal apodeme absent, median furcal bridge absent.

Material examined: South Africa: 1♂, 'Africa australis', Drège (lectotype, ZMHB); 1F, Capland', Drège (paralectotype, ZMHB); Eastern Cape Province: 1♂ Cuylerville,



Figures 31–34. Photographs of *Ectyphus pinguis* specimens. **31** *E. pinguis* (♂, AAM-003496, AMGS, [Morphbank](#)) **32** *E. pinguis* (♂, AAM-003487, SAMC, [Morphbank](#)) **33** *E. pinguis* (♀, AAM-003509, SAMC, [Morphbank](#)) **34** *E. pinguis* (♂ holotype *E. pinguis* var. *ceramiiformis*, NMSA, [Morphbank](#)). Scale lines = 5 mm.

31°47'00"S 26°56'00"E, 20.xii.1920, H. Cronwright (AAM-003522, SAMC); 1♀ Resolution, 33°10'00"S 26°37'00"E, 23.xii.1927, A. Walton (holotype *Ectyphus bitaeniatus*, NMSA); 1♂ Willowmore, 33°17'00"S 23°29'00"E, ---, J. Brauns (holotype *Ectyphus pinguis* var. *ceramiiformis*, NMSA); 2♂ Willowmore, ---, J. Brauns (holotype and paratype *Ectyphus pinguis* var. *karooensis*, NMSA); 1♀ Willowmore, ---, J. Brauns (AAM-003492, USNM); 1♀ Willowmore, 20.xii.1909, J. Brauns (paratype *Ectyphus flavidorsalis*, NMSA); 1♀ Albany District, 33°24'00"S 26°32'00"E, -.xii.1949, R. Phillips (AAM-003473, BMNH); 1♀ Georgida, 33°27'00"S 23°17'00"E, 5.i.1927, J. Brauns (holotype *Ectyphus flavidorsalis*, NMSA); 1♀ 1♂ Dunbrody, 33°28'00"S 25°33'00"E, -.1897, O'Neil (AAM-003509–AAM-003510, SAMC); 1♂ Kleinemonde, 33°31'39"S 27°03'00"E, ---, J. Cooper (AAM-003487, SAMC); 2♂ Kleinemonde, -.i.1891, M. White (AAM-003520–AAM-003521, SAMC); 1♀ Port Alfred, 33°36'00"S 26°54'00"E, 17.ii.1955, F. Junor (paratype *Ectyphus pinguis* var. *litoralis*, SAMC); 1♂ Port Alfred, 9.i.1971, J. Londt (AAM-003503, AMGS); 1♀ Port Alfred (AAM-003508, SAMC); 1♀ 2♂ Riet River mouth, 33°36'00"S 26°54'00"E, 17.xii.1971, D. Greathead (AAM-003470–AAM-003472, BMNH); 1♀ 3♂ Rietrivier mouth, near Port Alfred, 17.xii.1974, F. Gess (AAM-003493–AAM-003496, AMGS); 5♂ Rietrivier mouth, near Port Alfred, 29.xii.1973, F. Gess (AAM-003497–AAM-003501, AMGS); 2♂ Algoa Bay, 33°41'34"S 25°56'39"E, 15.xii.1892, J. Brauns



Figures 35–38. Photographs of *Ectyphus pinguis* specimens and wings of *E. pinguis* and *P. namibiensis*. **35** *E. pinguis* (♀ holotype *E. bitaeniatus*, NMSA, [Morphbank](#)) **36** *E. pinguis* (♀ holotype *E. flavidorsalis*, NMSA, [Morphbank](#)); Wings **37** *E. pinguis* (AAM-003463, NMSA, [Morphbank](#)) **38** *P. namibiensis* (AAM-003506, NMNW, [Morphbank](#)). Scale lines = 5 mm.

(ZSMC); 2♀ 2♂ Swartkops, Algoa Bay, 33°51'49"S 25°36'06"E, 25.xi.1921, J. Brauns (AAM-003447, AAM-003459–AAM-003461, NMSA); 1♂ Swartkops, Algoa Bay, 25.xi.1921, J. Brauns (AAM-003466, MZLU); 1♂ Swartkops, Algoa Bay, -.i.1919, B. Krüger (DEIC); 3♀ Swartkops, Port Elizabeth, 20.xi.1919, B. Krüger (AAM-003448, AAM-003462–AAM-03463, NMSA); 1♀ Swartkops, Port Elizabeth, -.ii.1919, B. Krüger (AAM-003465, NMSA); 1♂ Swartkops, Port Elizabeth, 25.xi.1919, B. Krüger (AAM-003464, NMSA); 1♀ 1♂ Swartkops, Port Elizabeth, 25.xi.1919, B. Krüger (AAM-003467–AAM-003468, ISNB); 4♀ 6♂ Gamtoos River Mouth, Papiesfontein, 33°57'47"S 25°01'46"E, -.i.1960, SAM Museum Staff (paratype *Ectyphus pinguis* var. *litoralis*, SAMC); 1♂ Van Staden's River Mouth, 33°58'00"S 25°13'00"E, -.i.1960, SAM Museum Staff (paratype *Ectyphus pinguis* var. *litoralis*, SAMC); 1♀ 1♂ Port Elizabeth, 33°58'00"S 25°35'00"E, 1.ii.1950, A. Brown (AAM-003450–AAM-003451, NMSA); 1♀ Port Elizabeth, 1.i.1971, M. Strydom (AAM-003034, SANC); 2♀ 3♂ Port Elizabeth, Cape Recife area, 34°01'14"S 25°40'60"E, 22–27.xii.1985, J. Londt (AAM-003442–AAM-003446, NMSA); 1♂ Jeffrey's Bay, Humansdorp, 34°02'00"S 24°46'00"E, 23.xii.1922, J. Brauns (AAM-003469, BMNH); 1♀ The Willows, Port Elizabeth, 34°02'00"S 25°36'00"E, 28.xii.1970, M. Strydom (AAM-003489, SANC); 1♂ Jeffrey's Bay, 34°03'00"S 24°55'00"E, 19.xii.1922, (DEIC); 9♀ 3♂ Jeffrey's Bay, -.i.1960, SAM Museum Staff (holotype and paratype *Ectyphus pinguis* var. *litoralis*, SAMC); 1♀ 1♂ Jeffrey's Bay, -.i.1960, SAM Museum Staff (paratype *Ectyphus pinguis* var. *litoralis*, ISNB); 1♀ 1♂ Jeffrey's Bay, -.i.1960, SAM Museum Staff (paratype *Ectyphus pinguis* var. *litoralis*, ISNB); Western Cape Province: 1♀ Tulbagh, 33°17'00"S 19°09'00"E, 10.xii.1924, J. Brauns (AAM-003449, NMSA); 1♂ 'Cape of Good Hope', 33°48'03"S 19°00'36"E, -.i.1835, J. Verreaux (MNHN).

Type locality, distribution, and biodiversity hotspots: The original type locality is ‚Africa australis‘ (South Africa). Following recommendation 76A.1.4. of the *International Code of Zoological Nomenclature* (4th edition) a new type locality is selected from within the range of the species. We hereby designate the Riet River mouth (33°36'00"S 026°54'00"E), near Port Alfred, Eastern Cape, South Africa as the new type locality. Cape Floristic Region and Maputaland-Pondoland-Albany biodiversity hotspots.

Remarks: Specimens identified as belonging to the three varieties of *E. pinguis* were examined, including a large series of paratypes of *E. pinguis* var. *litoralis*. These specimens were determined to represent colour and vestiture variation in *E. pinguis*, rather than belonging to distinct subspecies. The three names, *Ectyphus pinguis* var. *litoralis*, *Ectyphus pinguis* var. *karooensis*, and *Ectyphus pinguis* var. *ceramiiformis*, were proposed by Hesse to delimit infrasubspecific entities. Because these names were never adopted as valid for a species or subspecies, as was already pointed out by Bowden (1980: 326), the names are unavailable following the *International Code of Zoological Nomenclature* (4th edition, Article 45.6.4. and 45.6.4.1.). The unique female holotype of *E. bitaeniatus* and the two female type specimens of *E. flavidorsalis* were also examined. These specimens represent *E. pinguis* in our view and are here synonymised with this species. Similar colour variation as exhibited by these two species was observed in female specimens of *E. pinguis* and therefore does not characterise distinct species. Hesse (1969: 372) mentioned the ♀ specimen from Tulbagh in the Western Cape as probably being mislabelled. We have studied the specimen and agree with his identification as *E. pinguis*, but cannot add any information whether the locality is correct or not. This locality is far removed from any other locality in the eastern Western Cape and in the western Eastern Cape provinces (Fig. 45).

***Ectyphus pretoriensis* (Bezzi, 1924)**

Figs 9–10, 23–25, 45

Ectyphus pretoriensis (Bezzi, 1924) Hesse 1969: 377; Bowden 1980: 326.

Ectyphus armipes subsp. *pretoriensis* Bezzi 1924: 197.

