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Re-description of *Xysticus bimaculatus* L. Koch, 1867 (Araneae, Thomisidae) and characterization of its subsocial lifestyle

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Abstract

Spiders have become an important model to study the evolution of sociality, but a lack of their detailed natural history and taxonomy hinders broader comparative studies. Group-living crab spiders (Thomisidae) provide an excellent contrast to other social spiders since they lack a communal capture web, which was thought to be a critical factor in the evolution of sociality. Only three non-webbuilding crab-spider species are known to be subsocial or social, all of which belong to the genus *Diaea* Thorell, 1869. The aim of this study is to describe the social lifestyle of *Xysticus bimaculatus* L. Koch, 1867 for the first time. Furthermore, we present a detailed re-description of this species and discuss its taxonomic implications. Like other subsocial crab spiders, *X. bimaculatus* builds nests from tree leaves. Nests contain up to 38 spiders and sometimes several adult females, indicating the species may be at a transitory stage between subsociality and permanent sociality.

Keywords

Social spider, cooperation, female care, micro-CT, palp, taxonomy

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Introduction

The evolution of sociality is puzzling and determining factors that promote the transition towards a social lifestyle is a major challenge in evolutionary biology. Animals living in social groups benefit from cooperation in foraging, brood care and protection from predators (Brockmann 1997; Brown 1983; Choe and Crespi 1997; Creel 2001; Dechmann et al. 2010; Unglaub et al. 2013), but group living also entails costs such as competition for mating partners (Huchard and Cowlishaw 2011). In the last 20 years, the social lifestyle of "non-traditional" social taxa such as clonal aphids (Abbot 2009) or spiders (Avilés 1997; Lubin and Bilde 2007) has become of increasing interest. Spiders are recognized as important model organism to study the evolution of sociality (Agnarsson 2012; Agnarsson et al. 2006; Avilés 1997; Evans 1998a; Johannesen et al. 2005; Lubin and Bilde 2007; Ruch et al. 2009; Schneider and Bilde 2008; Yip and Rayor 2013). They are generally very aggressive and sociality in spiders is extremely rare (Agnarsson et al. 2006; Bilde and Lubin 2011). Nevertheless, sociality has evolved several times independently across eight families (Agnarsson et al. 2006), suggesting strong selective benefits from living in groups. However, identification of the selective agents is difficult due to a lack of detailed natural history and taxonomy of solitary, subsocial and social species (Agnarsson 2012). Such knowledge facilitates comparisons of factors promoting social behavior in general, for instance ecological factors (Avilés and Harwood 2012; Corcobado et al. 2012) and/or kin selection (Schneider and Bilde 2008).

The generally accepted hypothesis is that sociality in spiders evolved via the 'subsocial route', meaning that permanent sociality derived from ancestors with extended maternal care (Lubin and Bilde 2007; Wickler and Seibt 1993). This hypothesis is corroborated by the phylogenetic reconstruction of social spider lineages (Agnarsson et al. 2006; Johannesen et al. 2007). Subsocial spiders differ from permanently social spiders in that they disperse prior to mating and thus have an outbred mating system (Agnarsson et al. 2006; Avilés 1997; Lubin and Bilde 2007). In both, subsocial and social spiders, females care intensively for offspring and the latter cooperate, for instance, in hunting, foraging, webbuilding and predator defence (Avilés 1997; Lubin and Bilde 2007; Ruch et al. 2014a; Yip and Rayor 2013). A major characteristic explaining the evolution and maintenance of sociality in spiders is the construction of a communal capture web, which allows capturing large prey items (Avilés 1997; Lubin and Bilde 2007). Non-webbuilding subsocial and social lineages are documented in only two families, huntsman spiders (Sparassidae Bertkau 1872) as well as crab spiders (Thomisidae Sundevall 1833) The social lineages of both taxa can be exclusively found in Australia (Agnarsson and Rayor 2013; Evans 1995).

To date, all subsocial and social crab spiders are described in the genus *Diaea* Thorell, 1869 (Evans 1995). Three species are known to be subsocial or social: *D. socialis* Main, 1988 from Western Australia, *D. ergandros* Evans, 1995 and *D. megagyna* Evans, 1995 (= *D. inornata* (Szymkowiak and Dymek 2012)) from southeastern Australia (Evans 1997). Subsocial/social *Diaea* mainly build nests in small-leaved *Eucalyptus* trees. The climatic conditions in their habitats seem to be relatively similar across the range of their distribution from southern Queensland to Tasmania as well as in Western Australia (Evans 1997). Nest inhabitants are usually related, however, groups accept immigrating spiders from other nests in *D. ergandros* (Evans 1998a; Evans and Goodisman 2002). The presence of immigrating spiderlings seems to affect group dynamics and female care in *D. ergandros* (Ruch et al. 2014b) and female care is very important for offspring survival (Evans 1998a, b; Unglaub et al. 2013).

We have recently identified another case of subsociality in crab spiders: *Xysticus bimaculatus* L. Koch, 1867. The discovery of social behavior in a species outside the *Diaea* genus suggests a possible independent evolutionary event and thus the potential to identify common drivers in the evolution of sociality in spiders. Here, we describe the natural history and subsocial lifestyle for the first time (Koch 1867, 1876) and present a re-description of the species.

Methods

We initially discovered nests inhabited by several individuals of *Xysticus bimaculatus* L. Koch, 1867 in July 2011 on trees along the Enoggera Reservoir, Queensland, Australia (27°26'27.69"S, 152°55'29.03"E). We later surveyed spider nests in November 2011, April 2012 and November 2012 ($N = 166$) at four locations around Brisbane (Brisbane Forest Park, Toohey Forest, Mt Coot-tha, Mt Tibrogargan). During these surveys, we measured the nests and identified the trees these were built in. We determined the group composition (number, developmental stage and sex) of spiders inhabiting the nests. We used these data to pinpoint the dispersal stage of spiderlings, which is an indicator of the degree of sociality (Avilés and Harwood 2012; Lubin and Bilde 2007). All immature individuals are referred to as 'spiderlings'. We moreover recorded prey items as well as commensals and potential predators in active nests that were inhabited by at least one spider ($N = 131$).

For the species re-description, specimens were compared with collection material located at the Australian Museum, Sydney, the Queensland Museum, Brisbane and the Zoological Museum Hamburg and included species from the genera *Cymbacha*, *Diaea*, *Tharpyna* and *Xysticus* (see Suppl. material 1 (material examined), type *X. bimaculatus* see Figure 1). The description of the seta pattern was performed using the format described by Ramirez (2003).

Since the type locality has not been accurately specified in the original description, the species was re-described from specimens collected in the Enoggera Reservoir in April 2012. Specimens were stored in 70% EtOH and examined using a Zeiss Discovery V20 stereo microscope and imaged with a Zeiss MCr camera and a Leica M205A with a Leica 290 camera as well as with a Keyence Digital Microscope VHX-500 F. The images were edited and plates arranged using Adobe Photoshop CS4.

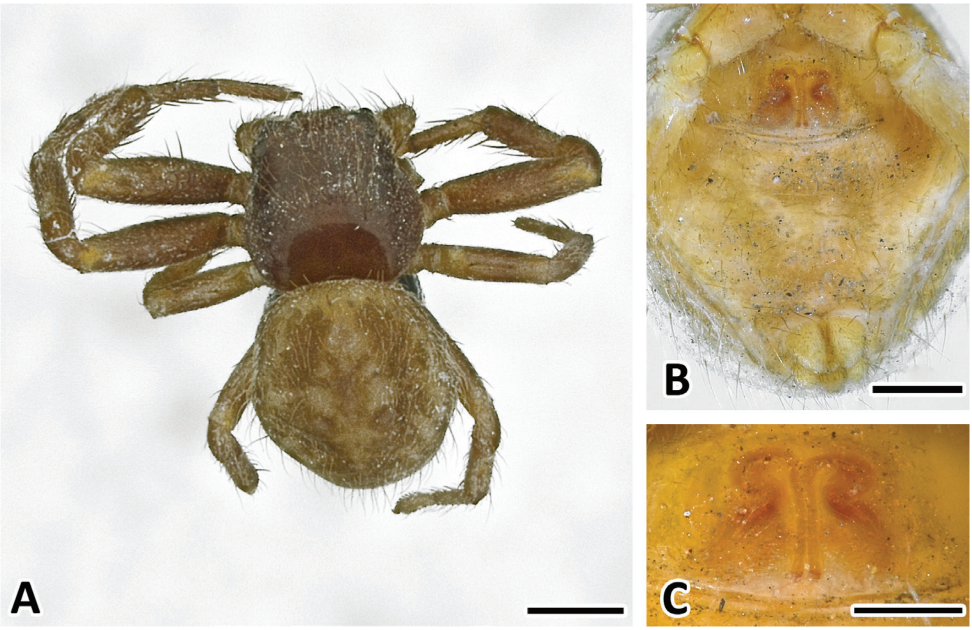

Figure 1. Female holotype of *Xysticus bimaculatus,* (MG 2260, now ZMH). **A** Habitus, scale bar 1 mm **B** Ventral, scale bar = 0.5 mm **C** Epigyne, scale bar = 0.25 mm.

Female copulatory organs were dissected and macerated using pancreatin (Alvarez-Padilla and Hormiga 2007) and imaged with a Zeiss MCr camera mounted on a Olympus BX60 light microscope.

The left male palpus (sperm transfer organ) was stained with a 1.0% iodine solution overnight and critical point dried for the micro-tomographic analyses. The dry palp was mounted onto an insect pin and scanned with an Xradia MicroXCT-200 X-ray imaging system (Carl Zeiss X-ray Microscopy Inc., Pleasanton, USA) at 30 kV and 6 W (20.0 scintillator-objective lens unit, 6 seconds exposure time, 1.18 µm pixel size). The data were processed using the 3D analysis software AMIRA v5.4.2 (Visage Imaging, Berlin, Germany). Selected parts of the palp were reconstructed by delineation of the contours in each section and surfaces were computed using the surface editor.

Analyses

Statistical analyses on spider group composition were performed using JMP 9.0 (SAS Institute Inc., USA). Figures were prepared with R version 2.15.3 (R Development Core Team 2013). Continuous data were tested for normal distribution (Shapiro-Wilk-Test) as well as for equal variance. Since data were not normally distributed we used non-parametric tests. Descriptive statistics are given as mean ± standard error (SE).

All measurements in the description are presented in mm unless stated otherwise.

Results

Natural history

Nest characteristics and host trees

The nests of *Xysticus bimaculatus* L. Koch, 1867 were constructed from 7.77 ± 0.49 leaves (range = 2–48 leaves, $N = 149$). The inside of the nests usually consisted of older, brown leaves and spiders subsequently and repeatedly attached fresh green leaves on the outside. The most comsmon host tree across all study sites was Blackwood (*Acacia melanoxylon*, 68%, Figure 2D). However, the spiders were not restricted to these trees and could also be found on other species, for example Brisbane Golden Wattle (*Acacia fimbriata*, 7%, Figure 2E) and Soap Trees (*Alphitonia excelsa*, 20%, Figure 2C).

Group composition

X. bimaculatus has an annual life cycle. Living spiderlings were found in 120 of the 166 surveyed nests. 27 of the 166 nests were old and no longer inhabited by *X. bimaculatus*. Adult living females were found in 71 nests. Ten of these adult females were found with an egg sac and the others with living spiderlings. On average, we found 10.5 ± 0.3 spiderlings per nest and group size ranged between one and 38 spiderlings ($N = 120$ nests). We found five size classes of spiderlings and all of these were found with caring adult females present in both seasons of examination (April and November). Usually, all spiderlings within a nest were of approximately the same size. We tested whether there was a certain size class after which group size decreases and found that there was no significant difference between size class (as a factor) and number of spiders inhabiting the nests (Wilcoxon Rank Sums: $\chi^2_4 = 3.59$, $P = 0.46$, $N = 116$, Figure 3), although the largest size class was found in smaller groups. This finding indicates that spiders disperse only shortly before maturation. While adult females were alive and present in 85.71% of nests containing small spiderlings (size class 1, $N_{nests} = 14$), the presence of an adult female significantly declined when spiderlings were larger (Pearson: $\chi^2 = 9.8$, $P = 0.04$, $N = 116$). However, the likelihood of an adult female present did not differ between size class 2 with 43.75% ($N_{nests} = 32$), size class 3 with 56% ($N_{nests} = 25$), size class 4 with 40.74% ($N_{nests} = 27$) and size class 5 with 38.89% ($N_{nests} = 18$) of the nests containing an adult living female. Subadult and adult males were exclusively found in November with a maximum of six adult males in a single nest.

In four nests we found multiple adult females caring for a brood and in four other cases we found two distinct broods within one nest (these were excluded from the analyses of age and number of spiders). The presence of multiple adult females did not overlap with the presence of two distinct broods within one nest. Living adult females were found in April (56.57%) as well as in November (26.79%), meaning that the presence of an adult living female inside the nest was significantly more likely in April (Pearson: $\chi^2 = 12.78$, $P = 0.0004$). The number of spiderlings per nest was significantly higher when an adult female was present (Wilcoxon: $Z = -4.31$, $P < 0.0001$, $N = 120$, Figure 4).

Figure 2. A Male and female *Xysticus bimaculatus* **B** Spiders attach leaves with silk to construct a typical nest **C** Nest constructed from *Alphitonia excelsa* **D** Nest constructed from *Acacia melanoxylon* **E** Nest constructed from *Acacia fimbriata.* Scale bars = 1 cm.

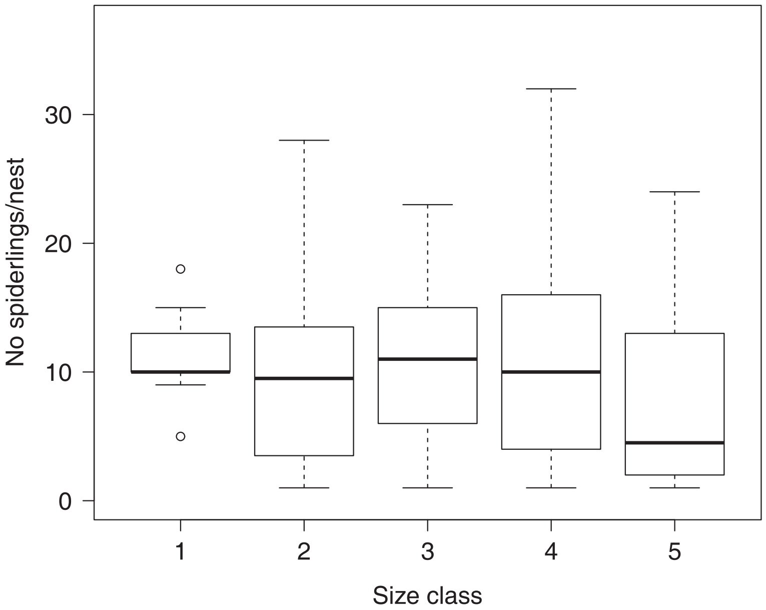

Figure 3. Average number of spiderlings per nest depending on spiderling size class (which reflects age). We found no significant decline in group size with increasing size class, indicating that spiderlings disperse shortly before maturation. The upper and lower whiskers show 1.5 times interquartile range, the box shows median and upper and lower quartile. Individual dots indicate outliers.

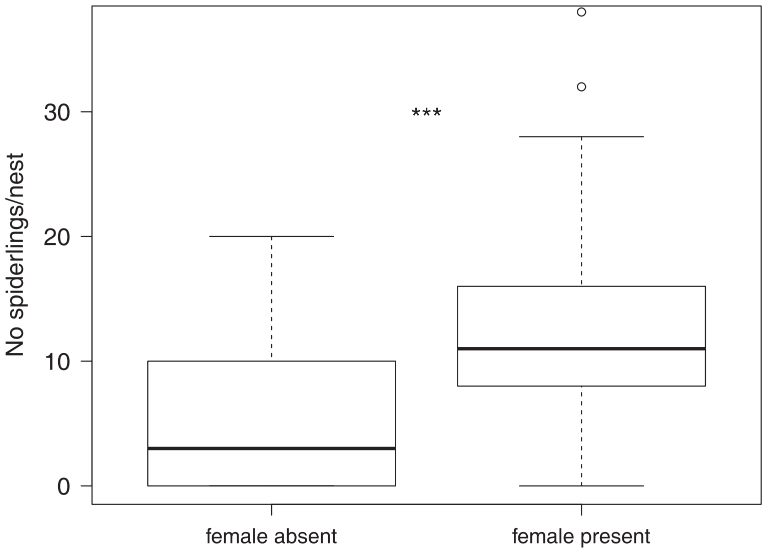

Figure 4. Number of spiderlings per nest is positively correlated with the presence of a caring female. The upper and lower whiskers show 1.5 times interquartile range, the box shows median and upper and lower quartile. Individual dots indicate outliers. *** $P < 0.0001$ indicates a statistically significant difference.

Prey, commensals and potential predators

On average, nests contained 2.3 ± 0.25 prey items ($N = 131$ nests). Main prey types were beetles (Coleoptera, 50%) and ants (Hymenoptera, 36%). In addition, we found wasps (Hymenoptera, 2%), caterpillars (Lepidoptera, 6%) and flies (Diptera, 1%). Most abundant commensals were woolly scale insects (Hemiptera, Coccoidea, 13%) and cockroaches (Blattodea, < 5%). Potential predators present in the nest were other spiders, for example Clubionidae (4%) and Salticidae (1%).

Species Re-description

Abbreviations

AM	Australian Museum, Sydney, Australia
MG	Museum Godefroy (now Zoological Museum Hamburg)
ZMH	Zoological Museum Hamburg, Germany
ALE	anterior lateral eyes
AME	anterior median eyes
PLE	posterior lateral eyes
PME	posterior median eyes
RTA	retrolateral tibial apophysis

Female

Based on paratype female KS120583 (AM).

Measurements

Body length: 4.36, carapace length: 1.83, carapace width: 1.83, carapace height: 1.21, carapace length/width ratio: 1, abdomen length: 2.53, abdomen width: 2.34, abdomen height: 2.03, abdomen length/width ratio: 1.08.

Coloration and markings

Carapace and chelicerae colored evenly black-brown. Sternum brown-yellowish with a darker outer frame. Labium and maxillae dark brown with white tips (Figure 5D).

The first two legs (Leg I & II) black-brown with faint orange annulations. Femur of leg I and II black-brown, patella anterior orange and posterior black, tibia anterior black with orange annulation and posterior black-brown, metatarsus and tarsus anterior orange and posterior black-brown.

Leg III and IV with distinct white annulations. Femur of leg III and IV anterior white and posterior black, patella anterior white and posterior black, tibia anterior black with white annulation and posterior black, metatarsus and tarsus anterior more white than black.

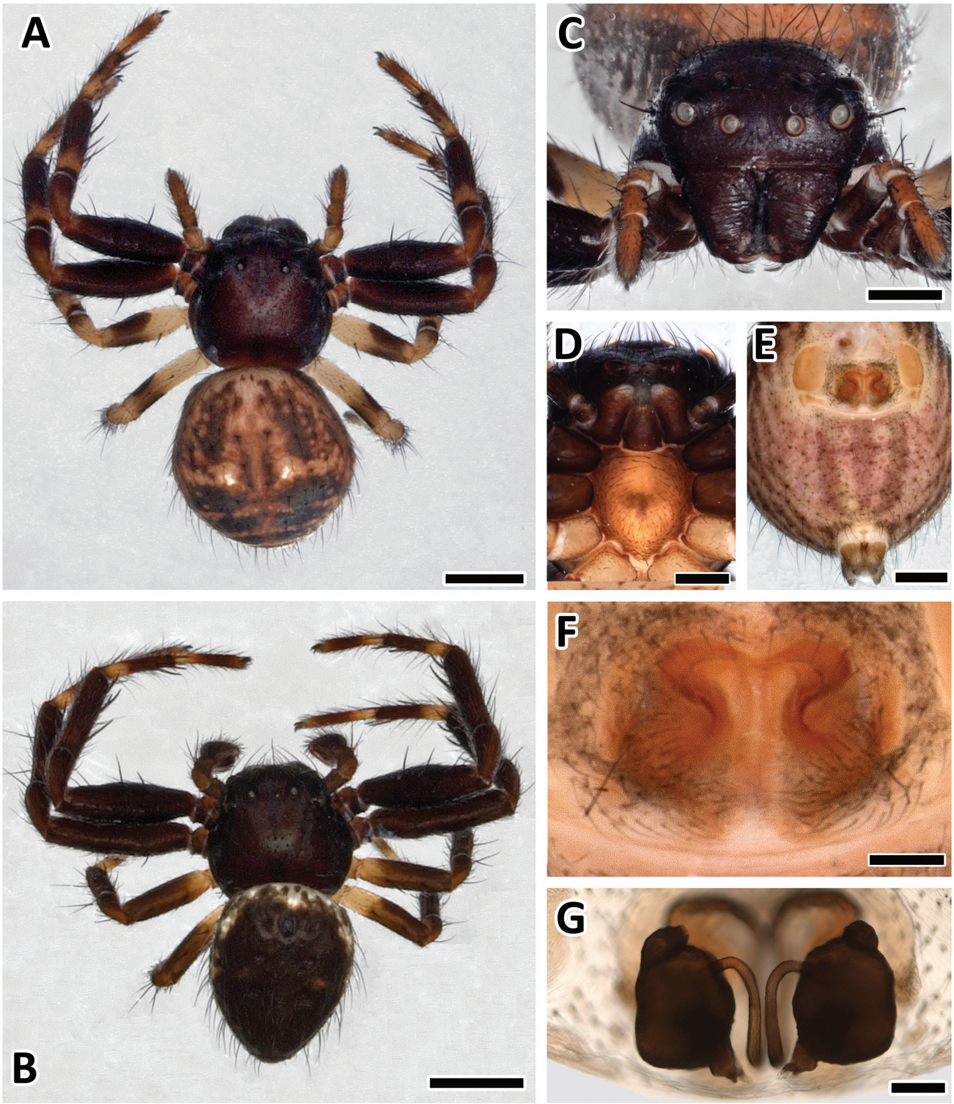

Figure 5. A Female *Xysticus bimaculatus* (AM, KS120583), habitus, scale bar = 1 mm **B** Male (AM, KS120583), habitus, scale bar = 1 mm **C** Female (AM, KS120583), frontal view, scale bar = 0.5 mm **D** Female (AM, KS120583), sternum and maxillae, scale bar = 0.4 mm **E** Female (AM, KS120583), ventral view, scale bar = 0.5 mm **F** Female (AM, KS120583), epigyne, scale bar = 0.25 mm **G** Female (AM, KS120583), vulva, scale bar = 0.1 mm.

Abdomen dark brownish with a dark indented cranial spot and two white spots dorsally in the middle (Figure 5A). Sides of the abdomen with black-brown vertical stripes. Ventral side of the abdomen lighter than the dorsal side with a dark brown section between epigyne and spinnerets (Figure 5E). Surroundings of the epigyne dark, spinnerets brown-yellowish.

Carapace

Carapace shape slightly convex and as long as wide.

Eyes

Lenses on order of diameter: ALE > PLE > AME > PME.

Distance between eyes: AME—AME = 0.45, ALE—ALE = 1.1, AME—ALE = 0.29, ALE—PLE = 0.29, PLE—PLE = 1.39, AME—PME = 0.33, PME—PME = 0.59, PME—ALE = 0.34, PME—PLE = 0.39.

Clypeus width 1.1, height 0.37, surface smooth. One long lateral seta (0.26) next to ALEs.

Chelicerae, maxillae and labium

Chelicerae oval and bulky, length 0.65 and width 1.09, wrinkled surface (Figure 5C). Fangs short (0.17).

Maxillae rounded, arched around labium, length 0.51. Labium shorter (0.36) than maxillae.

Sternum

Shield-shaped and convex, narrower towards leg III and IV, 0.84 long and 0.74 wide. Covered with fine setae (Figure 5D).

Legs

Legs I and II longer than legs III and IV. Surface of the legs evenly covered with setae. Leg setation: **I**: femur d 0-0-1, p 0-2-2-0; tibia p 0-0-1-0, v 2-2-2; metatarsus r 1(ap), v 2-2-0-2-p1; **II**: femur d 1-1; tibia v 0-2-0-2-2; metatarsus v 0-2-0-2-2; **III**: femur d 1-1; tibia v 2(ap); metatarsus p d1, v 2; **IV**: femur d 0-1-1-0; tibia v 2(ap); metatarsus p 2

Leg I. Fe: 1.73, Pa: 0.71, Ti: 1.15, Me: 0.90, Ta: 0.85, Total: 5.34
Leg II. Fe: 1.69, Pa: 0.77, Ti: 1.19, Me: 0.85, Ta: 0.85, Total: 5.34
Leg III. Fe: 1.21, Pa: 0.49, Ti: 0.76, Me: 0.53, Ta: 0.53, Total: 3.53
Leg IV. Fe: 1.36, Pa: 0.48, Ti: 0.84, Me: 0.59, Ta: 0.56, Total: 3.84
Leg formula: I = II > III < IV

Abdomen

Oval, covering the posterior part of the cephalothorax. Covered with evenly arranged setae. Five obvious indents.

Genitalia

Epigyne slightly wider than long (Figure 5F). Copulatory openings in upper part of epigyne medially to broad heart-shaped sclerotized central hood. Copulatory ducts curved, leading to large ovoid and bipartite spermathecae (Figure 5G).

Male

Based on paratype male KS120583 (AM)

Measurements

Body length: 3.3, carapace length: 1.43, carapace width: 1.50, carapace height: 1.01, carapace length/width ratio: 0.95 abdomen length: 1.87, abdomen width: 1.49, abdomen height: 1.23, abdomen length/width ratio: 1.25

Coloration and markings

Carapace and chelicerae black-brown, sternum brown. Labium and maxillae dark brown with white tips. Palps dark brown.

Leg I & II black-brown with posterior annulations. Femur, patella and tibia of leg I and II black-brown, metatarsus and tarsus anterior white and posterior black-brown.

Leg III and IV with distinct white annulations. Femur and patella of leg III and IV anterior white and posterior black, tibia anterior black with white annulation and posterior black, metatarsus and tarsus anterior more white than black.

Abdomen black with a white anterior frame, an anterior dark indented spot and four median dark indented spots (Figure 5B). Sides of the abdomen black. Ventral side of the abdomen dark brown, spinnerets brown.

Carapace

Carapace slightly convex and as long as wide.

Eyes

Distance between eyes: AME—AME = 0.38, ALE—ALE = 0.90, AME—ALE = 0.29, ALE—PLE = 0.30, PLE—PLE = 0.95, AME—PME = 0.24, PME—PME = 0.46, PME—ALE = 0.27, PME—PLE = 0.31.

Clypeus width 1.14, height 0.39, surface smooth. One long lateral seta (0.31) next to ALEs.

Chelicerae, maxillae and labium

Chelicerae oval and bulky 0.41 long, 0.70 wide, wrinkled surface. Fangs 0.17 long.

Maxillae rounded, arched around labium, 0.43 long. Labium shorter (0.28) than maxillae.

Sternum

Shield-shaped and convex, narrower towards leg III and IV, covered with fine setae. 0.80 long and 0.68 wide.

Legs

Setation of legs: **I**: femur d 1-1, p 1-1; tibia p 1-1, r 1-1, v 2-2-2; metatarsus p 0-1-1, r 0-1-1, v 2-2; **II**: femur d 1-1; tibia p1-1, r 1-1, v 0-2-0-2-2; metatarsus p 2-1(ap), r 1-1(ap), v 0-r1; **III**: femur d 1-1; tibia p 0-1, r 1, v p1-2(ap); metatarsus p 0-2, r 0-1; **IV**: femur d 1-0-1; tibia r 0-1, v p1-2(ap); metatarsus r 1, v 0-0-p1-p1

Leg I. Fe: 1.47, Pa: 0.61, Ti: 1.02, Me: 0.88, Ta: 0.94, Total: 4.91
Leg II. Fe: 1.47, Pa: 0.53, Ti: 0.92, Me: 0.81, Ta: 0.76, Total: 4.49
Leg III. Fe: 1.01, Pa: 0.41, Ti: 0.56, Me: 0.49, Ta: 0.43, Total: 2.90
Leg IV. Fe: 0.99, Pa: 0.40, Ti: 0.60, Me: 0.57, Ta: 0.44, Total: 3.00
Leg formula: I > II > III < IV

Abdomen

Egg-shaped, covered with evenly arranged setae. Five obvious indents.

Genitalia

Male pedipalps small with convex cymbium (Figure 6). Embolus short. Tibial apophyses strongly sclerotized. Ventral and intermediate tibial apophyses of similar length and half the size of RTA, RTA curved towards dorsal. No bulbar muscles, well-developed basal hematodocha. Large apodeme in distal part of tibia as attachment for two tibial muscles.