Diagnosis: The species is distinguished from congeners by the brown metepimeron, the white setation on the head and scutum, the narrow posterior yellow margin on abdominal tergites, and its apparent distribution in Pretoria.

Re-description male: Head: black, facial gibbosity light brown, in general lightly silver pubescent; width distinctly greater than thorax, interocular distance on vertex larger than at ventral eye margin, vertex between compound eyes slightly depressed, parafacial area very narrow, facial gibbosity nearly touching median eye margin; facial gibbosity distinct, well-developed and discernible in lateral view; mystax white, covering entire facial gibbosity; frons entirely grey pubescent, vertex medially apubescent, laterally silver pubescent, postgena lightly silver pubescent; setation: vertex white, frons white, ocp setae white, pocl setae white; ocellar triangle apubescent; proboscis brown,

short, about $\frac{1}{2}$ length of oral cavity; labellum small, as wide as prementum, about $\frac{3}{4}$ length of prementum, unsclerotised laterally; maxillary palpus cylindrical, light brown, longer than $\frac{1}{2}$ length of proboscis.

Antenna: brown, scape and pedicel white setose dorsally and ventrally; postpedicel cylindrical in proximal $\frac{1}{2}$, symmetrically bulbous in distal $\frac{1}{2}$, ≥ 5.0 times as long as combined length of scape and pedicel; apical 'seta-like' sensory element situated apically in cavity on postpedicel.

Thorax: brown, lightly grey pubescent; scutum medially dark brown, laterally brown, surface entirely smooth, lightly grey pubescent, scutal setation comprised of distinct rows of long dorsocentral setae and lateral scutal setae; dc setae pre- and post-suturally white, acr setae absent, lateral scutal setae white, npl, spal, and pal setae absent; postpronotal lobe light brown, grey pubescent; proepisternum, lateral postpronotum, and postpronotal lobe long white setose; scutellum lightly grey pubescent, long white setose, apical scutellar setae present; mesopostnotum, anatergite, and katatergite silver pubescent, asetose; katatergite elevated and smoothly convex; anterior anepisternum asetose, supero-posterior anepisternum asetose; posterior anepimeron long white setose, katepimeron asetose; metepimeron evenly elevated, same colour as T1, lightly silver pubescent, asetose; metepisternum silver pubescent, asetose.

Leg: light brown, setation predominantly white; pro, mes, and met coxa grey pubescent, white setose; met trochanter macrosetose medially; femur light brown, met femur evenly clubbed in distal $\frac{3}{4}$, in distal $\frac{1}{2}$ macrosetose, 1 antero-ventral and 1 postero-ventral row of macrosetae; pro, mes, and met tibia straight, met tibia cylindrical with distinct ventral keel terminating into a sharp spine; pro and mes tarsomere 1 as long as combined length of tarsomeres 2–3, met tarsomere 1 as long as combined length of tarsomeres 2–3; pulvillus well-developed, as long as well-developed claw, and as wide as base of claw; empodium absent.

Wing: length = 11.6 mm; hyaline throughout, veins light brown, microtrichia absent; cells r_1 , r_4 , r_5 , m_3 , + *cup* closed; C well-developed, around entire wing; R_4 terminates in R_1 ; R_5 terminates in R_1 ; stump vein (R_3) at base of R_4 present, short not reaching R_2 ; R_4 and R_5 widest apart medially; r-m distinct, R_{4+5} and M_1 apart, connected by crossvein; M_1 straight at r-m (not curving anteriorly), M_1 (or M_1+M_2) terminates in C; CuA_1 and CuA_2 split proximally to m-cu (cell m_3 narrow proximally); M_3+CuA_1 terminate together in C; A_1 undulating, cell a_1 wide, A_1 and wing margin further apart proximally than distally; alula well-developed; halter light brown.

Abdomen: brown; setation comprised of scattered white setae, surface entirely smooth; T1–7 brown with narrow light brown to dark yellow posterior margin; T1 long white setose, T2–3 sparsely white setose; T1–4 anteriorly lightly grey pubescent, T5–7 apubescent; S1 yellow, S2–7 brown with light brown posterior margin; S1 asetose, S2–3 sparsely white setose; S predominantly apubescent; T2–4 parallel-sided and not constricted waist-like; bullae on T2 brown, transversely elongate, surface entirely smooth, T2 surface anterior to bullae smooth.

Male terminalia: T1–7 well-developed, entirely sclerotised, T8 postero-medially weakly sclerotised, with anterior transverse sclerotised bridge connecting lateral scler-

rites; T7–8 anteriorly with 2 lateral apodemes; S6 regular, without any special setation postero-medially, S8 well-developed and simple, fused to T8 dorso-laterally, entire (undivided) ventro-medially; epandrium formed by single sclerite (fused medially ± entirely), pointed postero-laterally; subepandrial sclerite without lateral or median protuberances; hypandrium ± flat, rectangular to square sclerite, entirely fused with gonocoxite, forming a gonocoxite-hypandrial complex; gonocoxite dorso-ventrally flattened in distal ½, higher in proximal ½, with palp-like lateral appendage, gonocoxal apodeme present, short (at most slightly extending hypopygium anteriorly); 1 functional aedeagal prong, aedeagal epimere absent; lateral ejaculatory process absent; ejaculatory apodeme formed by single dorso-ventrally oriented plate; ventro-median margin of dorsal aedeagal sheath heavily sclerotised (appearing entirely closed); dorsal aedeagal sheath long, sperm sac entirely covered; sperm sac appearing ± heavily sclerotised.

Re-description female: Head: brown, facial gibbosity yellow; vertex entirely grey pubescent; maxillary palpus brown.

Antenna: scape and pedicel white and yellow setose dorsally and ventrally.

Thorax: light brown; scutum yellow, broad brown median presutural stripe and brown paramedial postsutural stripes, surface entirely smooth; scutal setation comprised of distinct rows of short dorsocentral setae and lateral scutal setae; postpronotal lobe yellow, partly white pubescent; proepisternum, lateral postpronotum, and postpronotal lobe short white setose; metepimeron silver pubescent, aetose.

Leg: brown and yellow; femur brown.

Wing: length = 11.9 mm; halter light yellow.

Abdomen: brown and yellow; T1 brown, T2 brown with yellow anterior and posterior margin, T3–7 brown laterally and yellow medially; T1–3 sparsely white setose; S1 yellow, S2–7 brown with scattered yellow areas; bullae on T2 black, transversely elongate.

Female genitalia: densely arranged anteriorly directed setae absent, only few on T7–8 and S7–8; T8 with broad anterior rectangular apodeme; T9 formed by wide, rectangular sclerite with median protuberance; T9+10 entirely fused, T10 divided into 2 heavily sclerotised acanthophorite plates, 11 acanthophorite spurs per plate; 3 spermathecae, all equally large, formed by ± expanded weakly sclerotised ducts; individual spermathecal duct long; S9 (furca) formed by 2 sclerites, separated anteriorly and posteriorly, anterior furcal apodeme present, 2 lateral projections forming divided apodeme, lateral furcal apodeme absent, median furcal bridge absent.

Material examined: South Africa: Gauteng Province: 1♂ Willows, Pretoria, 25°44'60"S 28°20'47"E, 23.ix.1917, H. Munro (lectotype, SAMC); 1♀ 1♂ Willows, Pretoria, 23.ix.1917, H. Munro (NMSA); 1♀ Fairy Glen (= Faerie Glen), Pretoria, 25°46'24"S 28°18'03"E, 19.ix.1915, H. Munro (paralectotype, SAMC); 1♂ Fairy Glen (= Faerie Glen), Pretoria, 19.ix.1915, H. Munro (NMSA).

Type locality, distribution, and biodiversity hotspot: Willows (suburb of Pretoria), 25°44'60"S 28°20'47"E, Gauteng, South Africa. Does not occur in any currently recognised biodiversity hotspot.

Remarks: In order to preserve taxonomic stability and make more universal the use of this specific name, the ♂ specimen from Willows, is here designated as the lectotype, making the ♀ specimen from Faerie Glen a paralectotype.

Genus *Parectyphus* Hesse, 1972

Parectyphus Hesse 1972: 165. Type species: *Parectyphus namibiensis* Hesse, 1972, by monotypy.

Diagnosis: The genus can be distinguished from other Afrotropical Mydidae by the presence of a complete stump vein (R_3) connecting R_2 and R_4 , the distinctly clubbed metathoracic femur, the presence of a ventral keel on the metathoracic tibia terminating into a well-developed apical spine, M_3+CuA_1 terminate together into C on the posterior wing margin, the configuration of the male terminalia, and its apparent distribution in south-western Namibia and far north-western South Africa.