Distribution

Probably widespread in sclerophyll forests around Brisbane, Queensland (Australia).

Discussion

We report the demographics of *Xysticus bimaculatus*, a non-webbuilding subsocial crab spider from southern Queensland. Its lifestyle appears to be very similar to the subsocial crab spider *Diaea ergandros* (Evans, 1995). Like in other subsocial crab spiders, the presence of a caring female seems to be important for offspring survival in *X. bimaculatus*. We found higher numbers of spiderlings in nests with a caring adult female present and a similar pattern was found in *D. ergandros* (Unglaub et al., 2013). The presence of an adult female is beneficial in *D. ergandros*, but also in the subsocial huntsman spider *Delena cancerides*, since adult spiders are able to capture prey more efficiently (Evans 1998a, b; Yip and Rayor 2011). We found that the likelihood of an adult living *X. bimaculatus* female being present in the nest was high when spiderlings were very young but declined when spiderlings were older. In *D. ergandros* some females are consumed by their offspring (matriphagy) (Evans et al. 1995) and it remains to be studied whether matriphagy occurs in *X. bimaculatus* as well and could explain the reported pattern.

Unlike subsocial *Diaea*, *X. bimaculatus* builds its nests mostly from *Acacia* and not from *Eucalyptus* leaves. This may favor the occurrence of the species in areas that are dominated by *Acacia melanoxylon*, which is however widely distributed and common along the Australian east coast. We only recorded those trees that were used for nest construction and did not quantify potentially available host trees, but both *Acacia* and *Eucalyptus* trees were present in all of our study sites. We never found *D. ergandros* and *X. bimaculatus* occurring sympatrically. *D. ergandros* seems to be absent along the

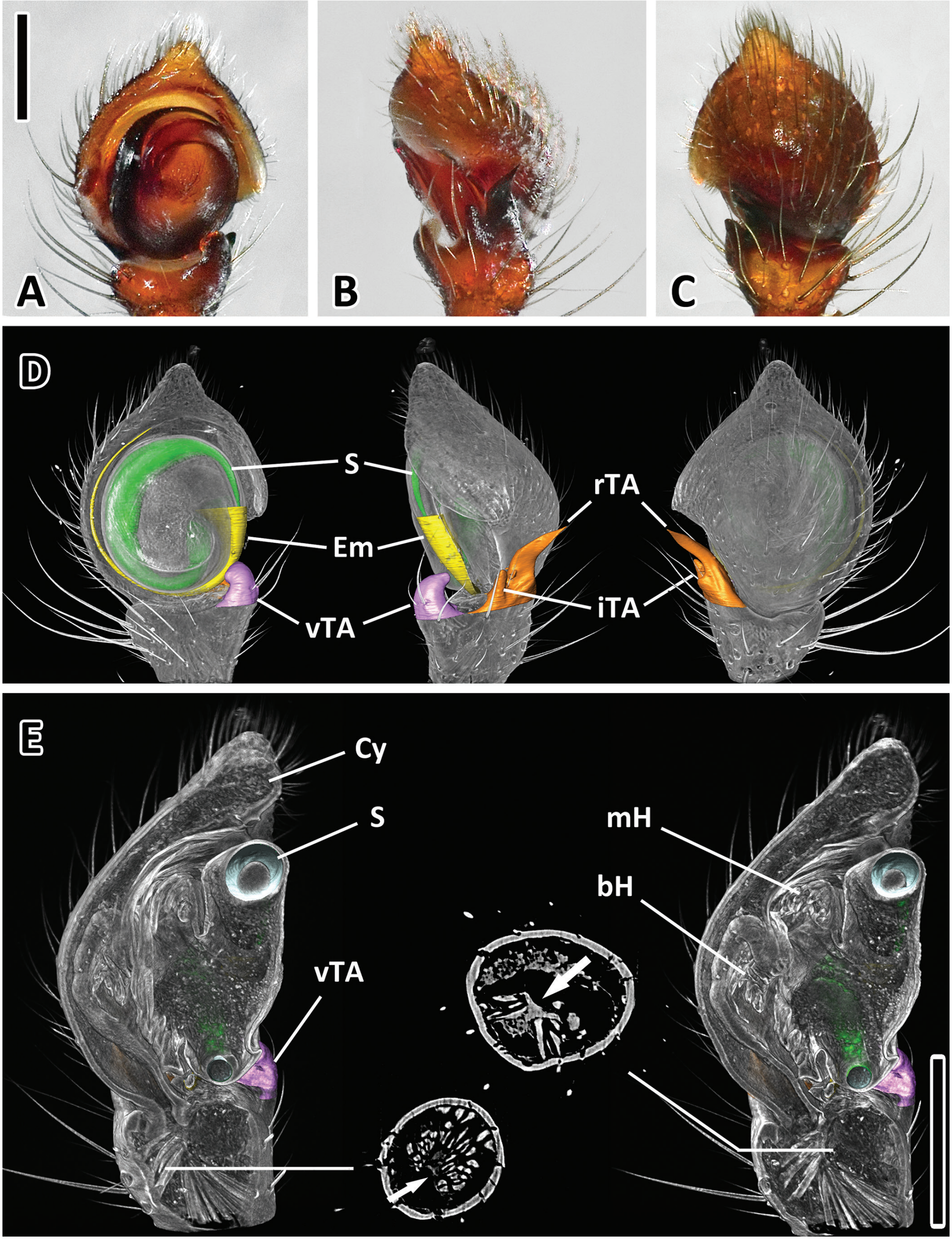

Figure 6. Left male palp of *Xysticus bimaculatus* (AM, KS120583) **A** Ventral view **B** Retro lateral view **C** Dorsal view **D** Colored surface models of different parts of the male superimposed on the volume rendering of the male palp (ventral, retrolateral, dorsal) **E** Longitudinal sections of the volume rendered male palp showing the two prominent hematodochae. Muscles are only present in tibia and attached to a large apodeme (see arrows in cross-sections). Abbreviations: **bH** basal hematodocha; **Cy** cymbium; **Em** embolus; **iTA** intermediate tibial apophysis; **mH** median hematodocha; **rTA** retrolateral tibial apophysis; **S** spermophor; **vTA** ventral tibial apophysis. Scale bars = 0.25 mm.

northern coast of New South Wales and southern coast of Queensland (Evans 1997) and so far we did not detect *X. bimaculatus* nests south of Queensland.

Similar to *D. ergandros*, nests of *X. bimaculatus* serve as foraging areas and major prey types are beetles (Coleoptera), but also wasps and ants (Hymenoptera) (Evans 1998a). In contrast to *D. ergandros* nests (Unglaub et al. 2013), we only found very few potential predators inside nests of *X. bimaculatus* however, the nest may still protect spiders from predators that we did not detect.

We found that nests contain on average 10 spiderlings in *X. bimaculatus*, which is fewer than in *D. ergandros*, where nests contain on average 45 inhabitants (Evans 1995). However, spiderling numbers in *X. bimaculatus* did not significantly decrease with increasing age, indicating that spiders have a relatively long period of communal activities. The finding that spiders disperse only shortly before maturation suggests a transitory stage between subsocial and permanently social (Lubin and Bilde 2007). In almost all social spiders studied to date, a transition from subsociality to sociality is accompanied by a switch from outbreeding to inbreeding, which has major consequences for speciation processes (Agnarsson 2012; Agnarsson et al. 2006; Agnarsson et al. 2013; Bilde et al. 2005; Johannesen et al. 2007). An exception can be found in social spiders of the genus *Tapinillus* (Oxyopidae), which is thought to be outbred because it does not have a female-biased sex ratio (Avilés 1994). It would be highly interesting to investigate the mating system and sex-ratio of *X. bimaculatus* and to compare it with other subsocial and social crab spiders.

The taxonomy of Thomisidae is challenging and a revision of most genera is needed (Benjamin et al. 2008; Szymkowiak 2007). Similarly, a recent molecular phylogeny of Sparassidae showed that two genera with subsocial species previously described as *Eodelena* are synonymous with *Delena* and all three known group-living *Delena* are closely related (Agnarsson and Rayor 2013). A molecular phylogeny of the group-living Thomisidae may thus help to understand whether sociality has evolved multiple times in this family or whether the species, albeit being assigned into different genera, are closely related as well. Since thomisid genera often lack a clear definition and diagnosis, species were assigned (especially in Australia) to the most common and cosmopolitan genera *Diaea*, *Misumena*, *Thomisus* and *Xysticus* (Lethinen 2002; Szymkowiak 2007). However, the taxonomic status of these genera is highly problematic. For example, Jantscher (2002) studied various thomisid genera of central Europe with a focus on the genus *Xysticus* and found at least three different groups within this genus characterized by the organization of the male palp (further previous suggestions of subgroups within *Xysticus* s.l. are reviewed in Jantscher (2002) and not addressed here). Since *X. bimaculatus* lacks tegular structures it does not belong to the group "*Xysticus* s. str." sensu Jantscher (2002), which is characterized by a complex tegular structure and at least two distinct tegular apophyses. Based on the apomorphies proposed by Jantscher (2002), *X. bimaculatus* might be part of the "*Proxysticus*" group characterized by the three distinct tibial apophyses. Nevertheless, these suggestions are only based on data of European material and comprehensive studies of *Xysticus* s.l., a group which is likely paraphyletic (Jantscher 2002) are still lacking.

Although crab spiders have a worldwide distribution (Platnick 2014) group-living crab spiders can be exclusively found in Australia. This continent has a history of long isolation and is renowned for its harsh environmental conditions (Herberstein et al. 2014). It has been suggested that certain evolutionary phenomena are more pervasive in Australia, such as cooperative breeding or deception (Herberstein et al. 2014). Some solitary Australian crab spiders, for example, use their body UV reflection as deceptive signal to attract and hunt naïve pollinators (Heiling et al. 2004). The harsh environmental conditions prevalent in Australia may as well have played a role in the evolution of sociality in two spider families (Thomisidae and Sparassidae). The multiple independent origins across spider families provide the opportunity for comparative investigations aiming to unravel selective forces being responsible for the evolution of this lifestyle. Since both Thomisidae and Sparassidae do not build capture webs, alternative perspectives on key factors for the evolution of sociality need to be considered (Evans 1998a). Ecologically rather similar, the subsocial *Xysticus* and *Diaea* are a very suitable model to study their behavior and its drivers on comparative grounds.

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Author contributions

JR and TR collected the field data, compared specimens in museum collections, measured specimens and took photographs of collection material. JR analyzed and interpreted the natural history data. TR took the in situ photographs. PM scanned and reconstructed the male palp and described the seta pattern. Figure plates were prepared by JR, TR and PM. JR wrote the manuscript, with contributions from TR and PM.

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Supplementary material 1

List of species examined

Jasmin Ruch, Torben Riehl, Peter Michalik

Data type: specimens data

Explanation note: The table shows a list of all species examined as well as the location of the material. Sex (male, female or juvenile) and whether the material was type material (yes/no) is shown as well.

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RESEARCH ARTICLE

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Revision of the East Mediterranean *Orthomus* (Coleoptera, Carabidae, Pterostichini), with description of *Parorthomus* gen. n. *socotranus* sp. n. from Socotra Island and key to the Old World genera of subtribe Euchroina

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Abstract

The East Mediterranean species of *Orthomus* Chaudoir, 1838 are revised. The type series of *Feronia longula* Reiche & Saulcy, 1855, *F. berytensis* Reiche & Saulcy, 1855, *F. proelonga* Reiche & Saulcy, 1855, *Orthomus longior* Chaudoir, 1873, *O. sidonicus* Chaudoir, 1873, and *O. berytensis akbensis* Mateu, 1955 were studied and lectotypes for the first four are designated. Also, the following nomenclatural acts are proposed: *Feronia proelonga* Reiche & Saulcy, 1855, **syn. n.** of *Orthomus berytensis* (Reiche & Saulcy, 1855); *Feronia elongata* Chaudoir, 1859, **syn. n.** of *Orthomus berytensis* (Reiche & Saulcy, 1855); *Orthomus sidonicus* Chaudoir, 1873, **syn. n.** of *Orthomus longior* Chaudoir, 1873; *Orthomus velocissimus andalusiacus* Mateu, 1957, **syn. n.** of *Orthomus velocissimus akbensis* Mateu, 1955, new assignment for *Orthomus berytensis akbensis* Mateu, 1955. As a result, three species of the genus inhabit the East Mediterranean biogeographical region: *O. berytensis*, *O. longior*, and *O. longulus*. A key to these three species is given. *O. longior* is recorded for Turkey and Syria for the first time. In addition, a new synonymy of two West Mediterranean taxa is proposed: *O. szekessyi* (Jedlička, 1956), **syn. n.** of *O. balearicus* (Piochard de la Brûlerie, 1868), and a new genus and a species are described: *Parorthomus* **gen. n.** *socotranus* **sp. n.**

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(type locality: Republic of Yemen, Socotra Archipelago, Socotra Island, Fimihin env., 530 m.a.s.l.). Illustrations of the species dealt with here are provided including external characters, habitus, mentum and submentum, and genitalia are provided.

Nine genera of the "African Series" of subtribe Euchroina Chaudoir, 1874 are keyed for the first time. Checklists of the species of *Orthomus* and of the Old World euchroine genera are given.

Keywords

Coleoptera, Carabidae, Pterostichini, *Orthomus*, *Parorthomus*, taxonomy, new genus, new species, new synonyms, lectotype designation, key, checklist, East Mediterranean, Spain, Republic of Yemen

Introduction

Orthomus Chaudoir, 1838 is a Palaearctic genus of pterostichine carabid beetles with Circum-Mediterranean distribution, which includes 23 species (Bousquet 2003, Lorenz 2005, Wrase and Jeanne 2005, Pupier and Coulon 2013). The greatest diversity of species is concentrated in the Western Mediterranean, mostly in the Iberian Peninsula and North-West Africa. Only a few species live in the Eastern Mediterranean. The group is often ranked as nominotypical subgenus of *Orthomus* s.l., together with the Macaronesian *Eutrichopus* Tschitschérine, 1897 (three species), *Gietopus* Machado, 1992 (one species), *Nesorthomus* Bedel, 1899 (eight species), *Wolltinerfia* Machado, 1985 (two species), and the North-West African *Trichopedius* Bedel, 1899 (one species) (Bousquet ibid., Lorenz ibid., Serrano et al. 2009, Serrano et al. 2012), but some authors accepted a generic status (Mateu 1954, Machado 1992, Ortuño 1996, Wrase and Jeanne 2005, Donabauer 2008).

A recent work on mitochondrial DNA variations among species of *Eutrichopus*, *Wolltinerfia* and *Orthomus*, found relatively high genetic divergence between them and suggested dealing with these as distinct genera (Moya et al. 2004: 3163). Based on established phyletic distance, the last taxon is treated here as an independent genus.

All the afore-enumerated taxa together with the Afrotropical genera *Abacillius* Straneo, 1949 and *Abacillodes* Straneo, 1988 were referred as to the "African Series" of subtribe Euchroina Chaudoir, 1874 (Will 2006). The species included in Euchroina share several derived characters that is exceedingly short or no coronal suture (i), ventrally extended membranous band on the maxillary stipes (ii) in the larvae (Bousquet and Liebherr 1994), well-impressed frontal furrows of head, not or hardly attaining the level of anterior supra-orbital puncture (iii), hind trochanters without setae (iv), and "gooseneck" shaped bursa copulatrix (v) in the imago (Will 2002, 2006, Frania and Ball 2007), which suggest monophyletic origin of the subtribe. Besides, most Old World euchroines have relatively large and prominent eyes compared to the size of the head, submentum without lateral setae, distinct parascutellar stria, sternites V-VII with transverse sulci (complete or not), segment 5 of tarsomeres setose beneath and median lobe of aedeagus with dorsal ostium.

The genus *Cedrorum* Borges & Serrano, 1993 from the Azores does not belong to this series as its only species, *C. azoricus* Borges & Serrano, 1993, exhibits a set of features atypical of the euchroines, such as: superficial frontal furrows, submentum with lateral setae, left paramere with a slight transverse aphophysis, falcate right paramere, no transverse sulci on sternites V-VII (contrary to the statement of Borges and Serrano 1993: 320) and segment 5 of tarsomeres glabrous ventrally.

The East Mediterranean species of *Orthomus* were the object of taxonomic reviews quite a while ago (Mateu 1955). Since then, however, new data and new material have accumulated. Investigations of material in several European museum and private collections demonstrated that the identifications of the species from the area in question were often incorrect, our investigations proved the occurrence of only three species there. For example, a review of material from Greece, formerly published or identified as *O. barbarus* and *O. berytensis*, revealed that only the latter species inhabits this country (Arndt et al. 2011: 58). Hence, the necessity to improve our taxonomic knowledge of the East Mediterranean representatives of the genus was the main reason to start this work. Besides, a few years ago one of us (DWW) received a series of *Orthomus*-like specimens from Socotra Island. Subsequent examination has proven that it belongs to a species and a genus new to science.

Material and methods

More than 260 specimens of twenty-four species (and one new to science from Yemen) of Euchroina from the Mediterranean and Afrotropical region were examined: *Abacillius basilewskyi* Straneo, 1962, *Abacillodes jocquei* Straneo, 1988, *A. malawianus* Straneo, 1988, *Orthomus abacoides* (Lucas, 1846), *O. aquila* (Coquerel, 1859), *O. aubryi* Jeanne, 1974, *O. balearicus* (Piochard de la Brûlerie, 1868), *O. barbarus barbarus* (Dejean, 1828), *O. barbarus formenterrae* (Breit, 1933), *O. barbarus penibeticus* Mateu & Colas, 1954, *O. berytensis* (Reiche & Saulcy, 1855), *O. dimorphus dimorphus* Antoine, 1933, *O. dimorphus antoinei* Mateu, 1955, *O. discors* (Wollaston, 1864), *O. hispanicus* (Dejean, 1828), *O. lacouri lacouri* (Antoine, 1941), *O. lacouri kocheri* Mateu, 1955, *O. leprieuri* Pic, 1894, *O. longior* Chaudoir, 1873, *O. longulus* (Reiche & Saulcy, 1855), *O. maroccanus* Chaudoir, 1873, *O. perezii* (Martinez & Saez, 1873), *O. planidorsis* (Fairmaire, 1872), *O. rubicundus* (Coquerel, 1859), *O. starkei* Wrase & Jeanne, 2005, *O. tazekensis tazekensis* (Antoine, 1941), *O. tazekensis rifensis* Wrase & Jeanne, 2005, *O. velocissimus velocissimus* (Waltl, 1835), *O. velocissimus akbensis* Mateu, 1955, *O. velocissimus pardoi* Mateu, 1957. For comparison we examined also several specimens of *Cedrorum azoricus azoricus* Borges & Serrano, 1993 and of *C. azoricus caveirensis* Borges & Serrano, 1993, a species not belonging to the euchroines.

The lectotypes are designated and validated in order to stabilize the nomenclature in the genus according to Article 74.7.3 of the Code (ICZN 1999). Without this action, our concept of some "well-known" species would be uncertain, because in many instances, we dealt with type-series consisting of two or more species, and the series are divided between two museums.

Male specimens were boiled in water and their genitalia were extracted, put in 10% KOH solution, then washed and neutralized and then stored in glycerine. The figures were made with Zeiss transmitted-light microscope. After that, the aedeagus and parameres were embedded in Euparal either on the same card with specimen from which they were extracted or on a separate transparent label beneath the specimen from whom they were removed. The measurements and other drawings were made with the aid of an Olympus SZX10 stereobinocular. The photos of habitus and pronotum were made with a Zeiss Stemi 2000 microscope equipped with an AxioCam ERc 5s camera.

Measurements: body length from the apex of the longer mandible to the apex of the longer elytron (BL); maximum linear distance across the head, including the eyes (HW); maximum width of pronotum (PW); length of pronotum, measured from the apical margin to the basal margin along the midline (PL); width of the pronotal base, between the tips of the hind angles (PbW); length of elytra, from a line connecting the apices of the humeral angles to the apex of the longer elytron (EL); maximum width of elytra (EW). The surface of the paramere close-fitting to the distal part of the median lobe of the aedeagus is denoted as internal face, on the contrary the second surface is the external face.

The material examined is housed in the collections listed below:

BMNH	The Natural History Museum, London, United Kingdom (Max Barkley)
CRHG	Christoph Reuter collection, Hamburg, Germany
DWBG	David W. Wrase collection, Berlin, Germany
HLMD	Hessisches Landesmuseum Darmstadt, Darmstadt, Germany (Sabine Wamser)
IRSNB	Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium (Alain Drumont)
JFPC	Jan Farkač collection, Prague, Czech Republic
JSAG	Joachim Schmidt collection, Admannshagen, Germany
MBAP	Museo del Dipartimento di Biologia Animale dell'Università, Pavia, Italy (Edoardo Razzetti, Stefano Maretti)
MHNG	Muséum d'histoire naturelle, Genève, Switzerland (Julio Cuccodoro)
MIZ	Museum and Institute of Zoology, Polish Academy of Sciences, Warszawa, Poland (Dominika Mierzwa)
MNH	Entomologie, Muséum National d'Histoire Naturelle, Paris, France (Thierry Deuve, Azadeh Taghavian)
MPHG	Manfred Persohn collection, Herxheimweyer, Germany
MRAC	Musee Royal de l'Afrique Centrale, Tervuren, Belgium (Marc De Meyer)
NMNHS	National Museum of Natural History, Sofia, Bulgaria (Borislav Guéorguiev)
NMPC	Národní museum v Prague, Prague, Czech Republic (Jiří Hájek)
NMW	Naturhistorisches Museum Wien, Vienna, Austria (Harald Schillhammer)
PSHG	Peer H. Schnitter collection, Halle, Germany
RFBN	Ron Felix collection, Berkel-Enschot, the Netherlands
TAU	National Collection of Insects, Department of Zoology, Tel Aviv University, Israel (Laibale Friedman)

TFPG	Thomas Forcke collection, Pforzheim, Germany
VSKC	Vladimir Skoupý collection, Kamenné Žehrovice, Czech Republic
ZMAN	Zoölogisch Museum Amsterdam, the Netherlands (Ben Brugge)

Taxonomy

Key to the Old World genera of Euchroina

1 Tarsomeres of all legs glabrous dorsally. Elytra with parascutellar striae well-engraved (long in *Orthomus*, *Abacillodes*, *Parorthomus* gen. n., short in *Abacillius*).. **2**

\- Tarsomeres of all legs pubescent dorsally. Elytra with parascutellar striae vestigial or lacking...**6**

2 Elytra with discal setiferous punctures in interval 3 / stria 3. Mentum tooth bifid...**3**

\- Elytra without discal setiferous punctures. Mentum tooth hardly excavate (*A. aculeatus*) or round (*A. basilewskyi*) at tip ....***Abacillius* Straneo, 1949**

3 Elytra with two setiferous punctures in interval 3 / stria 3, with last puncture in medial third of elytron..**4**

\- Elytra with three to four setiferous punctures in interval 3 / stria 3, with last puncture in posterior third of elytron ....***Parorthomus* gen. n.**

4 Pronotum subquadrate (sides straight or slightly narrowed towards hind angles), with anterior angles slightly to moderately prominent forward. Abdominal sternites V-VII with transverse sulci complete and well-impressed **5**

\- Pronotum subtrapezoid (sides broadened towards hind angles), with fore angles fairly prominent forward. Abdominal sternites V-VII with transverse sulci distinct only laterally (*N. annae* Donabauer, 2008, *N. bedelianus* Lutshnik, 1915 and *N. dilaticollis* Wollaston, 1854) or lacking (remaining species)...... .... ***Nesorthomus* Bedel, 1899**

5 Species with intercoxal process of prothorax bordered and distribution in the Mediterranean biogeographical region..............***Orthomus* Chaudoir, 1838**

\- Species with intercoxal process of prothorax slightly bordered (*A. jocquei*) or unbordered (*A. malawianus*) and distribution in the Afrotropical biogeographic region (Malawi)....................................***Abacillodes* Straneo, 1988**

6 Smaller species (less than 6 mm), with continental distribution in northwest Africa... ***Trichopedius* Bedel, 1899**

\- Larger species (more than 6 mm), with insular distribution in the Macaronesian biogeographical region **7**

7 Head with distinct eyes and paraorbital sulci not extended behind posterior margin of eye. Elytra truncate apically ... ***Eutrichopus* Tschitschérine, 1897**

\- Head with very small or no eyes and paraorbital sulci grooved, extended behind posterior margin of eye toward neck. Elytra rounded apically............**8**

8 Sides of pronotum straight towards hind angles. Elytra not narrowed basally .... ***Gietopus* Machado, 1992**

\- Sides of pronotum distinctly concave towards hind angles. Elytra narrowed basally .... ***Wolltinerfia* Machado, 1985**

Checklist of the Old World genera of Euchroina

Abacillius Straneo, 1949	Republic of South Africa
Abacillodes Straneo, 1988	Malawi
Eutrichopus Tschitschérine, 1897	Canary Islands
Gietopus Machado, 1992	Canary Islands
Nesorthomus Bedel, 1899	Madeira
Orthomus Chaudoir, 1838	Canary Islands, Mediterranean
Parorthomus gen. n.	Socotra
Trichopedius Bedel, 1899	Algeria
Wolltinerfia Machado, 1985	Canary Islands

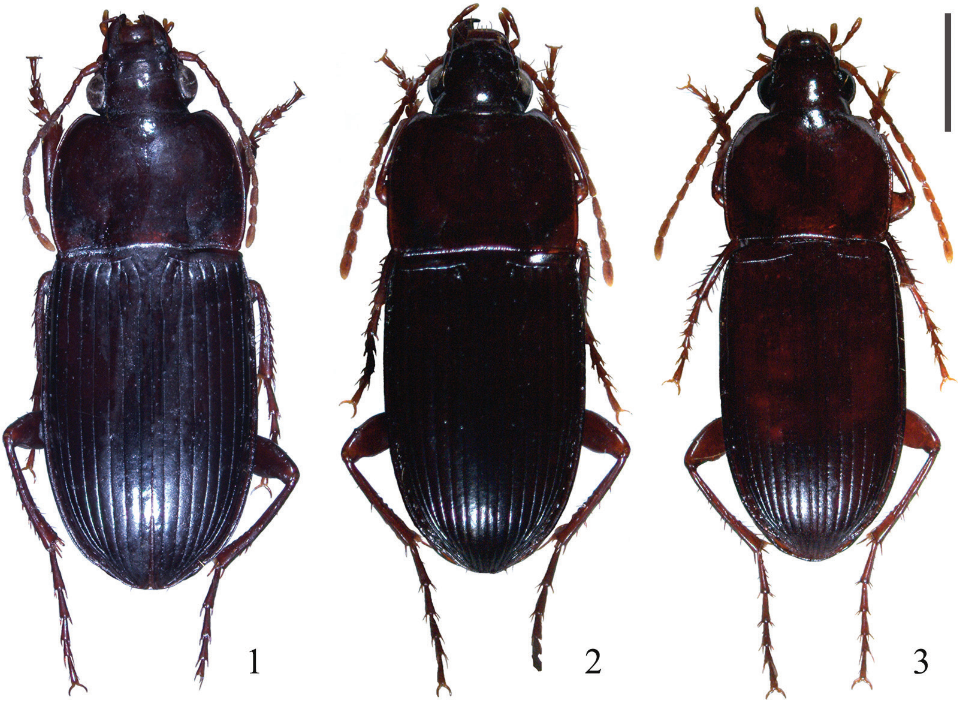
I. Revision of the East Mediterranean *Orthomus* species

Orthomus berytensis **(Reiche & Saulcy, 1855)**

Figs 1, 4, 8, 12, 16

Feronia (*Argutor*) *berytensis* Reiche & Saulcy, 1855: 618 (type locality: “De Beyrouth”)
Feronia (*Argutor*) *longula* Reiche & Saulcy, 1855: 616, part
Feronia (*Argutor*) *proelonga* Reiche & Saulcy, 1855: 619 (type locality: “Des bords du Jourdain”), syn. n.
Feronia elongata Chaudoir, 1859: 116 (type locality: “Moräa, Beyruth und Alexandrien.”), syn. n.
? *Feronia varinii* Gautier des Cottes, 1866: 178 (type locality: “Sardinia”)
Feronia atlantica Fairmaire, 1875: 543 (type locality: “Mogador” [Essaouira, Morocco])
Othomus [sic] *longior* Chaudoir, 1873: 105, part
Feronia (*Orthomus*) *barbara*: Piochard de la Brûlerie, 1876: 416
Orthomus barbarus berytensis: Mateu, 1955: 56, 76
Orthomus muluyensis Antoine, 1957: 205 (type locality: Guercif)
Pterostichus (*Orthomus*) *haligena* Wollaston, 1860: 87 (type locality: “Great Salvage”)

Note. The taxon *haligena*, described from the Salvage Islands belongs to *O. berytensis* (see Machado 1992: 260, Lorenz 1998: 249, 2005: 265) and not to *O. barbarus* where it was quoted by Bousquet (2003: 477), as a subspecies, erroneously with the distribution data Madeira. The examination of 13 specimens (Ilhas Selvagens, Selvagem Grande, SE. sublittoral zone, 65-90 m (under stones), XI/XII 2006, D. Putzer



Figures 1–3. Habitus. **1** *Orthomus berytensis* (Reiche & Saulcy, 1855), male, "Tel-Aviv" **2** *O. longior* Chaudoir, 1873, male, "Upper Galilee, Ya'ar Bar'am" **3** *O. longulus* (Reiche & Saulcy, 1855), male, "Upper Galilee, Ha Khula Valley, Ma'agar Einan lake". Scale bar = 2 mm.