Parectyphus namibiensis Hesse, 1972

Figs 26–28, 30, 38–44, 45

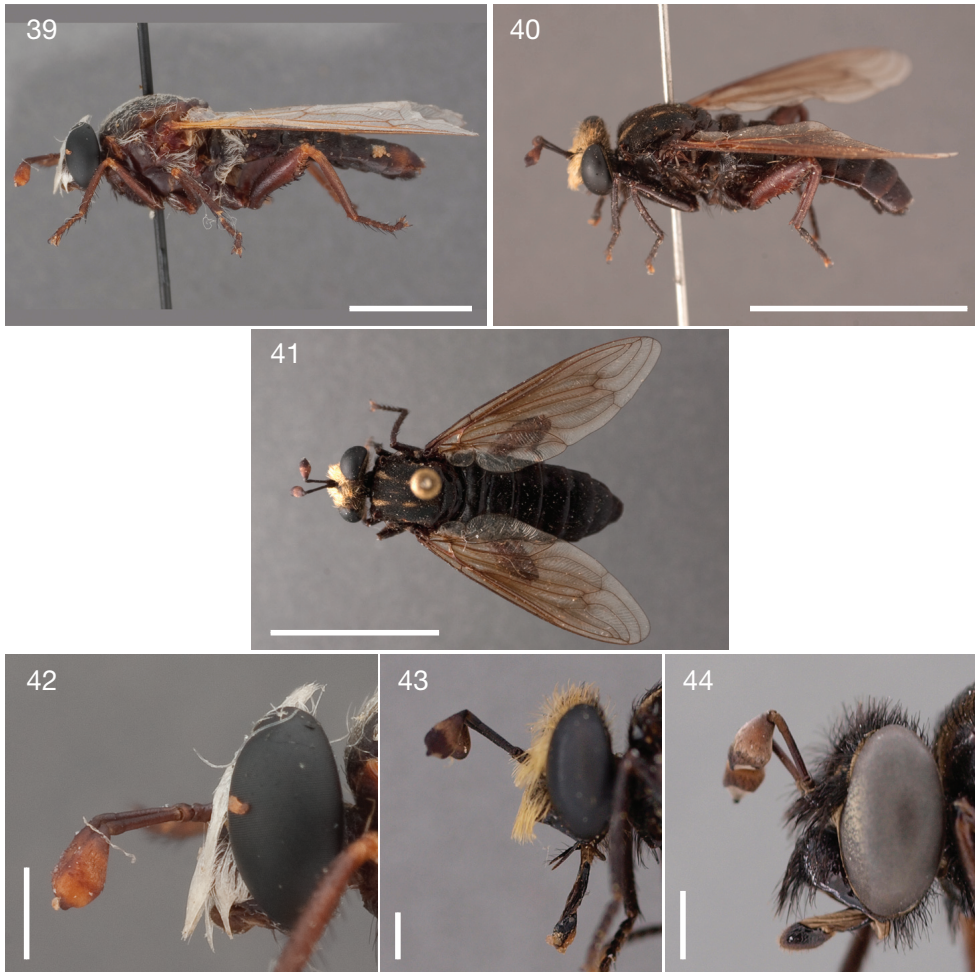
Parectyphus namibiensis Hesse 1972: 165; Bowden 1980: 326.

Diagnosis: See above for generic diagnosis.

Re-description male: Head: black, facial gibbosity light brown, rarely black, in general rarely predominantly apubescent, yellow pubescent on median eye margin; width distinctly greater than thorax, interocular distance on vertex larger than at ventral eye margin, vertex between compound eyes slightly depressed, parafacial area very narrow, facial gibbosity nearly touching median eye margin; facial gibbosity distinct, well-developed and discernible in lateral view; mystax white, covering entire facial gibbosity, rarely yellow, covering entire facial gibbosity; frons predominantly apubescent, vertex medially apubescent, laterally grey pubescent, rarely medially apubescent, laterally yellow pubescent, postgena lightly silver pubescent; setation: vertex white, rarely yellow, frons white, rarely yellow, ocp setae white, rarely yellow, pocl setae white, rarely yellow; ocellar triangle apubescent; proboscis brown, long, projecting beyond fronto-clypeal suture; labellum small, as wide as prementum, as long as prementum, unsclerotised laterally; maxillary palpus cylindrical, brown, about $\frac{1}{2}$ length of proboscis.

Antenna: brown, scape and pedicel brown setose dorsally and ventrally; postpedicel cylindrical in proximal $\frac{1}{2}$, symmetrically bulbous in distal $\frac{1}{2}$, ≥ 4.0 times as long as combined length of scape and pedicel, rarely ≥ 6.0 times as long as combined length of scape and pedicel; apical 'seta-like' sensory element situated apically in cavity on postpedicel.

Thorax: brown, rarely dark brown to bluish-black, scutum predominantly grey pubescent, pleura predominantly apubescent, rarely predominantly yellow pubescent;



Figures 39–44. Photographs of *Parectyphus namibiensis* specimens. **39 + 42** *P. namibiensis* (♂ holotype, SMNS) **39** lateral ([Morphbank](#)) **42** head lateral ([Morphbank](#)); **40, 41, + 43** *P. namibiensis* (♂, AAM-003485, SAMC) **40** lateral ([Morphbank](#)) **41** dorsal ([Morphbank](#)) **43** head lateral ([Morphbank](#)) **44** *P. namibiensis* (♂, AAM-003606, NMNW, [Morphbank](#)). Scale lines = 5 mm.

scutum medially bluish-black, laterally brown, surface entirely smooth, lightly grey pubescent, rarely lightly yellow pubescent, paramedial stripes (merging postsuturally) and posterior lateral stripes densely yellow pubescent, scutal setation comprised of scattered short white, sometimes black, setae with distinct rows of long dorsocentral setae and lateral scutal setae; dc setae pre- and postsuturally white, rarely pre- and postsuturally black, acr setae present, lateral scutal setae white, rarely black, npl, spal, and pal setae absent; postpronotal lobe light brown, partly silver pubescent, rarely dark brown, partly yellow pubescent; proepisternum, lateral postpronotum, and postpronotal lobe long brown setose, rarely long black setose; scutellum lightly grey pubescent, long white setose, rarely lightly grey pubescent, long black setose, apical scutellar setae

present; mesopostnotum, anatergite, and katatergite grey pubescent, rarely lightly yellow pubescent, mesopostnotum asetose, anatergite long black setose or long white setose, katatergite asetose; katatergite elevated and smoothly convex; anterior anepisternum asetose, supero-posterior anepisternum long white setose, rarely long black setose; posterior anepimeron long black setose or long white setose, katepimeron asetose; metepimeron evenly elevated, same colour as T1, apubescent, asetose, rarely silver pubescent, asetose; metepisternum silver pubescent, asetose.

Leg: brown, setation black and white; pro coxa apubescent, long black setose, mes coxa lightly silver pubescent, long white and black setose, rarely apubescent, long black setose, met coxa lightly silver pubescent, long white and black setose, rarely apubescent, long black setose; met trochanter setose medially or macrosetose medially; femur brown, met femur evenly clubbed in distal $\frac{3}{4}$, in distal $\frac{1}{2}$ macrosetose, 1 antero-ventral and 1 postero-ventral row of macrosetae; pro, mes, and met tibia straight, met tibia cylindrical with distinct ventral keel terminating into a sharp spine; pro and mes tarsomere 1 about as long as individual tarsomeres 2, 3, or 4, met tarsomere 1 slightly longer than tarsomere 2, tarsomeres 1 and 2 longer than tarsomeres 3 and 4 combined; pulvillus well-developed, as long as well-developed claw, and as wide as base of claw; empodium absent.

Wing: length = 13.5–15.5 mm; generally hyaline, sometimes slightly brown stained along veins, veins light brown, microtrichia absent; cells r_1 , r_4 , r_5 , m_3 , + *cup* closed; C well-developed, around entire wing; R_4 terminates in R_1 ; R_5 terminates in R_1 ; stump vein (R_3) at base of R_4 present, long and connecting R_4 and R_2 ; R_4 and R_5 widest apart medially; r-m distinct, R_{4+5} and M_1 apart, connected by crossvein; M_1 straight at r-m (not curving anteriorly), M_1 (or M_1+M_2) terminates in C; CuA_1 and CuA_2 split proximally to m-cu (cell m_3 narrow proximally); M_3+CuA_1 terminate together in C; A_1 undulating, cell a_1 wide, A_1 and wing margin further apart proximally than distally; alula well-developed; halter light brown, rarely brown.

Abdomen: brown to bluish-black; setation comprised of scattered white and black setae, surface microrugose; T1–7 brown, rarely dark brown with narrow light brown posterior margin; T1 long white setose, T2–3 short black setose, rarely T1 long black setose, T2–3 short black setose; T predominantly apubescent; S1 light brown, S2–7 light brown with narrow yellow posterior margin, rarely S1–7 brown; S1 asetose, S2–3 short black setose; S predominantly apubescent; T2–4 parallel-sided and not constricted waist-like; bullae on T2 black, transversely elongate, surface entirely smooth, T2 surface anterior to bullae smooth ;.