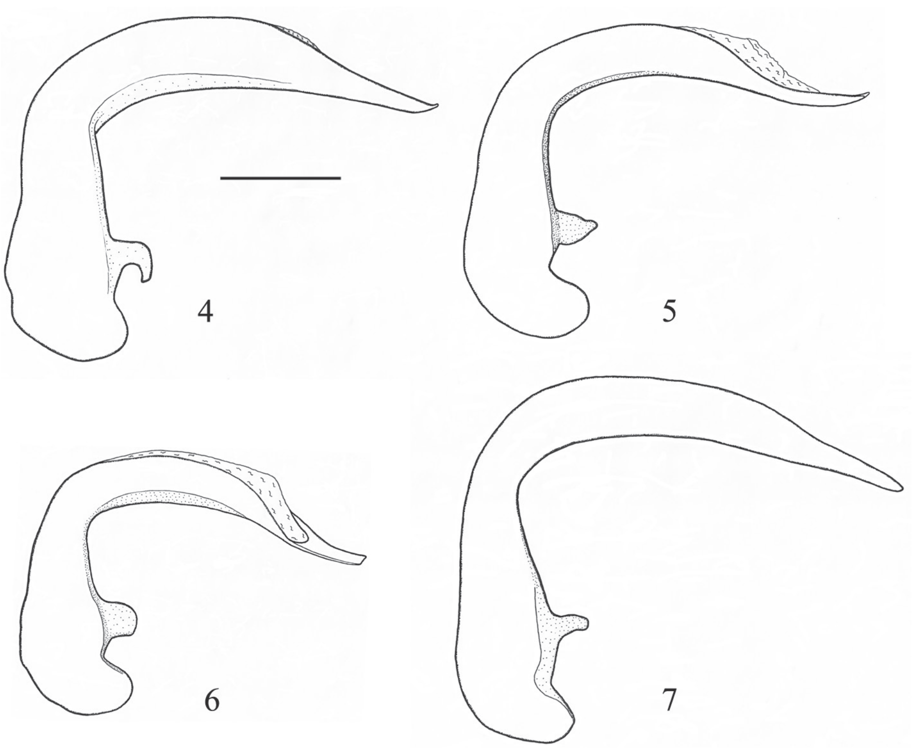
leg., DWBG) in comparison with specimens from the Canaries and from Morocco revealed some differences, namely a smaller body size and a strong elytral reticulation in males, almost as strong as in females. These differences could suggest that we deal with a distinct taxon but further investigations are needed. The taxonomic status of the names *atlantica* and *muluyensis*, both partly considered in the literature as a "forma" or a subspecies of *berytensis* or as a synonym to this name must be cleared up by further investigation of a larger sample of material.

Type material. ***Feronia berytensis*** **Reiche & Saulcy, 1855.** Consists of six syntypes, 4 ♂♂, 1 ♀ preserved in MHNG and 1 ♂ in MNHP. The study revealed conspecificity. The specimens in MHNG are placed under a Melly's taxa label "*longulus* Reiche, var: *berytensis* Reiche ." [handwritten by Melly with pen]. Further, all specimens bear individually the following two labels "Coll. Reiche" [black print on white label] and "*Orthomus longulus* Reiche var. *berytensis* Reiche Label MHNG 2010" [black print on white label by Cuccodoro]. In addition, the male selected as lectotype with label, subsequently added: "Lectotype *Feronia berytensis* Reiche & Saulcy, 1855 B.Guéorguiev & D.W.Wrase des. 2012" [black print on red label], the remaining five: "Paralectotype *Feronia berytensis* Reiche & Saulcy, 1855 B.Guéorguiev & D.W.Wrase des. 2012" [black print on red label]. The genitalia of the lectotype and of a further male paralectotype from MHNG were examined and glued to cards, pinned beneath the specimens from which they had been removed. The specimen from MNHP is a male, with previously extracted genitalia and glued on a separate card pinned beneath the specimen. This sample bears two old labels equal in size and type: "*berytensis* type Reiche" [handwritten on white label by Mateu], "Syrie" [handwritten on white label by Chaudoir], as well as a new one: "Paralectotype *Feronia berytensis* Reiche & Saulcy, 1855 B.Guéorguiev & D.W.Wrase des. 2012" [black print on red label]. All six specimens with a label, subsequently added: "*Orthomus berytensis* (Reiche & Saulcy) det. B.Guéorguiev" [black print on white label].

We got the information that the part of the Reiche collection housed in MHNG was integrated into the general collection (which was build up essentially from the collection of André Melly) with all specimens with: "Coll. Reiche" but usually there are neither locality, nor identification labels attached to individual specimens, and that identification and locality data figure only on the 'taxa labels' (handwritten by Melly) pinned to the bottom of the drawer, which have thus to be considered as pertaining collectively to the specimens pinned above (Cuccodoro in litt.). The species was described from "Beyruth", taking into consideration the above mentioned facts concerning labelling of the types we suppose the above mentioned typical specimens as coming from the type locality.

Type material. ***Feronia longula* Reiche & Saulcy, 1855 (specimens belonging to *O. berytensis*).** The type series in MHNG contains two specimens belonging to *O. berytensis*: 1 ♀, "Jaffa, Syrie" [Reiche's handwriting on yellow label], "Coll. Reiche" [black print on white label], "*Orthomus longulus* Reiche Label MHNG 2010" [black print on white label by G. Cuccodoro]; 1 ♂, "Coll. Reiche" [black print on white label], "*Orthomus longulus* Reiche 'Egypte, Syrie.' Label MHNG 2010" [black print on white label by G. Cuccodoro], and with labels subsequently added: "Paralectotype *Feronia longula* Reiche & Saulcy, 1855 B.Guéorguiev & D.W.Wrase des. 2012" [black print on red label], "*Orthomus berytensis* (Reiche & Saulcy) det. B.Guéorguiev" [black print on white label].

Type material. ***Feronia proelonga* Reiche & Saulcy, 1855.** Consists of 2 ♂♂, 2 ♀♀ preserved in MHNG and 1 ♂ in MNHP, all conspecific. The specimens in MHNG are placed under a Melly's taxa label "var: *praelongus* Reiche, Palestine" [handwritten by A. Melly with pen]. One male specimen, chosen for lectotype bears the following labels: "Jourdain" [Reiche's handwriting on yellow label], "Coll. Reiche" [black print on white label], "*Orthomus praelongu* [sic!] Reiche 'Palestine.' Label MHNG 2010" [black print on white label by Cuccodoro], "Lectotype *Feronia proelonga* Reiche & Saulcy, 1855 B.Guéorguiev & D.W.Wrase des. 2012" [black print on red label]. One male and two females from MHNG: "Coll. Reiche" [black print on white label], "*Orthomus praelongu* [sic!] Reiche 'Palestine.' Label MHNG 2010" [black print on white label by G. Cuccodoro], "Paralectotype *Feronia proelonga* Reiche & Saulcy, 1855 B.Guéorguiev & D.W.Wrase des. 2012" [black print on red label] are accordingly designated. All four specimens with a label, subsequently added: "*Orthomus berytensis* (Reiche & Saulcy) det. B.Guéorguiev" [black print on white label]. The genitalia of the lectotype and the male



Figures 4–7. Median lobe of aedeagus, lateral view. **4** *Orthomus berytensis* (Reiche & Saulcy, 1855), lectotype of *Feronia berytensis* **5** *O. longior* Chaudoir, 1873, paralectotype of *Feronia longula* Reiche & Saulcy **6** *O. longulus* (Reiche & Saulcy, 1855), male, "Megiddo" **7** *O. velocissimus akbensis* Mateu, 1955, holotype of *O. barbarus akbensis*. Scale bar = 0.5 mm.

paralectype from MHNG examined by ourselves (the apices of both median lobes were found damaged!) and glued to cards together with the respective specimens. The specimen from MNHP, designated as paralectotype, was with previously extracted genitalia. Its aedeagus and parameres are glued to a separate card pinned beneath the specimen. Additionally, this paralectotype bears two old labels equal in size and type: "*proelongus* type Reiche" [handwritten on white label by Mateu] and "Jourdain" [handwritten on white label by Chaudoir], as well as a new one: "Paralectotype *Feronia proelonga* Reiche & Saulcy, 1855 B.Guéorguiev & D.W.Wrase des. 2012" [black print on red label]. All specimens with a label, subsequently added: "*Orthomus berytensis* (Reiche & Saulcy) det. B.Guéorguiev" [black print on white label].

The study of the type material of *Feronia proelonga* found that this taxon is to be removed from synonymy with *O. barbarus barbarus* (cfr. Bousquet 2003: 477) and treated as conspecific with *O. berytensis*. Originally, it was separated by the authors in the relatively shorter size of body and pronotum seemingly more transversal, with two basal impressions distinct and strongly punctured. We found such variations in the populations of *O. berytensis* coming from modern-day Israel.

Type material. ***Feronia elongata* Chaudoir, 1859.** We were unable to find any type specimen(s) of this taxon, but the description and especially the distribution Chaudoir gave for his species (Chaudoir 1859: 116) let us draw the conclusion that he dealt with *O. berytensis*. This view is consistent with that of Chaudoir (1873: 105) who synonymized his *O. elongatus* partly with *O. longulus* sensu Wollaston (1864: 47), and Wollaston (1865: 39), which concerns, according to Machado (1992: 259), *O. berytensis*. On the other side, the first locality listed by the author from among the type one is "Moräa". Morea was the name of the Peloponnese Peninsula in South Greece during the early modern period (ca. 1500–1800). At present, based on recent data (Arndt et al. 2011: 58, present work: 'Other material studied'), we certainly know that only *O. berytensis* inhabits this part of the East Mediterranean. Therefore we propose the synonymy of *Feronia elongata* with *F. berytensis*.

Type material. ***Orthomus longior* Chaudoir, 1873 (specimens belonging to *O. berytensis*).** The type series in MNHP contains 3 ♀♀ which belong to *O. berytensis*. These samples are considered syntypes of *O. longior* as they and a fourth specimen, which is here designated lectotype of *O. longior* (for that specimen see under *O. longior*), were found alongside in the former collection of René and Charles Oberthür who acquired the Chaudoir collection. Each of the three specimens bears the labels: "*longior*" [red handwritten with ball-pen on white label by Mateu], and, subsequently added: "Paralectotype *Orthomus longior* Chaudoir, 1873 B.Guéorguiev & D.W.Wrase des. 2012" [black print on red label], and: "*Orthomus berytensis* (Reiche & Saulcy) det. B.Guéorguiev" [black print on white label].

Other material studied.

IMPRECISE LOCALITY: 1 ♂, "Syrie Gory." (MHNG).

GREECE: 1 ♂, "Graecia" / "Sammlung Schroeder" (MIZ); 1 ♀, "L. Miller Graecia" (ZMAN). **Atticí**: 1 ♂, "Graecia Attica", von Oertzen" (ZMAN); 3 ♂♂, 2 ♀♀, "b. Athen v. O." (ZMAN); 1 ♂, Peloponnes", X 2009, Umlauf leg. (DWBG). **Crete**: Rethymno Prefecture, 1 ♀, "Adele, IV.1986, Egger leg." (NMW).

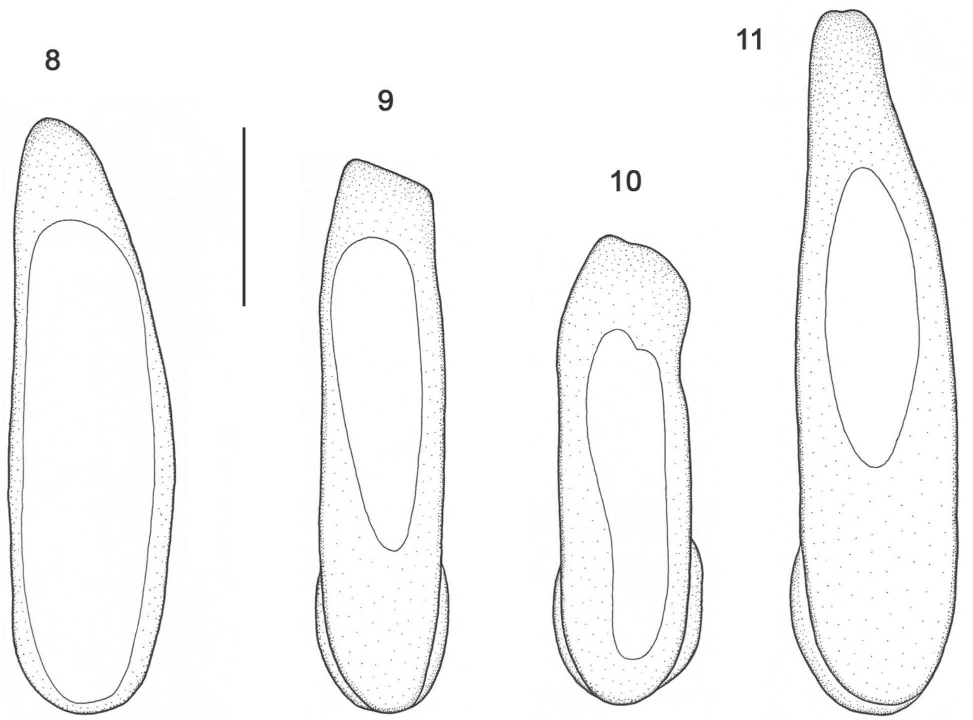
NORTHERN CYPRUS: **Gazimağusa District**: 2 ♀♀, Agia Napa, 8.IV.1983, J. Nielsen leg (DWBG); 1 ♂, 2 ♀♀, 3 km W Agia Napa, 9.-14.IV.1999, A. Pütz leg. (DWBG); 1 ♀, Agia Napa env., middle IV 1998, M. Sieber leg. (DWBG); 6 ♂♂, 1 ♀, Ydatodexameni Kouklion, Mantres tou Prastio, ca 16 km W Famagusta, 500 m, 35°07'N, 33°46'E (fallow land with Salicornia/Sueda), 20.II.2011, D.W.Wrase leg. [5] (DWBG); 2 ♂♂, same data but: loamy field edge (DWBG).