Male terminalia: T1–7 well-developed, entirely sclerotised, T8 postero-medially weakly sclerotised, with anterior transverse sclerotised bridge connecting lateral sclerites; T7–8 anteriorly with 2 lateral apodemes; S6 regular, without any special setation postero-medially, S8 well-developed and simple, fused to T8 dorso-laterally, entire (undivided) ventro-medially; epandrium formed by single sclerite (fused medially \pm entirely), pointed postero-laterally; subepandrial sclerite without lateral or median protuberances; hypandrium \pm flat, rectangular to square sclerite, entirely fused with gonocoxite, forming a gonocoxite-hypandrial complex; gonocoxite dorso-ventrally flattened

in distal ½, higher in proximal ½, with palp-like lateral appendage, gonocoxal apodeme present, short (at most slightly extending hypopygium anteriorly); 1 functional aedeagal prong, aedeagal epimere absent; lateral ejaculatory process absent; ejaculatory apodeme formed by single dorso-ventrally oriented plate; ventro-median margin of dorsal aedeagal sheath heavily sclerotised (appearing entirely closed); dorsal aedeagal sheath long, sperm sac entirely covered; sperm sac appearing ± heavily sclerotised.

Description female: Head: in general yellow pubescent; mystax black, covering entire facial gibbosity; frons yellow pubescent, vertex medially apubescent, laterally yellow pubescent; setation: vertex black, frons black, ocp setae black, pocl setae black.

Antenna: postpedicel ≥ 5.0 times as long as combined length of scape and pedicel.

Thorax: light brown, predominantly yellow pubescent; scutum medially brown, laterally dark yellow, surface entirely smooth, lightly yellow pubescent, anterior paramedial and lateral stripes densely yellow pubescent; dc setae pre- and postsuturally black, acr setae present, rarely absent; lateral scutal setae black; postpronotal lobe light brown, partly white pubescent; proepisternum, lateral postpronotum, and postpronotal lobe long black setose; scutellum lightly grey pubescent, long black setose; mesopostnotum, anatergite, and katatergite lightly yellow pubescent, mesopostnotum asetose, anatergite long black setose; supero-posterior anepisternum long black setose; posterior anepimeron long black setose; metepimeron same colour as T1, lightly silver pubescent, asetose; metepisternum silver pubescent, asetose.

Leg: brown and yellow, setation predominantly black; pro, mes, and met coxa apubescent, long black setose; met trochanter macrosetose medially; femur brown, met femur yellow; pro and mes tarsomere 1 longer than tarsomere 2, but less than combined length of tarsomeres 2–3; met tarsomere 1 as long as combined length of tarsomeres 2–3.

Wing: length = 12.8–14.2 mm; slightly brown stained throughout; halter light brown.

Abdomen: brown; setation comprised of dense short black setae; T1 brown, yellow medially, T2–7 brown with narrow dark yellow anterior and posterior margin, rarely T1–7 yellow, brown postero-laterally; T1–3 densely black setose; S1 light brown, S2–7 light brown with narrow yellow posterior margin.

Female genitalia: densely arranged anteriorly directed setae present on T7–8 and S7–8; T8 with broad anterior rectangular apodeme; T9 formed by wide, rectangular sclerite with median protuberance; T9+10 entirely fused, T10 divided into 2 heavily sclerotised acanthophorite plates, 8 acanthophorite spurs per plate; 3 spermathecae, all equally large, formed by ± expanded weakly sclerotised ducts; individual spermathecal duct long; S9 (furca) formed by 2 sclerites, separated anteriorly and posteriorly, anterior furcal apodeme present, 2 lateral projections forming divided apodeme, lateral furcal apodeme absent, median furcal bridge absent.

Material examined: Namibia: Erongo Region: 1♂ Gobabeb, 23°33'37"S 15°02'26"E, 408 m, -.-.- (holotype, SMNS); Karas Region: 1♀ Kanaän 104, 25°50'42"S 16°09'30"E, 6–7.x.1972, (AAM-003505, NMNW); 1♂ Klinghardt Mountains, 27°20'00"S 15°45'00"E, 1.x.1982, V. Whitehead (AAM-003486, SAMC); 1♂ Klinghardt Mountains, 24.x.1977, V. Whitehead (AAM-003485, SAMC); 1♂ Na-

muskluft 88, 27°48'00"S 16°52'00"E, 7–14.x.1970 (AAM-003504, SAMC); 3♀ 1♂ Rosh Pinah, 10 km NW, 27°54'00"S 16°42'00"E, 13.viii.1990, C. Roberts E. Marais (AAM-003606–AAM-003609, NMNW); **South Africa:** Northern Cape Province: 2♀ Tnong-Gys Dunes, 29°32'50"S 17°14'03"E, 23–25.ix.1988, J. Irish E. Marais (AAM-003506–AAM-003507, NMNW).

Type locality, distribution, and biodiversity hotspot: Gobabeb (23°33'37"S 15°02'26"E), Erongo, Namibia. Namibia and South Africa. Succulent Karoo biodiversity hotspot.

Remarks: Prior to this study, *P. namibiensis* was only known from the ♂ holotype collected at Gobabeb (Fig. 45). The location of new *Parectyphus* specimens in two museum collections has allowed us to describe the female for the first time and also to observe a considerable amount of colour variation among the 11 studied specimens. We dissected the ♂ terminalia from all localities, if available, to verify whether there is morphological variation in these generally species-specific features. However, we were unable to detect any differences and therefore concluded that all specimens represent *P. namibiensis* albeit coming from isolated collecting events (Fig. 45). The type locality, which marks the northern-most record, is some 700 km separated from the Tnong-Gys dunes in north-western South Africa as the southern-most record. While

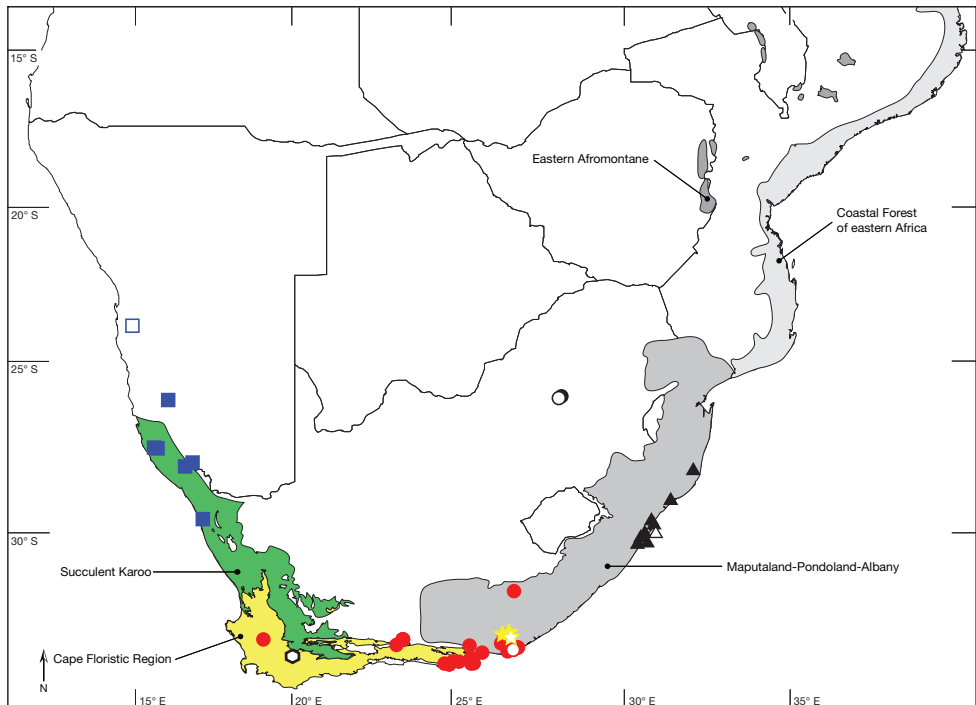


Figure 45. Map of southern Africa with biodiversity hotspots *sensu* Conservation International showing distribution of *Ectyphus abdominalis* (hexagon), *E. armipes* (triangle), *E. capillatus* (yellow star), *E. pinguis* (red circle), *E. pretoriensis* (black circle), and *Parectyphus namibiensis* (blue square). Type localities with open symbols.

the holotype is entirely white setose (Fig. 39, 42), the specimens from the Klinghardt Mountains and Namuskluft, in the centre of the currently known distribution, are yellow setose (Fig. 40–41, 43) and the specimens from Rosh Pinah and Tnong-Gys dunes in the south are black setose (Fig. 44). The pubescence pattern on the scutum is in several instances very difficult to observe and since most specimens we studied were caught in wet Malaise traps, the coloration of the entire body might also differ among populations. Although Hesse (1972) observed an absence of macrosetae on the metathoracic trochanters of the holotype, the other specimens studied by us exhibit macrosetae, which is consistent with the delimitation of Ectyphinae as having macrosetose metathoracic trochanters (e.g., Wilcox and Papavero 1971), which separates this taxon from other Mydidae taxa. As mentioned under *E. armipes*, there are three specimens of this species known from Tongaat on the KwaZulu-Natal coast of South Africa in which the particular wing venation of *Parectyphus*, namely the stump vein (R_3) entirely connecting R_2 and R_4 (Fig. 38), is also found. *P. namibiensis* exhibits other characteristics not found among *Ectyphus* species, e.g., the configuration of the male terminalia and the shape of the furca and spermathecae in the females, and therefore we do not propose to synonymise both genera. A comprehensive phylogenetic analysis of Mydidae, including all Ectyphinae, genera currently in preparation by the second author, will shed light on this question and establish whether *Ectyphus* and *Parectyphus* are adelphotaxa or whether *Parectyphus* is just an apomorphic *Ectyphus*.

Identification key to the genera and species of Ectyphinae

A dichotomous identification key to all species of *Ectyphus* and *Parectyphus* including the three remaining species from the Nearctic Region is provided below. An illustrated online version of this key can be accessed at (http://www.mydidae.tdvia.de/online_keys) and a multi-access, matrix-based key can be accessed on the same web-site. An updated, illustrated identification key to all 11 currently recognised subfamily taxa, which is based on the key by Papavero and Wilcox (1974), can also be accessed on the above web-site.

- 1 Metathoracic femur cylindrical, only slightly wider than prothoracic and mesothoracic femur; postpedicel bulbous in distal ½ (cylindrical in proximal ½); Nearctic..... **8**
- Metathoracic femur distinctly clubbed, much wider than prothoracic and mesothoracic femur (Fig. 5); postpedicel bulbous in distal ⅔ (cylindrical in proximal ⅓); Afrotropical (Fig. 1)..... **2**
- 2 Stump vein (R_3) connecting R_4 and R_2 (Fig. 38); anatergite setose (Fig. 39); supero-posterior anepisternum setose (Fig. 39); discal scutellar and apical scutellar setae present; proboscis long, projecting well beyond fronto-clypeal suture (Fig. 40); ♂ aedeagus large, laterally compressed; ♀ ovipositor with 8 acanthophorite spurs per plate ***Parectyphus namibiensis* Hesse, 1972**

- Stump vein (R_3) extending from R_4 , but not reaching R_2 (Fig. 37); anatergite asetose (Fig. 33); supero-posterior anepisternum asetose (Fig. 36); discal scutellar and apical scutellar setae usually absent, rarely laterally developed; proboscis short (Fig. 32), only in a single species projecting slightly beyond fronto-clypeal suture (Fig. 6); ♂ aedeagus rounded, with a cup-like opening; ♀ ovipositor with 11 acanthophorite spurs per plate **3**
- 3 Facial gibbosity yellow (Fig. 32); postpronotal lobes yellow (Fig. 34) **5**
- Facial gibbosity brown; postpronotal lobes brown (Fig. 5) **4**
- 4 Proboscis about $\frac{1}{2}$ as long as oral cavity; labellum much shorter than prementum; parafacial area narrow, facial gibbosity nearly touching median eye margin; vertex and frons light brown setose; western South Africa (Montagu)
..... ***Ectyphus abdominalis* Bezzi, 1924**
- Proboscis slightly longer than oral cavity (Fig. 6); labellum as long as prementum; parafacial area wide, facial gibbosity in anterior view clearly separated from median eye margin; vertex and frons white setose; eastern South Africa (along KwaZulu-Natal coast) ***Ectyphus armipes* Bezzi, 1924**
- 5 T5–7 densely long white setose (Fig. 8); abdominal tergites microrugose (setae with distinct sockets, especially where brown coloured)
..... ***Ectyphus capillatus* Hesse, 1969**
- T5–7 sparsely short white setose (Fig. 4); abdominal tergites entirely smooth **6**
- 6 Katatergite yellow; legs yellow to light brown (Fig. 4); T1–7 with entire yellow posterior margins (Figs 3–4); eastern Africa (Kenya) ***Ectyphus amboseli* sp. n.**
- Katatergite brown (Fig. 9); legs primarily brown (Fig. 9); T1–7 at least medially with brown posterior margin (some specimens with narrow yellow posterior margins, Fig. 31); South Africa **7**
- 7 Metepimeron yellow (in stark contrast to brown T1, Fig. 32); ♂ palp-like lateral gonocoxal appendage situated sub-apically (Fig. 20); ♂ and ♀ abdominal tergites with broad yellow latero-posterior margins (sometimes yellow margins occupy latero-posterior $\frac{1}{2}$ of tergite, Figs 31, 33); south to south-western South Africa (Eastern and Western Cape, Fig. 45)
..... ***Ectyphus pinguis* Gerstaecker 1868**
- Metepimeron brown (same colour as T1, Fig. 9); ♂ palp-like lateral gonocoxal appendage situated apically (Fig. 23); ♂ and ♀ abdominal tergites with very narrow yellow latero-posterior margins (Figs 9–10); north-eastern South Africa (Gauteng, Fig. 45) ***Ectyphus pretoriensis* (Bezzi, 1924)**
- 8 Anepisternum and katepisternum partly grey pubescent (not obvious to naked eye); R_5 terminates in C (cell r_4 open), sometimes in R_1 very close to C; apical metathoracic tibial spine present in ♂ and ♀; ♂ hypandrium partially fused to gonocoxite; ♂ palp-like lateral gonocoxal appendage absent
..... ***Heteromydas bicolor* Hardy, 1944**
- Dorsal anepisternum and dorsal katepisternum distinctly white pubescent (visible to naked eye); R_5 terminates in R_1 (cell r_4 closed); apical metathoracic

- tibial spine present in ♂, absent or very much reduced in ♀; ♂ hypandrium completely free from gonocoxite; ♂ palp-like lateral gonocoxal appendage present.....9
- 9 Supero-posterior anepisternum with only few white setae; bulbous (distal) part of postpedicel sub-equal to or longer than cylindrical (proximal) part; thorax generally yellow to light brown; ♂ abdominal tergites lightly grey pubescent; for ♂ terminalia see Kondratieff and Fitzgerald 1996 *Opomydas limbatus* Williston, 1886
- Supero-posterior anepisternum densely long white setose; bulbous (distal) part of postpedicel shorter than cylindrical (proximal) part; thorax generally dark brown; ♂ abdominal tergites apubescent; for ♂ terminalia see Kondratieff and Fitzgerald 1996..... *Opomydas townsendi* Williston, 1898

Discussion

Biology and ecology

The family Mydidae is most often collected in arid to semi-arid areas, and *Ectyphus* and *Parectyphus* are not exceptional. Hesse described the then known habitats as “scrub- and sclerophyll-covered dunes” (1969: 372) and “semi-wooded and forested parts” (1972: 165) of southern Africa. Even in the Namib Desert, the holotype of *Parectyphus namibiensis* was probably collected from a “wooded environment ... namely that found along the banks of the Kuiseb River” (Hesse 1972: 165). The new collecting localities for *P. namibiensis* (Fig. 45) occur inland, but sand dunes or at least dry, sandy river beds are present. Several species of *Ectyphus* have been collected at river mouths with presumably larger amounts of open sand, *i.e.*, Gamtoos River near Papiessfontein, Riet River in Port Alfred, Van Staden’s River, and possibly the Tongaat River. According to Hesse (1969) *Ectyphus* is often collected resting on the ground or sand in open spaces. Although the life history of species of Ectyphinae has not been observed, behavioural characteristics are probably similar to other Mydidae. All species appear to have functional mouthparts, although these can be short as in *E. abdominalis*, *E. amboseli*, *E. capillatus*, *E. pinguis*, and *E. pretoriensis*, and so probably visit flowers and feed on pollen and nectar. The larvae of *Ectyphus* and *Parectyphus* remain unknown.

Seasonal incidence

Ectyphus: abdominalis: January; *amboseli* sp. n.: September; *armipes*: November–April, July, September; *capillatus*: December–January; *pinguis*: November–February; *pretoriensis*: September; *Parectyphus: namibiensis*: August–October. While *E. armipes* ap-

pears to fly for much of the year along the KwaZulu-Natal coast, *E. abdominalis*, *E. capillatus*, and *E. pinguis* appear only during the southern Hemisphere summer and both, *E. pretoriensis* and *P. namibiensis*, fly only in spring.

Biodiversity hotspots

Areas of high plant endemism, which are under serious threat of destruction and which have already sustained loss of biodiversity, are referred to as biodiversity hotspots by Conservation International (<http://www.conservation.org>) (Myers et al. 2000). The presence or absence of Mydidae species in designated biodiversity hotspots is an indication of whether these species will be protected when funding for the preservation of the hotspots is made available. *Ectyphus armipes* and *E. capillatus* are endemic to the Maputaland-Pondoland-Albany hotspot. *Ectyphus pinguis* is found in both Maputaland-Pondoland-Albany and the Cape Floristic Region, as well as slightly outside of both of these hotspots. *Ectyphus abdominalis* is endemic to the Cape Floristic Region. Parts of the range of *Parectyphus namibiensis* are in the Succulent Karoo hotspot. *Ectyphus amboseli* sp. n. was collected just outside the boundaries of the Eastern Afromontane hotspot, but further collection efforts in localities with higher elevations may result in *E. amboseli* specimens from this patchy biodiversity hotspot. The majority of species and specimens studied occur or are endemic to biodiversity hotspots *sensu* Conservation International. However, two species, *E. amboseli* sp. n. and *E. pretoriensis*, do not occur in any biodiversity hotspot.