UN BUFFER ZONE (Cyprus): 5 spec., Achna dam, 11.12.2006, under stones, K. Austin & E. Small leg. (BMNH, NMNHS).

REPUBLIC OF CYPRUS: **Larnaca District**: 1 ♂, 2 ♀♀, Pyla ["Pula"], 22.I.1992, J. Hořyna leg. (DWBG).

SYRIA: **Gouvernement Dar'a**: 1 ♀, Buṣrā (free zone), 100 km S Damascus, 5.XII.2007, R. Kmeco leg. (DWBG).

ISRAEL: 1 ♂, Palestine Negev, 8.2.19, leg. Bythinsky-Salz (TAU); 5 ♂♂, 5 ♀♀, Palestyna Dzebata 25.XII.25 (MIZ). - **Jerusalem District**: 1 ♂, Kiryat Anavim, 8.4.1948 (TAU). **Northern District**: 1 spec., Golan, Tel Quazir, 29.3.-26.4.87, Richter leg. (NMW). - **Tel Aviv District**: 1 ♂, Tel-Aviv, 19.X.1987, G. Coulon leg. (TAU).



Figures 8–11. Median lobe of aedeagus, dorsal view. **8** *Orthomus berytensis* (Reiche & Saulcy, 1855): lectotype of *Feronia berytensis* **9** *O. longior* Chaudoir, 1873, paralectotype of *Feronia longula* Reiche & Saulcy **10** *O. longulus* (Reiche & Saulcy, 1855), male, "Megiddo" **11** *O. velocissimus akbensis* Mateu, 1955, holotype of *O. barbarus akbensis*. Scale bar = 0.5 mm.

- **Central District**: 1 ♂, 1 ♀, SW Khadera (brackish pond), 27.III.2008, D.W.Wrase leg. (DWBG); 2 ♂♂, 1 ♀, Nitsanim, dunes betw. Ashdod and Ashkelon, 29.III.2008, D.W.Wrase leg. (DWBG). - **Haifa District**: 2 ♂♂, 1 ♀, Atlit, 16.XI.1998, V. Chikatunov leg. (TAU); 2 ♀♀, Salines at Atlit, S Haifa, 30.III.2008, D.W.Wrase leg. (DWBG). - **South District**: 1 ♀, Revivim, 2.8.1958, Coll. Krystal J. (TAU); 1 ♀, Segula, Qiryat Gat, 5.v.1996, V. Chikatunov leg. (TAU); 1 ♀, Ashdod, 7.12.96, R. Hoffman leg. (TAU); 1 ♂, 1 ♀, Ofaqim, 11.ii.1997, L. Friedman leg. (TAU); 2 ♂♂, 1 ♀, Ha Bsor, Nakhal Bsor, ca 12 km SW Ofakim (banks, leaf litter, under plants, sifted), 22.III.2008, D.W.Wrase leg. (DWBG); 1 ♂, Gilat, SW Jerusalem, E Gaza, 31°20'N, 34°40'E, olive plantation, 29.III.2011, M. Kurtz leg. (MPHG).

Gaza Strip: 8 ♂♂, 5 ♀♀, Env. Gaza, 30.III.1987, W. Heinz leg. (DWBG); 9 spec., Gaza Umg., 29.3.–26.4.87, Richter leg. (NMW).

LIBYA: **Tripoli District**: 8 spec., Tripoli, 0-20 m, 12-18.04.1998, P. Beron leg. (NMNHS); 1 ♀, Tripoli, IV 1982, Březina leg. (DWBG); 4 spec., Tripoli, Soani Road, 4.XII.1982, V. Pamukov leg. (NMNHS); 1 ♀, 4 km W Sidi Muhammad al Mabkhud, 32°28'53.3N / 20°56'29.4"E, 333 m, 21.V.2002, A. Reiter leg. (DWBG). - **Binghazi District**: 1 ♂, 1 ♀, Tolmeitha (Ptolemais), 19.III.2000, J. Kny & P. Rudich leg. (DWBG). - **Jabal al Akhdar District**: 1 ♂, Susa, Apollonia, 22.II.83, O. Kodym leg. (DWBG).

EGYPT: 2 ♀♀, Cairo-Alexandria, 8.5.1956, W. Kühnell leg. (NMW). - **Faiyum Governorate**: 4 ♂♂, 2 ♀♀, Kom Oshim, 1.5.1956, W. Kühnell leg. (NMW). - **North Sinai Governorate**: 1 ♀, El-Arish 11.1.57, A. Sabay leg. (TAU). - **Alexandria Governorate**: 1 ♂, 100 km S Alexandria, 19.I.1994, W. Ullrich leg. (DWBG). - **Beni Suef Governorate**: 1 ♂, 1 ♀, El Shanawaya, 1.IX.1994, W. Ullrich leg. (DWBG); 1 ♂, the same but 29.V.1995 (DWBG); 1 ♀, the same but 4.VI.1995 (DWBG); 5 ♂♂, 3 ♀♀, the same but 12.V.1995 (DWBG). - **Cairo Governorate**: 1 ♂, 1 ♀, Helwan, 19.I.1931, W. Roszkowski leg. (MIZ); 1 ♀, El Maadi, 8.XI.1993, W. Ullrich leg. (DWBG). - **Ismaïlia Governorate**: 3 ♀♀, Abu Suweir-el-Mahatta, 19.XII.1995, W. Ullrich leg. (DWBG); 1 ♂, Waraura, 4.VI.1995, W. Ullrich leg. (DWBG).

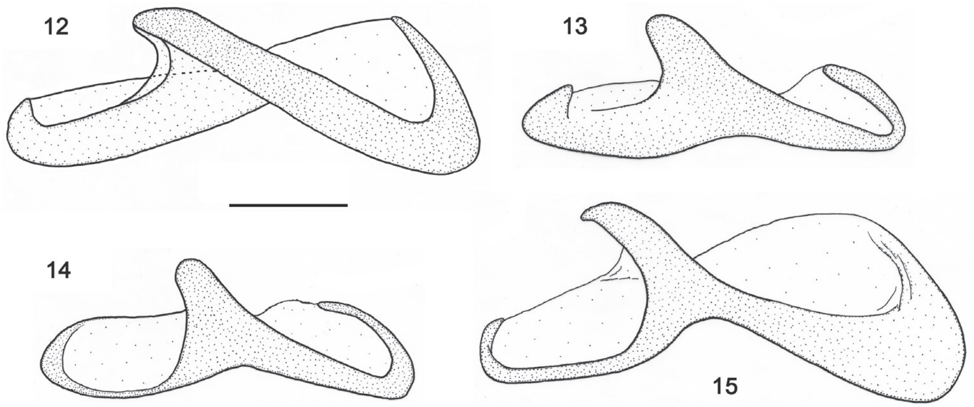
Distribution in eastern Mediterranean area. Reported from Greece: Greek mainland (“Attika” [Attica], Ionian Island (“Zante [Zakynthos]), Apfelbeck 1904: 257, as *Pterostichus barbarus*, and Aegean Islands (“Rodos” [Rhodes]), Schatzmayr 1935: 242, as *Pt. barbarus*, 1942: 67, as *Pt. barbarus longulus*). In Greece recently collected only on Crete and also on the Peloponnese. Turkey (Casale and Vigna Taglianti 1999: 382), Syria (only in the extreme South West), Israel, Gaza Strip, on Cyprus, in Libya (coastal regions), and Egypt (mainly in the North West).

Orthomus longior Chaudoir, 1873

Figs 2, 5, 9, 13, 17

Othomus [sic!] *longior* Chaudoir, 1873: 105 (type locality: “Sidon”), (as locality of LT), part
Feronia (*Argutor*) *longula* Reiche & Saulcy, 1855: 616, part
Orthomus sidonicus Chaudoir, 1873: 110 (type locality: “Sidon (Syrie)” [Saïda, Lebanon], syn. n.
Orthomus longulus sidonicus: Mateu 1955: 56, 63

Type material. *Orthomus longior* Chaudoir, 1873 (specimens belonging to *O. longior*). Consists of 4 ♀♀ preserved in MNHP, investigation revealed non-conspecificity. Three specimens are identical with the lectotype of *O. berytensis* (for these specimens see under *O. berytensis*). The fourth female possesses labels: “Sidon” [handwritten on white label by Chaudoir], “*longior*” [handwritten in red with ball-pen on white label by Mateu]. This specimen is conspecific with the holotype of *O. sidonicus*. As only that bears a locality label we choose this one as lectotype of *O. longior*. This action led to the synonymy of *O. longior* with *O. sidonicus*. The two names are published on the same date in the same work (Chaudoir 1873). As “first reviewing authors”, we give precedence of the former following the Article 24.2.2 of the Code (ICZN 1999). Hence, the specimen in question is supplied with additional label: “Lectotype *Orthomus longior* Chaudoir, 1873 B.Guéorguiev & D.W.Wrase des. 2012” [black print on red label].



Figures 12–15. Right paramere, internal face. **12** *Orthomus berytensis* (Reiche & Saulcy, 1855): lectotype of *Feronia berytensis* **13** *O. longior* Chaudoir, 1873, paralectotype of *Feronia longula* Reiche & Saulcy **14** *O. longulus* (Reiche & Saulcy, 1855), male, "Megiddo" **15** *O. velocissimus akbensis* Mateu, 1955, holotype of *O. barbarus akbensis*. Scale bar = 0.2 mm.

Type material. ***Feronia longula* Reiche & Saulcy, 1855 (specimens belonging to *O. longior*).** The following three male and one female specimen belong to the type series of *Feronia longula* (MHNG, see below). The study of the genitalia of all males, as well as the external characters of both sexes proved that all specimens belong to *O. longior*: 1 ♂, "Beyrouth" [Reiche's handwriting on yellow label], "Coll. Reiche" [black print on white label], "*Orthomus longulus* Reiche Label MHNG 2010" [black print on white label by G. Cuccodoro]; 1 ♂, "*longulus*" [Reiche's handwriting on white label], "Coll. Reiche" [black print on white label], "*Orthomus longulus* Reiche 'Egypte, Syrie.' Label MHNG 2010" [black print on white label by G. Cuccodoro]; 1 ♂, "Coll. Reiche" [black print on white label], "*Orthomus longulus* Reiche 'Egypte, Syrie.' Label MHNG 2010" [black print on white label by G. Cuccodoro]; 1 ♀, "Nazareth" [Reiche's handwriting on yellow label], "Coll. Reiche" [black print on white label], "*Orthomus longulus* Reiche Label MHNG 2010" [black print on white label by Cuccodoro]. All specimens with labels, subsequently added: "Paralectotype *Feronia longula* Reiche & Saulcy, 1855 B.Guéorguiev & D.W.Wrase des. 2012" [black print on red label], "*Orthomus longior* Chaudoir, 1873 det. B.Guéorguiev" [black print on white label].

Type material. ***Orthomus sidonicus* Chaudoir, 1873.** Holotype ♂ in MNHP, with extracted genitalia. The median lobe and parameres are well preserved and glued on a separate card pinned beneath the specimen. The specimen bears the following labels: "Sidon." [handwritten on white label by Chaudoir], "*sidonicus* Chaud." [handwritten in red with ball-pen on white label by Mateu], and, subsequently added: "Holotype *Orthomus sidonicus* Chaudoir, 1873" [black print on red label by Guéorguiev], "*Orthomus longior* Chaudoir, 1873 det. B. Guéorguiev" [black print on white label].

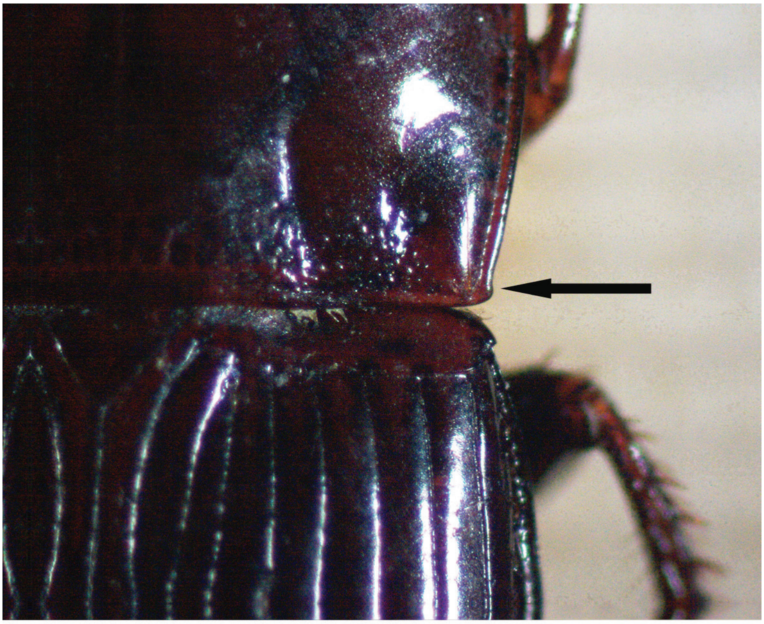
Other material studied.