Conclusion

The description of *Ectyphus amboseli* sp. n. expands the distribution of Afrotropical Ectyphinae by presenting a Kenyan species far from all other known species in southern Africa. This distribution does also have implications for the discussion of the phylogenetic relationships of Ectyphinae to other Mydidae, which are being further investigated by the second author (in prep.). In addition to the previously known distribution in southern Africa and western North America, Ectyphinae are now also known from eastern Africa. A similar distribution with a western North American element and a primarily southern African element within the Afrotropical Region is also found within the Willistoninae of the Asilidae (Dikow 2009). Within Willistoninae, the genus *Sisyrondytes* Loew, 1856 even occurs in the southern Palaearctic Region, but the highest species diversity is found in southern Africa (see Londt 2009). We predict that additional records of *Ectyphus*, or possibly even undescribed species, will become available with more field work along the eastern African coast and especially in Mozambique and Tanzania, both poorly collected areas.

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A new genus and two new species of Phygadeuontini (Hymenoptera, Ichneumonidae, Cryptinae) from China

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Abstract

Carinityla Sheng & Sun **gen. n.**, *Carinityla punctulata* Sheng & Sun **sp. n.** and *Carinityla pilosa* Sheng & Sun **sp. n.** belonging to the tribe Phygadeuontini of the subfamily Cryptinae (Hymenoptera, Ichneumonidae), collected from Jiangxi Province, China, are described. A key to the species of the new genus, *Carinityla* Sheng & Sun, **gen. n.**, is provided and the genus is placed in Townes' key to genera of Endaseina.

Keywords

Ichneumonidae, *Carinityla*, new genus, new species, taxonomy, China.

Introduction

According to the most recent catalogue of Ichneumonoidea (Yu et al. 2005), the tribe Phygadeuontini of the subfamily Cryptinae (Hymenoptera, Ichneumonidae), comprises 123 genera. Townes (1970) included 14 subtribes within Phygadeuontini (= Gelini of Townes). Two subtribes, Cephalobaridina and Gnypetomorphina, were subsequently synonymized with, respectively, the Phygadeuontina and Hemitelina by Horstmann (1992). Prior to this publication 33 genera and 76 species of Phygadeuon-

tini have been recorded from China (Sheng and Sun 2009, Sheng and Zeng 2010, Sun and Sheng 2010).

In this article, one new genus and two new species, collected in Quannan County, Jiangxi Province, China, are described. The new genus belongs to the subtribe Endaseina of the tribe Phygadeuontini. Type specimens are deposited in the Insect Museum, General Station of Forest Pest Management, State Forestry Administration, People's Republic of China.

The specimens were collected using the entomological net in the forest of Quannan County, Jiangxi Province (China). The forest of Quannan is a forest composed of mixed deciduous angiosperms and evergreen conifers, mainly including *Quercus* spp., *Castania* spp., *Castanopsis fabri* Hance, *Cinnamomum* spp., *Pinus massoniana* (Lamb.).

The morphological terminology is mostly that of Gauld (1991). Wing vein nomenclature is based on Ross (1936) and the terminology on Mason (1986, 1990).

Taxonomy

Carinityla Sheng & Sun, gen. n.

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Type species: *Carinityla punctulata* Sheng & Sun, sp. n.

Etymology. The name of the new genus is based on the strongly swollen tyloids. The gender is feminine.

Description. Fore wing length 7.2 to 8.8 mm. Head and thorax with dense and comparatively long hairs. Eye surface with short, sparse hairs. Upper margin of face slightly produced, weakly concave medially. Clypeus slightly convex, median portion of apical margin somewhat arcuate and distinctly raised. Mandible elongate, upper and lower margins almost parallel, upper tooth longer than lower tooth. Apical truncation of scape almost transverse. Apical half of antenna strongly flattened below in female. Flagellomeres 10 to 11 (12) of male with strongly swollen tyloids. Epomia long and strong, from lower-anterior angle of pronotum continuing to its dorsal portion (Figure 4). Notauli present. Posterior edge of mesoscutum with transverse groove, which is unusually conspicuous and complete. Scutoscutellar groove without median longitudinal carina. Epicnemium with short transverse carina opposite lower corner of pronotum. Epicnemial carina strongly curved backward or broken (Figure 5) above sternaulus. Anterior half of sternaulus deep; posterior half weak, reaching to posterior margin of mesopleuron above its lower posterior corner. Areolet pentagonal, receiving vein 2m-cu at or slightly basad of its outer corner (Figures 1,7,10,14). Vein 2m-cu subvertical, with one bulla. Hind wing vein 1-cu strongly inclivous, about 3.0 to 4.0 times as long as

cu-a. Propodeum completely areolate, carinae very strong. Costula connecting area superomedia in front of its middle. Propodeal spiracle 3.0 to 3.5 times as long as wide. Median dorsal carinae of first tergum absent. Ovipositor compressed, tip very long and gradually tapered, with a weak nodus and very thin and indistinct ridges on ventral valve.

Remarks. This new genus is similar to *Amphibulus* Kriechbaumer 1893 and *Coptomystax* Townes 1970 and can be distinguished from *Amphibulus* in the notaulus present; epicnemial carina strongly curved backward or secondary carina present above sternaulus; fore wing vein 2m-cu almost reaching 3rs-m (Figure 1,7,10,14). In *Amphibulus*, the notaulus is absent; the epicnemial carina is neither curved backward nor is there a secondary carina above the sternaulus; fore wing vein 2m-cu is usually far from 3rs-m, usually connecting with the areolet near its median portion. The new genus can be distinguished from *Coptomystax* Townes by the eye surface with short sparse hairs; the upper margin of face without tubercle; a transverse groove at the posterior edge of mesoscutum distinct, complete and unusually conspicuous; the epicnemial carina approaching the subalar prominence, or discontinuous above the sternaulus. In *Coptomystax* the eye surface is bare; the upper edge of the face has a high and compressed median tubercle; the transverse groove at the posterior edge of the mesoscutum is distinct medially, evanescent laterally; the epicnemial carina ends below the middle of the hind edge of the pronotum.

This new genus can also be easily distinguished from the related genera *Endasys* Förster 1869 and *Cisaris* Townes 1970 by the following combination of characters: scutoscuteellar groove without median longitudinal carina, median dorsal carinae of first tergum absent (*Endasys*: scutoscuteellar groove with a median longitudinal carina, first tergum with distinct median dorsal carinae); fore wing with distinct areolet, posterior edge of mesoscutum with transverse groove (*Cisaris*: fore wing without areolet, posterior edge of mesoscutum without transverse groove).

In Townes' (1970) key to genera, the new genus can be inserted as follows:

- 7 Median dorsal carinae of first tergite strong, at least in front of spiracle. Prescutellar transverse groove with a strong median longitudinal carina. Holarctic Region **6. *Endasys***
- Median dorsal carinae of first tergite weak or absent. Prescutellar transverse groove usually without a strong median longitudinal carina..... **7'**
- 7' Upper margin of face edge-shaped, without median tubercle. Apical half of antenna strongly flattened below in female. Areolet receiving vein 2m-cu at or slightly basad of its outer corner. Eye surface with sparse hairs..... ***Carinityla* Sheng & Sun, gen. n.**
- Upper margin of face concave, at least not edge-shaped, with a median tubercle. Apical half of antenna not flattened below. Areolet receiving vein 2m-cu near its center. Eye surface with or without hairs..... **8**

***Carinityla punctulata* Sheng & Sun, sp. n.**

urn:lsid:zoobank.org:act:99CDCBA6-0D3A-4FB9-967F-B363959C26C7

Figures 1–9

Etymology. The name of the new species is based on the dense punctures on the head and thorax.

Types. *Holotype*, female, CHINA: Quannan County, 628m, Jiangxi Province, 9 June 2010, leg. Shi-Chang Li. *Paratypes*: 7 males, CHINA: Quannan County, 628 to 700m, Jiangxi Province, 16 May to 10 June 2008, leg. Shi-Chang Li. 1 female and 1 male, CHINA: Quannan County, 628 to 700m, Jiangxi Province, 26 to 31 May 2010, leg. Shi-Chang Li.

Diagnosis. Second tergum, hind femur and tibia reddish brown. Notaulus not reaching to center of mesoscutum. Scutellum weakly convex, lateral sides not raised, without carina except at its basal corner.

Description. Female. Body length 9.3 to 9.7 mm. Fore wing length 7.2 to 7.8 mm. Ovipositor length about 2.8 mm. Head and mesosoma with dense punctures and long yellowish brown hairs.

Head. Face (Figure 2) convex, approximately 2.2 times as wide as long, with dense, irregular punctures, median portion with short longitudinal wrinkles. Clypeal suture vestigial between clypeal foveae. Clypeus slightly convex, basal portion with punctures sparser than on face, subapically with shallow transverse concavity; apical portion smooth and impunctate, distinctly raised medially. Subbasal portion of mandible with short longitudinal wrinkles, apical portion with sparse shallow punctures; upper tooth distinctly longer than lower tooth. Cheek and gena with dense punctures, distance between punctures 0.2 to 0.5 times diameter of puncture. Subocular sulcus distinct. Malar space 0.4 to 0.5 times as long as basal width of mandible. Gena slightly convergent backward, in dorsal view 0.7 to 0.8 times as long as width of eye. Vertex (Figure 3) with dense punctures. Postero-ocellar line about 0.44 times as long as ocular-ocellar line. Frons approximately flat, with even and dense punctures, distance between punctures 0.2 to 0.5 times diameter of puncture. Antenna distinctly shorter than body length, with 27 flagellomeres, ratio of length of flagellomere 1:2:3:4:5 is 3.7:4.1:4.0:4.0:3.9. Flagellomeres 10 to 11 (12) of male with strongly swollen tyloids (Figure 8) on apical half of flagellomere and at most half as long as flagellomere. Occipital carina complete and strong, joining oral carina above base of mandible.

Mesosoma. Anterior portion of pronotum with weak longitudinal wrinkles and fine punctures; laterally concave and lower portion with oblique transverse wrinkles; upper posterior portion with fine punctures, upper posterior margin shoulder-shaped, raised narrowly. Mesoscutum with dense elongate punctures. Notaulus present on front portion of mesoscutum. Scutoscutellar groove with very weak longitudinal wrinkles. Scutellum slightly convex, with irregular punctures. Postscutellum concave, smooth. Subalar prominence strongly convex. Anterior and upper margins of mesopleuron with fine punctures; median portion of mesopleuron (Figure 5) with irregular transverse punctures; speculum with dense and fine punctures. Epicnemial carina broken above sternaulus, upper end of lower portion connecting with short transverse carina oppo-



Figures 1–9. *Carinityla punctulata* Sheng & Sun, sp. n. 1–6: Female. 1 Body, lateral view 2 Face 3 Vertex 4 Pronotum laterally 5 Mesopleuron 6 Propodeum. 7–9: male. 7 Body, lateral view 8 Median portion of flagellomeres and tyloids 9 Propodeum.

site lower corner of pronotum; upper portion of epicnemial carina oblique, upper end reaching about half distance to subalar prominence. Metapleuron with dense punctures, distance between punctures 0.2 to 0.5 times diameter of puncture. Juxtacoxal carina complete. Anterior portion of submetapleural carina strongly lobed. Wings brownish hyaline. Fore wing with vein 1cu-a slightly distal of 1-M by less than vein width. Vein 2-Cu approximately 2.0 times as long as 2cu-a. Hind wing vein 1-cu about 3.0 times as long as cu-a. Legs robust, with dense brown hairs. Hind coxa and femur with distinct fine punctures. Spurs of hind tibia about half length of first tarsomere. Ratio of length of hind tarsomeres 1:2:3:4:5 is 10.0:4.5:3.5:1.8:3.7. Propodeum (Figure 6) with sandy beige long hairs. Area superomedia hexagonal, 1.2 times as wide as long, costula connecting slightly in front of its middle. Area basalis smooth, vaguely punctate. Area externa with distinct punctures. Area superomedia with indistinct longitudinal wrinkles. Area dentipara with oblique longitudinal wrinkles. Area lateralis with oblique transverse wrinkles. Area petiolaris with transverse wrinkles. Propodeal spiracle approximately 3.3 times as long as wide, almost touching lateral longitudinal carina (closer to lateral longitudinal carina than to pleural carina). Propodeal apophysis short and compressed.

Metasoma. First and second terga smooth and shining, with very sparse and fine punctures. First tergum about 2.3 times as long as apical width. Postpetiole evenly convex. Median dorsal carinae absent. Dorsolateral and ventrolateral carinae complete. Spiracle circular, very small, slightly convex, located at apical 0.4 of first tergum. Second tergum 0.5 to 0.6 times as long as apical width. Remaining terga with short brown hairs. Ovipositor sheath approximately 0.95 times as long as hind tibia. Ovipositor compressed, with weak nodus.

Color (Figure 1). Black, except the following. Ventral side and apical portion of scape, apical portion of pedicel, ventral side of basal portion (more or less) and flat side of flagellomeres, tegula brown. Dorsal sides of seventh to thirteenth flagellomeres white. Median portion of mandible, dorsal sides of front and mid femora and tibiae brown. Maxillary and labial palpi, fore and mid coxae, trochanters and ventral sides of femora yellowish brown. Fore and mid tarsi dark brown. Hind coxa brown to yellowish brown. Hind trochanter, femur and tibia reddish brown. Apical ends of hind femur and tibia, hind first tarsomere brownish black. Hind second to fifth tarsomeres blackish brown. First and second terga, basal margin of third tergum reddish brown. Posterior margin of third to sixth terga slightly narrowly tinged brown. Main portions of seventh and eighth terga white. Fore wing with stigma brown, veins blackish brown. Hind wing with veins brown.

Male (Figure 7). Body length 9.5 to 11.0 mm. Fore wing length 7.2 to 8.5 mm. Face 1.7 to 1.8 times as wide as long. Antenna with 26 to 28 flagellomeres. Upper posterior portion of pronotum, in front of tegula, weakly convex. Notaulus present, almost reaching to center (about 0.4) of mesoscutum. Area superomedia inverse trapeziform, 1.9 to 2.1 times as wide as long, costula connecting at its anterior 0.2 (Figure 9). First tergum 2.6 to 2.7 times as long as apical width. Antennae with dorsal profiles of eighth to thirteen flagellomeres white. Apical half of hind first tarsomere and second to fourth tarsomeres buff. First to third terga reddish brown.

Host. Unknown.

***Carinityla pilosa* Sheng & Sun, sp. n.**

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Figures 10–16

Etymology. The specific name is derived from the long and dense hairs on the body.

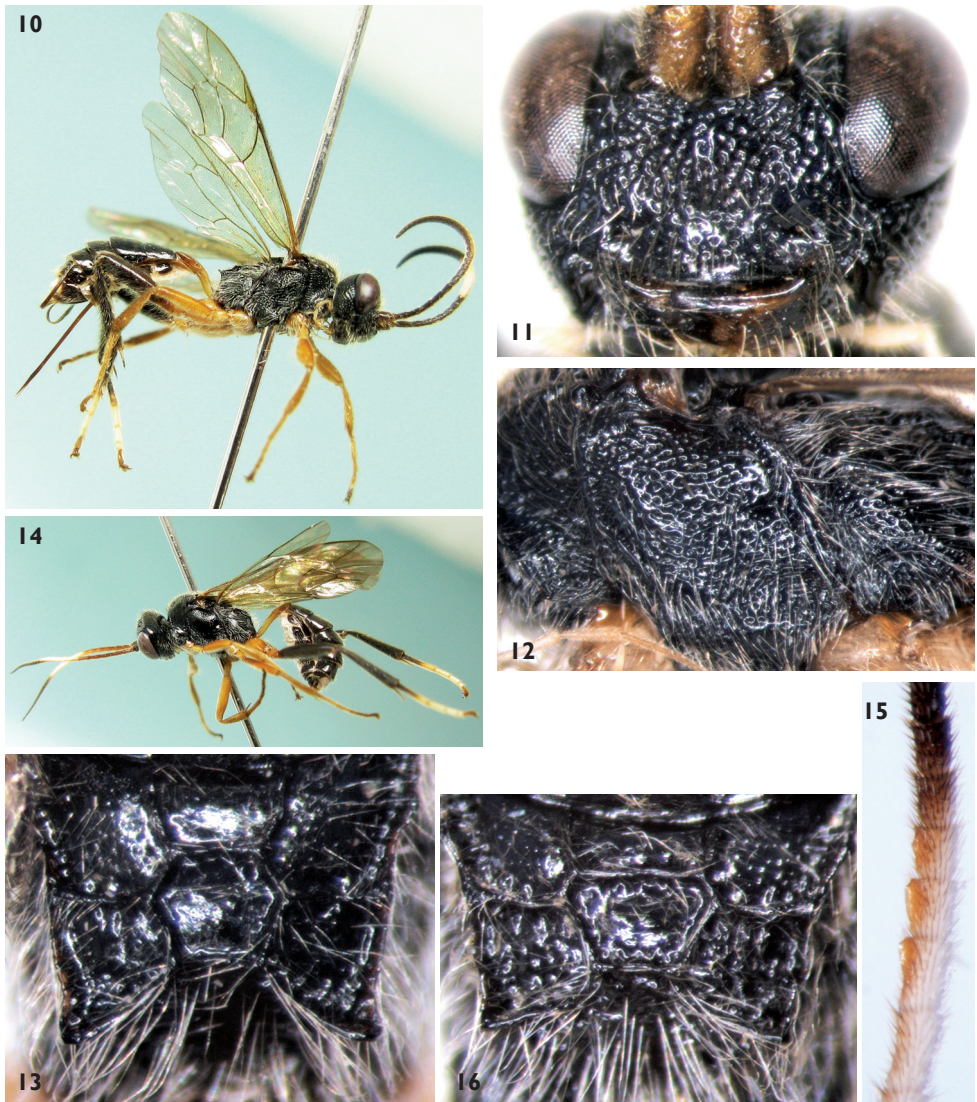
Types. *Holotype*, female, CHINA: Quannan County, 650m, Jiangxi Province, 29 June 2010, leg. Shi-Chang Li. *Paratypes*: 7 males, CHINA: Quannan County, 530 to 628m, Jiangxi Province, 12 May to 10 June 2008, leg. Shi-Chang Li. 3 males, CHINA: Quannan County, 628 to 700m, Jiangxi Province, 31 May to 18 June 2010, leg. Shi-Chang Li.