ISRAEL: **Northern District**: 2 ♂♂, 2 ♀♀, Upper Galilee, Nahal Kziv, 30.i.1999 / 6.iii.1999, M. Finkel (TAU); 1 ♂, 1 ♀, Upper Galilee, Meron Mts., Meron Field School, ca 1000 m (open woodland), 8.–20.III.2008, D.W.Wrase leg. (DWBG); 1 ♂, 1 ♀, Upper Galilee, Meron Mts., Har Meron, 850 m (cedar/pine forest, pitfall trap), 6.V.1996, P. Schnitter & K. Staven leg. (DWBG); 1 ♂, Upper Galilee, Meron Mts., Nakhar (Wadi) Moran, 1 km W Meron field school, ca 900 m (N. slope, slope spring, under stones), 11.III.2008, D.W.Wrase leg. (DWBG); 1 ♀, Upper Galilee, Meron Mts., Har Meron, Kamin Rom, 1100 m, 32°59.447'N, 035°24.669'E (open stony grazing land, limestone), 1.IV.2008 D.W.Wrase leg. (DWBG); 1 ♂, 1 ♀, Upper Galilee, Ya'ar Bar'am, ca 1.5 km W Jish (Gush Khalav), ca. 700 m (edge of oak forest), 9.III.2008, D.W.Wrase leg. (DWBG); 1 ♂, N. Golan Heights, Qalat Nimrod, 300–600 m 7.IV.1985, W. Heinz leg. (DWBG); 1 ♂, Golan Heights 19.iv.1994, M. Warburg leg. (TAU); 2 ♂♂, 1 ♀, Golan Heights, Mas'ada, Ya'ar Odem Reserve, 934 m, 33°13.449'N, 035°45.184'E (grazing woodland, oaks, litter sifted), 21.IV.2006, D.W.Wrase leg. (DWBG); 1 ♂, 1 ♀, Golan Heights, Ya'ar Odem S Mas'ada, 33°13.449'N, 035°45.184'E, 934 m (*Quercus boissieri*/ *calliprinos* forest, under stones), 10.III.2008, D.W.Wrase leg. (DWBG). - **Haifa District**: 1 ♀, Haifa ["Syrien Haifa Reitter"] (NMW); Carmel Ridge: 1 ♀, Nahal Oren, Mt. Carmel, 15.11.1995, Pavlicek & Chikatunov leg. (TAU); 3 ♂♂, 4 ♀♀, 'En Ya'aqov, 23.iii.2006 / 8.ii.2007 / 19.iii.2007, I. Schtirberg' (TAU).

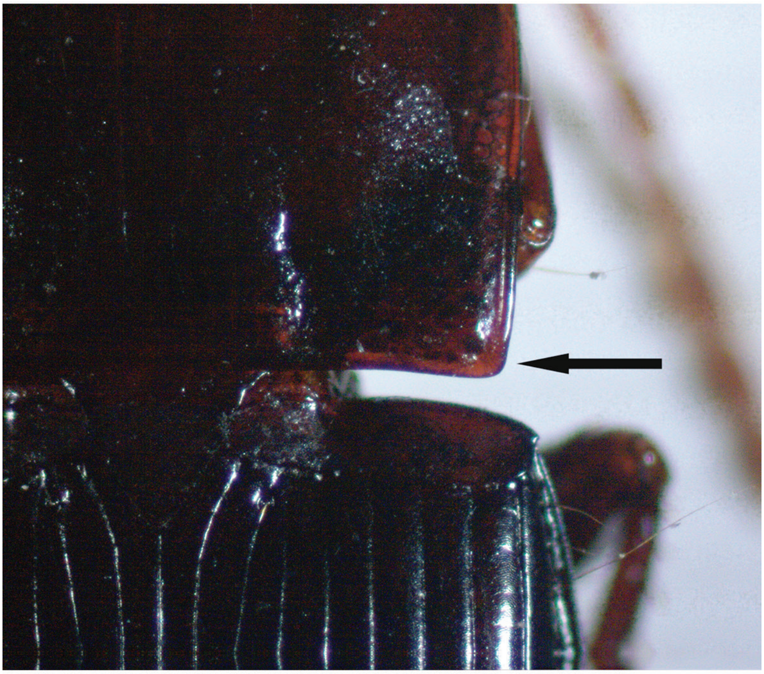
LEBANON: **Muhāfazat Bayrūt**: 2 ♀♀, Beirut ["Beyruth, Syr. coll. Plason" / "*sidonicus* Chd. det. Ing. Jedlička"] (MIZ). 1 ♂, 3 ♀♀, E Bayrūt, Faytroun, 34°.00'N, 35°44'E, ca. 1100 m, 30.X.2012, Chr. Reuter leg. (CRHG, DWBG). 14 ♂♂, 7 ♀♀, S Bayrūt, Dammour env., ca. 200 m, pitfall trap, II 2013, Chr. Reuter leg. (CRHG, DWBG, JSAG, NMNHS). - **Chouf District**: 1 ♀, Barouk, Mount Lebanon, El Mir massif, 1700-1950 m, 20.V.2006, T. Tichý leg. (DWBG.). - **Keserwan District**: 4 ♀♀, Balloun at Jitra, S Jounié, 600 m, 9./14.IV.1997, W. Heinz leg. (DWBG). 10 ♀♀, Rayfoun, ca. 33°58'N, 35°42'E, mixed decidous forest, 800–900 m, 18.XI.2012, Chr. Reuter leg. (CRHG, DWBG, JSAG, NMNHS). 1 ♂, 3 ♀♀, same data but: mixed oak forest, ca. 990 m, 15.III.2013 (CRHG, DWBG). 1 ♂, 1 ♀, same data but: 30.III.–15.IV.2013 (CRHG, DWBG).

SYRIA: **Al-Lādhiqīyah**: 2 ♀♀, Lattaki-Slenfe, 27.4.1990, Reuter leg. (NMW); 1 ♂, Şlinfah, Abal an Nusayriah Mt., 1200 m, 24.–26.V.1995, P. Kabátek leg. (DWBG); 2 ♂♂, 5 ♀♀, Jabāl Ansarya, At Tammāzah, 790 m, 34.15.404N, 030.10.136E, 20.XII.2006, R. Sehnal leg. (DWBG); 1 ♀, Slenfeh, 18.4.2010, Vl. Skoupý leg. (VSKC).

TURKEY: **Antalya Province**: 1 ♀, Alanya-Yayla, 1000 m, 13.5.1987, Steiner leg. (NMW); 1 ♀, Manavgat, Kiselot, 3.1.91, 10 m HN, Wunderle leg. (NMW); 1 ♂, Antalya env., 8.II.1999, J. Blümel leg. (DWBG); 1 ♂, 1 ♀, Avsallar near Incekum beach, 22 km W Alanya, 9.-23.V.1995, A. Pütz leg. (DWBG); 2 ♀♀, Incekum, env. Avsallar, under stone, II 1999, Schlarbaum leg. (TFPG); 3 ♂♂, 1 ♀, Gedevit-Yayla near Alanya, ca 1100 m, 10.IV.1992, W. Heinz leg (DWBG, JSAG); 1 ♂, Karaburu near Alanya, middle V 1997, M. Sieber leg. (DWBG); 1 ♂, Manavgat env., 3.I.1991, V. Assing leg. (DWBG); 1 ♀, E. Taurus Mts., Çaltepe env. (Manavgat District), 1600 m, 37.18N, 31.12E (subalpine), 10.–14.VI.2004, P. Croy leg. (DWBG). - **Hatay Province**: 1 ♀, W Yayladaği, 475 m, N35°54'30.8", E36°01'11.3", 05.-10.05.2006, Schnitter leg. (PSHG).



16



17

Figures 16–17. Pronotum posterior right angle. **16** *Orthomus berytensis* (Reiche & Saulcy, 1855), male, "Tel-Aviv" **17** *O. longior* Chaudoir, 1873, male, "Upper Galilee, Ya'ar Bar'am".

Wrong locality. 1 ♀, Amasya: Amasya [“Amasia coll. Kraatz”] (DWBG).

Male genitalia (15 specimens examined).

Distribution. Turkey (only Antalya and Hatay Province), Syria (only Latakia Governorate), Lebanon (several coastal districts), North Israel (Northern District; Haifa District). First species records to Turkey and Syria.

Orthomus longulus (Reiche & Saulcy, 1855)

Figs 3, 6, 10, 14

Feronia (*Argutor*) *longula* Reiche & Saulcy, 1855: 616 (type locality: “De Beyrouth”), part
Feronia (*Argutor*) *berytensis* Reiche & Saulcy, 1855: 618, part
Orthomus longior Chaudoir, 1873: 105, part
Orthomus longulus s.str.: Mateu, 1955: 56, 60

Type material. *Feronia longula* Reiche & Saulcy, 1855 (specimens belonging to *O. longulus*). The type series of *F. longula* consists of 11 syntypes, 4 ♂♂, 6 ♀♀ of them in MHNG and 1 ♂ in MNHP. The specimens in MHNG are placed under a Melly’s taxa label “*longulus* Reiche., Egypte, Syrie” [handwritten by Melly with pen] pinned to the bottom of the drawer, which thus are to be considered as pertaining collectively to all specimens. Our revision revealed that the specimens in MHNG are not conspecific but belong to three distinct species. Three males and one female belong to *O. longior* (for these specimens see under *O. longior*), while another male and another female belong to *O. berytensis* (for these specimens see under *O. berytensis*). Only four females are representatives of *O. longulus*, labelled individually as follow. One female selected for lectotype: “…” [handwritten remnant on small quadratic yellow label], “Beyrouth” [Reiche's handwriting on brown label], “Coll. Reiche” [black print on white label], “*Orthomus longulus* Reiche Label MHNG 2010” [black print on white label by Cuccodoro], “Lectotype *Feronia longula* Reiche & Saulcy, 1855 B.Guéorguiev & D.W.Wrase des. 2012” [black print on red label]; 3 ♀♀, “Coll. Reiche” [black print on white label], “*Orthomus longulus* Reiche ‘Egypte, Syrie.’ Label MHNG 2010” [black print on white label by Cuccodoro], “Paralectotype *Feronia longula* Reiche & Saulcy, 1855 B.Guéorguiev & D.W.Wrase des. 2012” [black print on red label]. The specimen from MNHP is a male, with previously extracted genitalia and glued to a separate card pinned beneath the specimen. The most part of its aedeagus is destroyed, certainly by a species of the genus *Anthrenus* Geoffroy, 1762, but the apical lamella is still preserved. This male is conspecific with the above last four females from MHNG and it is designated as paralectotype, too: “*longulus* type Reiche” [handwritten on white label by Mateu], “Paralectotype *Feronia longula* Reiche & Saulcy, 1855 B.Guéorguiev & D.W.Wrase des. 2012” [black print on red label]. All five specimens, pertaining to the true *longulus*, with a label, subsequently added: “*Orthomus longulus* (Reiche & Saulcy) det. B.Guéorguiev” [black print on white label].

Other material studied.

ISRAEL: - **Northern District**: 1 ♂, "Palestine. …Galilee XII.1924 O. Theodor." (BMNH); 1 spec., "Nazaret, 17.3.-3.4.87, Kfar …. L. Blumenthal leg." (NMW); 3 ♂♂, 5 ♀♀, Megiddo, Ein Ha'emek, 230 m, Getreideacker, 08.V.1996, Schnitter & Staven leg. (DWBG); 1 ♂, 4 ♀♀, "Merom Golan, 12.VI.2000, V. Chikatunov leg." (TAU); 2 ♂♂, 3 ♀♀, Upper Galilee, N. sea shore of Sea of Galilee, Ein Sheva (Tabkha), -192 m, 32°52.453'N, 035°32.726'E (stony and loamy pasture), 25.IV.2006, D.W.Wrase leg. (DWBG); 1 ♂, Lower Galilee, ca 4 km W Tamra, (route 70), 32°51.799'N, 035°10.292'E (loamy field edge), 25 m, 25.IV.2006 D.W.Wrase leg. (DWBG); 1 ♂, 6 ♀♀, Upper Galilee, Ha Khula Valley, Ma'agar Einan lake, 73 m, 33°05.137'N, 035°34.730'E (toe of dam, in moist loamy soil), 1./2.V.2006 D.W.Wrase leg. (DWBG, JSAG); 1 ♂, Bir el Maksur, 32°45.901'N/ 035°13.883'E, 23.II.2005, W. Starke leg. (DWBG); 1 ♀, Nazareth, Kfar ?Hochbreeh, 17.III.-3.IV.1987, Blumenthal leg. (DWBG). - **Haifa District**: 2 ♂♂, 2 ♀♀, Haifa ["Syrien Haifa Reitter"] (BMNH, MHNG, MIZ, NMW); 1 ♀, Mount Carmel, 23.XII.25 (MIZ); 4 ♀♀, Haifa, 15.XII.1941 / 8.I.1942 / 4.XII.1954 Bytinski-Salz (TAU); 1 ♀, Nahal Oren, Mount Carmel, 18.3.1996, Pavliček & Chikatunov leg. (TAU); 1 ♀, Haifa, Check Post, 8.II.2000, V. Chikatunov & T. Pavliček leg. (TAU); 1 ♂, Mount Carmel, Ya´ar ha- Ya´aramin ca. 500 m (under stones), 30.III.2008, D.W.Wrase leg. (DWBG).

Wrong locality. 1 ♂, "42 St." / "*Orthomus berytensis* Reich. Portugal Dr Stierlin (above), 2. b. (underneath)" (MHNG).

Male genitalia (9 specimens examined).

Distribution. North Israel (Northern District; Haifa District), Lebanon (Beyrouth, type material).

Key to the East Mediterranean species of *Orthomus* Chaudoir

1 Abdominal sternites densely and deeply punctured and rugose laterally **2**

\- Abdominal sternites superficially punctured or smooth laterally.................. **3**

2 Pronotum with hind angles obtuse at tip, often with small denticles protruding laterally (Fig. 16). All discal setiferous punctures of elytra as a rule situated close to or in stria 3. Elytral striae smooth, sometimes with a shallow punctuation. Mesepisternum smooth or with shallow punctuation only. Elytral microsculpture in females consisting of isodiametric meshes almost regularly arranged (as in *O. longior*). Median lobe of aedeagus toward apex distinctly shifted to the left, apical lamella narrowed distally, almost round at tip (dorsal aspect) (Figs 4, 8)........................... ***O. berytensis* (Reiche & Saulcy, 1855)**

\- Pronotum with hind angles almost right-angled, rounded at tip (Fig. 17). Second discal setiferous punctures of elytra mostly adjoining stria 2 (rarely one or two punctures in the middle of interval 3; by exception one puncture adjoining stria 3). Elytral striae ± strongly punctured throughout. Mesepisternum with distinct, dense and coarse punctuation. Elytral microsculpture in females somewhat irregular, consisting of isodiametric meshes mixed with little transverse meshes. Apical lamella of median lobe with a single angle at left side, right side rounded (dorsal aspect) (Figs 6, 10)....... ***O. longulus*** **(Reiche & Saulcy, 1855)**

3 Elytral striae smooth, sometimes with a weak punctuation laterally and apically, situation of elytral discal punctures as in *O. longulus*. Elytral microsculpture in females consisting of isodiametric meshes almost regularly arranged (as in *O. berytensis*). Pronotum with hind angles almost right-angled at tip, with small denticles protruding laterally, similar to *O. berytensis* (populations from Turkey) or with hind angles somewhat obtuse-angled, rounded at tip, as in *O. longulus*, rarely with suggestion of a denticle (populations from Lebanon, Syria, Israel). Apical lamella of median lobe angled at both sides (dorsal aspect) (Figs 5, 9).. ***O. longior*** **Chaudoir, 1873**

II. Notes on West Mediterranean *Orthomus* species

Orthomus velocissimus akbensis Mateu, 1955

Figs 7, 11, 15

Orthomus barbarus akbensis Mateu, 1955: 57, 74 (type locality: "Akbes, Siria", patria falsa)
? *Feronia hesperica* Motschulsky, 1849: 73 (type locality: "le midi de l'Espagne")
Orthomus barbarus expansus form. *transiens* Mateu, 1957: 99, unavailable
Orthomus barbarus expansus form. *malacensis* Mateu, 1957: 99, unavailable
Orthomus barbarus andalusiacus Mateu, 1957: 103 (type locality: "Prov. de Málaga: Gobantes"), syn. n.
Orthomus expansus malacensis Jeanne, 1981: 45 (type locality: "Málaga")

Type material. *Orthomus barbarus akbensis* Mateu, 1955. Holotype ♂ (IRSNB): "Holotypo" [print on red label], "Syrie Akbes" [print on white label], "*Orthomus barbarus* subsp. *akbesensis* [sic!] mihi J. Mateu det., 1951" [mixed handwritten & print on white label]. Genitalia extracted, well preserved, glued to a separate card pinned beneath the specimen.