Diagnosis. Second tergum, hind femur and tibia black. Notaulus of male reaching beyond center of mesoscutum. Lateral sides of scutellum raised and median portion weakly concave in male. Scutellum with lateral carina extending 0.2 to 0.3 of its length.

Description. Female. Body length about 9.0 mm. Fore wing length about 7.2 mm. Ovipositor length about 2.8 mm. Head and mesosoma with long and dense yellowish brown hairs.

Head. Face (Figure 11) strongly convex medially, approximately 1.9 times as wide as long, with dense and irregular punctures. Clypeal suture vestigial between clypeal foveae. Clypeus slightly convex, basal portion with sparse and irregular punctures, distance between punctures 1.0 to 3.0 times diameter of puncture; subapical portion with shallow, transverse concavity; apical 0.2 smooth and impunctate, median section of apical margin distinctly raised. Mandible with indistinct longitudinal wrinkles and fine punctures; upper tooth longer than lower tooth. Cheek with elongate punctures. Subocular sulcus indistinct. Malar space approximately 0.5 times as long as basal width of mandible. Gena with dense punctures, distance between punctures 0.2 to 1.0 times diameter of puncture; in dorsal view approximately 0.6 times as long as width of eye. Vertex with irregular punctures, distance between punctures 0.2 to 1.5 times diameter of puncture. Postero-ocellar line about 0.6 times as long as ocular-ocellar line. Frons approximately flat, with regular and dense punctures, distance between punctures 0.2 to 1.0 times diameter of puncture. Antenna distinctly shorter than body in length, with 27 flagellomeres, ratio of length of flagellomeres 1:2:3:4:5 is 3.7:4.7:4.5:4.3:4.1. Flagellomeres 10 to 11 (12) of male with tyloids (Figure 15) similar to those of *C. punctulata*. Tyloid on flagellomere 11 0.7 to 0.9 times as long as flagellomere. Occipital carina complete and strong, joining oral carina above base of mandible.

Mesosoma. Anterior portion of pronotum with fine punctures, laterally concave and lower portion with dense, oblique transverse wrinkles; upper posterior portion with fine punctures, distance between punctures 0.2 to 1.0 times diameter of puncture; upper posterior margin slightly and narrowly raised. Mesoscutum with dense punctures, distance between punctures 0.2 to 0.5 times diameter of puncture; posterior median portion with irregular longitudinal wrinkles. Notaulus present anteriorly. Scutoscutellar groove with fine longitudinal wrinkles. Scutellum almost flat, with irregular punctures. Postscutellum smooth and shining, lateral portion strongly convex, anterior-lateral portion deeply concave. Subalar prominence strongly con-



Figures 10–16. *Carinityla pilosa* Sheng & Sun, sp. n. **10–13:** Female. **10** Body, lateral view **11** Face **12** Mesopleuron **13** Propodeum **14–16:** male **14** Body, lateral view **15** Median portion of flagellomeres and tyloids **16** Propodeum.

vex. Upper portion of mesopleuron (Figure 12) with dense punctures; lower portion, above sternaulus, with irregular punctures; lower posterior portion with transverse wrinkles. Speculum with dense punctures. Epicnemial carina strongly curved backward above sternaulus, upper end reaching to subalar prominence. Metapleuron with dense and irregular punctures. Juxtacoxal carina complete. Anterior section of submetapleural carina strongly projecting. Wings brownish hyaline. Fore wing with vein 1cu-a almost opposite 1-M. Vein 2-Cu approximately 2.0 times as long

as 2cu-a. Hind wing vein 1-cu about 3.0 times as long as cu-a. Legs robust, with long and dense brown hairs. Hind coxae and femora with distinct fine punctures. Spurs of hind tibia approximately half length of first tarsomere. Ratio of length of hind tarsomere 1:2:3:4:5 is 10.0:4.7:3.4:1.6:3.7. Propodeum (Figure 13) with long, brown hairs. Area superomedia hexagonal, approximately 1.15 times as wide as long, costula connecting slightly in front of its middle. Area basalis and area superomedia smooth and shining. Area externa with fine punctures. Area dentipara with indistinct wrinkles. Area spiracularis almost smooth. Area lateralis with oblique transverse wrinkles. Area petiolaris and area posteroexterna with transverse wrinkles. Propodeal apophysis short and compressed. Propodeal spiracle approximately 3.0 times as long as wide, distance to pleural carina approximately 1.3 times as long as distance to lateral longitudinal carina.

Metasoma. First to third terga smooth and shining. First tergum approximately 2.3 times as long as apical width. Hind section of dorsolateral carina, behind spiracle, indistinct. Lateral margins of petiole almost parallel, only posterior portion slightly broadened. Postpetiole weakly and evenly convex, anterior half with sparse and fine punctures. Spiracle circular, very small, located at about apical 0.3 of first tergum. Second tergum approximately 0.65 times as long as apical width. Remaining terga with short brown hairs and indistinct punctures. Ovipositor sheath approximately as long as hind tibia. Ovipositor compressed, with weak nodus.

Color (Figure 10). Black, except the following. Ventral profiles of scape and pedicel dark brown. Flat portion of flagellomeres more or less brown. Dorsal profiles of eighth to fourteenth flagellomeres white. Maxillary and labial palpi buff except dark bases. Median portion of mandible crimson. All coxae and trochanters, inner profiles of front and mid femora yellowish brown. Remaining portion of fore legs and mid femora brown. Apices of mid femora, mid tibiae and tarsi puce. Apical portion of first tarsomere of hind tarsi, second to fourth tarsomeres, posterior median portions of sixth and seventh terga, main portion of eighth tergum white. Petiole of first tergum yellowish brown; postpetiole reddish brown. Stigma yellowish brown. veins brownish black.

Male (Figure 14). Body length 9.5 to 12.0 mm. Fore wing length 7.5 to 8.8 mm. Face 1.7 to 1.8 times as wide as long. Malar space 0.2 to 0.3 times as long as basal width of mandible. Antenna with 27 to 29 flagellomeres. Upper posterior portion of pronotum, in front of tegula, weakly convex. Notaulus long, reaching beyond center of mesoscutum. Lateral sides of scutellum raised, median portion weakly concave; basal 0.2 to 0.3 with lateral carina. Median portion of mesopleuron smooth and shining, impunctate. Area superomedia 1.5 to 1.6 times as wide as long, costula connecting at its anterior 0.3 (Figure 16). Propodeal spiracle 3.0 to 3.5 times as long as wide. First tergum 2.3 to 2.5 times as long as apical width. Dorsal profile of basal flagellomeres brownish black, ventral profile reddish brown; dorsal profiles of seventh to thirteen flagellomeres white; apical flagellomeres brownish black. Stigma and veins brownish black.

Host. Unknown.

Key to species of *Carinityla* Sheng & Sun

- 1 Female **2**
 – Male **3**
- 2 Epicnemial carina complete, strongly curved backward above sternaulus. First tergum lacking hind portion of dorsolateral carina (behind spiracle). Hind femora and second tergum black ***C. pilosa* Sheng & Sun, sp. n.**
- Epicnemial carina broken above sternaulus. Dorsolateral carina of first tergum complete. Hind femora and second tergum reddish brown ***C. punctulata* Sheng & Sun, sp. n.**
- 3 Notaulus reaching beyond center of mesoscutum. Lateral sides of scutellum raised, median portion weakly concave. Area superomedia of propodeum 1.5 to 1.6 times as wide as long. Hind femora and second to third terga black.... ***C. pilosa* Sheng & Sun, sp. n.**
- Notaulus not reaching to center of mesoscutum. Scutellum normal, weakly convex, lateral sides slanting downwards. Area superomedia of propodeum 1.9 to 2.1 times as wide as long. Hind femora and second to third terga reddish brown..... ***C. punctulata* Sheng & Sun, sp. n.**

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