Other material studied. PORTUGAL: - **Faro**: 1 ♂, Lagos env. 27./28.X.2006, V. Neuman leg. (cWR). 1 ♀, E Bensafrim, N Lagos, 28.III.1995, Chr. Bayer leg. (cWR). 1 ♀, Sagres, 4.IV.1989, M. Sachez (cWR). 1 ♂, 1 ♀, Sagres, 1 km from coast, 9.IV.1992, V. & C. Neumann leg. (cWR). 1 ♂, Sierra Monchique, Cabo de Sáo Vicente, 11.V.1992, V. & C. Neumann leg. (cWR). 1 ♂, 2 ♀♀, Carvoeiro, 10.V.1997, B. Nickel leg. (cWR).

SPAIN: - **Córdoba**: 1 ♂, Córdoba, escuela, 10.IV.2003, T. Tichý leg. (cWR). - **Granada**: 1 ♂, La Herradura, 27.XII.1998-3.I.1999, G. Siering leg. (cWR). - **Málaga**: 1 ♂, Malaga, 28.VIII.1996, P. Beron leg. (NMNHS). 1 ♀, "Sierra de Tejeda, Competa S, 600 m, 6.4.2001, Ch. Bauer leg." (NMNHS).

Remarks. *Orthomus berytensis akbensis* was described from "Akbes, Siria", based on a male and a female specimen. Mateu characterized it as having the pronotal base not bordered bilaterally, the pronotum widest at about middle, and with basal fovea punctured, the elytral striae hardly punctured, the metatibia in male crenulate at internal side, and the median lobe (Mateu 1955: 75, Fig. 9) somewhat differing from *O. barbarus berytensis*.

The study of the structure of the median lobe of aedeagus and the parameres, as well as selected external features in the holotype of *O. barbarus akbensis* demonstrated that it is really different from the other three East Mediterranean species. Its comparison with various taxa of the genus revealed that it is identical with specimens of *O. velocissimus andalusiacus* Mateu, 1957 (compare Figs 4, 8, 12 and Mateu 1957, Lámina IV, Figs 5-8, Pupier and Coulon 2013: 224, Fig. 1d). Hence, we synonymize the latter with *O. barbarus akbensis* which becomes the senior synonym and therefore the name of a valid subspecies of *O. velocissimus* (Waltl, 1835).

Lorenz (2005: 265) formally declared *Feronia hesperica* as a *nomen oblitum*, in spite of the fact that a junior name has never been declared as *nomen protectum*. This statement is incorrect, since after 1899 this taxon was cited at least twice in the coleopterological literature. Heyden et al. (1906: 86) and Csiki (1930: 612) recorded it as synonym of *Pterostichus* (*Orthomus*) *barbarus*. The type locality cannot be fixed exactly geographically, Motschulsky (1849: 52) wrote that the coleopterological yields the collector Handschuh made in 1847 in southern Spain came from "principalement aux environs de Carthagène", which means that other parts of southern Spain cannot be excluded. Thus, we accept the view of Mateu (1957: 103) and list *F. hesperica* as a questionable senior synonym of *O. velocissimus akbensis*, before the identity of the former can be settled.

The name *malacensis* Mateu was used as an infrasubspecific one (as also *transiens*) and is therefore not available according to Article 45.5 of the Code (ICZN 1999). The name *malacensis* Jeanne is the available name for *malacensis* Mateu (see also Serrano 2003: 45), adopted by Jeanne (1981) in agreement with Art. 45.5.1.

Lorenz (1998: 249, 2005: 265) combines *O. malacensis* Jeanne with the year 1978. Though Jeanne's work is part of "Tome VIII, 1978-1980" of the Bulletin de la Société linnéenne de Bordeaux, it was not printed until 1981 (see last page of that paper).

The application of Art. 72.4.4 specifies the type locality of *O. malacensis* Jeanne.

Updated Checklist of the species of *Orthomus* Chaudoir, 1838

1. *abacoides* Lucas, 1846: 46 (*Oodes*)	Algeria
= *trapezicollis* Chaudoir, 1859: 117 (*Feronia*)	
= *occidentalis* Gautier des Cottes, 1870: 299	
= *modestus* Reiche, 1871: 427 [replacement name]	

Note1: See Note2 under *O. barbarus*.

2. *achilles* Wrase & Jeanne, 2005: 888	Algeria
3. *aquila* Coquerel, 1859: 768 (*Feronia*)	Algeria
= *numidus* Chaudoir, 1859: 118 (*Feronia*)	
4. *aubryi* Jeanne, 1974: 68	Spain
5. *balearicus* Piochard de la Brûlerie, 1868: lxxx (*Feronia*)	Balearic Islands
= *szekessyi* Jedlička, 1956: 392 (*Pterostichus*) syn. n.	
6.1. *barbarus barbarus* Dejean, 1828: 261 (*Feronia*)	Portugal, Spain, France
? *rectangulus* Fairmaire, 1859: li (*Feronia*)	
= *expansus* Mateu, 1957: 98	
= *logronicus* Mateu, 1957: 98 [unav.]	
6.2. *barbarus formenterrae* Breit, 1933: 67 (*Pterostichus*)	Balearic Islands
6.3. *barbarus penibeticus* Mateu & Colas, 1954: 53	Spain

Note1: *Feronia rectangulus* described from Batna, Algeria, probably is to fall in synonymy with another species of *Orthomus*, rather than with *O. barbarus*.

Note2: Pupier and Coulon (2013: 217, 218) say that, according to Zaballos and Jeanne (1994) and Ortuño (1996), *formenterrae* and *penibeticus* are subspecies to *O. abacoides*. The contrary is the view of Serrano (2003) and Bousquet (2003) who treat these taxa as subspecies of *O. barbarus*. The last reviewing authors (Pupier and Coulon 2013: 218, 219, 223) say: "Il en est de même de la subordination de *penibeticus* et *formenterrae* en tant que sous-espèces d'*O. abacoides*", but also: "Cependant l'incertitude du rattachement de ces formes à *O. barbarus* tel que le préconisent Serrano (2003) et Bousquet ne permet pas, sans etude suplementaire avec suffisamment de materiel, de fixer leur status." Due to these uncertainties we follow the view of Serrano (2003).

Note3: *Pterostichus* (*Orthomus*) *szekessyi* Jedlička, 1956 was described from the Balearic Islands, based on a male without an exact locality (Jedlička, 1956). The holotype is stored in the collections of the Magyar Természettudományi Múzeum, Budapest and one of us (DWW) has examined it. It is in fairly good condition, the right last four antennomeres and the left metatarsus are lacking. The specimen was originally pinned and subsequently glued to card, with aedeagus not extracted (now it is glued to a separate card beneath the specimen). It is labelled with: "Balearen" [handwritten on white label], "Typus" [black print on red label], "Pterostichus (Orthomus) Sze´kessyi sp.n. det. ING. JEDLIČKA" [red label, species name handwritten in black by Jedlička, the rest printed]. It agrees in all characters, including the construction of the median lobe of the aedeagus, with these ones of *O. balearicus*. Hence, we propose the synonymy of *Pterostichus* (*Orthomus*) *szekessyi* with *Feronia balearicus* Piochard de la Brûlerie, 1868. The specimen is additionally labelled with "Orthomus balearicus PIOCHARD DE LA BRÛLERIE, 1868 D.W. Wrase det. 2014" [black print on white label].

7. *berytensis* Reiche & Saulcy, 1855: 618 (*Feronia*)	Sardinia, Sicily, Malta Greece, Turkey, Cyprus Syria, Lebanon, Israel Canary Islands, Morocco Tunisia, Libya, Egypt
= *proelongus* Reiche & Saulcy, 1855: 619 (*Feronia*) syn. n.	
= *elongatus* Chaudoir, 1859: 116 (*Feronia*) syn. n.	
= *haligena* Wollaston, 1860: 87 (*Pterostichus*)	
? *varinii* Gautier des Cottes, 1866: 178 (*Feronia*)	
= *atlanticus* Fairmaire, 1875: 543 (*Feronia*)	
= *oceanicus* Mateu, 1951: 283 [unav.]	
= *muluyensis* Antoine, 1957: 205	

Note1: *Feronia varinii* described from Sardinia, is most probably a synonym of *O. berytensis* rather than of *O. barbarus*.

8.1. *dimorphus antoinei* Mateu, 1955: 70	Morocco
8.2. *dimorphus dimorphus* Antoine, 1933: 85	Morocco
9. *discors* Wollaston, 1864: 47 (*Pterostichus*)	Canary Islands
= *persimilis* Harold Lindberg, 1950: 2 (*Pterostichus*)	
10. *hispanicus Dejean,* 1828: 260 (*Feronia*)	Spain
= *quadrifoveolatus* Chaudoir, 1859: 117 (*Feronia*)	
11.1. *lacouri haroldi* Pupier & Coulon, 2013: 221	Morocco
11.2. *lacouri kocheri* Mateu, 1955: 68	Morocco
11.3. *lacouri lacouri* Antoine, 1941: 38 (*Platysma*)	Morocco, Algeria
11.4. *lacouri pupieri* Jeanne, 1988: 12	Algeria
12. *leprieuri* Pic, 1894: 104	Algeria, Tunisia
13. *longior* Chaudoir, 1873: 105	Turkey, Syria, Lebanon Israel
= *sidonicus* Chaudoir, 1873: 110 syn. n.	
14. *longulus* Reiche & Saulcy, 1855: 616 (*Feronia*)	Lebanon, Israel
15. *maroccanus* Chaudoir, 1873: 108	Spain, Morocco
= *humeralis* Antoine, 1957: 208 [unav.]	
16. *perezii* Martínez & Saez, 1873: 57 (*Feronia*)	Spain
17. *planidorsis* Fairmaire, 1872: 420 (*Feronia*)	Spain, France
18. *poggii* Leo & Magrini, 2002: 510	Italy (Isola il Toro)
19. *rubicundus* Coquerel, 1859: 769 (*Feronia*)	Algeria, Tunisia
= *modicus* Coquerel, 1859: 770 (*Feronia*)	
= *manogramma* Chaudoir, 1859: 119 (*Feronia*)	
= *minutus* Reiche, 1871: 427	
20. *starkei* Wrase & Jeanne, 2005: 882	Morocco
21.1. *tazekensis rifensis* Wrase & Jeanne, 2005: 885	Morocco
21.2. *tazekensis tazekensis* Antoine, 1941: 411 (*Platysma*)	Morocco
= *scutellaris* Antoine, 1941: 412 [unav.]	
22.1. *velocissimus akbensis* Mateu, 1955: 74	Spain
? *hesperica* Motschulsky, 1849: 73 (*Feronia*)	
= *transiens* Mateu, 1957: 99 [unav.]	

= *malacensis* Mateu, 1957: 99 [unav.]	
= *andalusiacus* Mateu, 1957: 103 syn. n.	
= *malacensis* Jeanne, 1981: 45	
22.2. *velocissimus pardoi* Mateu, 1957: 102	Spain
22.3. *velocissimus velocissimus* Waltl, 1835: 53 (*Argutor*)	Spain

Note1: For *Feronia hesperica* see remarks under *O. velosissimus akbensis*.

III. Notes on Afrotropical Euchroina

Parorthomus **gen. n.**

http://zoobank.org/1F0CC178-2E35-4E59-8BAC-8E73F1983095

Type species. *Parorthomus socotranus* sp. n.

Diagnosis. A Euchroina genus of beetles that are medium-sized (8.2-10 mm), black coloured, brachypterous, with the following combination of characters: convex eyes; mentum with bifid tooth and large labial pits; pronotum sides posteriorly straight to slightly convex; elytra with 3-4 (rarely 2 or 5) discal setiferous puncture in stria 3/interval 3, with last puncture in posterior third of elytron; intercoxal process of prothorax subquadrate, distinctly bordered at sides and backwards; metaepisterna as wide as long; abdominal sternites V–VII with transverse basal sulci complete and well-impressed; mesotibia and metatibia straight in both sexes, mesotibia distally with slight inner callus in males; tarsomeres glabrous dorsally, with segment 5 setose ventrally; distal part of median lobe of aedeagus considerably curved to left in dorsal aspect; spermatheca with appended gland spherical and elongate diverticulum.

Description. None required because the genus is monobasic, and its characters are the same as those of its type species.

Etymology. A prefix in apposition (masculine), formed from the Greek *παϱά*-, meaning “beside”, “near”, “alongside”, and the name of the Mediterranean pterostichine genus *Orthomus* to which the new taxon is related.

Parorthomus socotranus **sp. n.**

http://zoobank.org/3D5BF7E1-9EB4-47FB-92C5-7E2C7D958916
Figs 18–24, 28, Table 1

Orthomus sp.: Wranik 2003: 442, plate 170, Fig. f.

Type material. Holotype ♂, “Yemen, Socotra Isl., Fimihin, GPS 12.474N, 54.015E, 530 m, x.2000, leg. V. Bejček & K. Šťastný” (DWBG) / “HOLOTYPE *Parorthomus* gen. n. *socotranus* sp. n. Guéorguiev, Wrase & Farkač des. 2014” [black print on red label, black framed]. Paratypes 24 ♂♂, 29 ♀♀, labelled as follow: 4 ♂♂, 4 ♀♀, with the same data as the holotype (DWBG, JFPC, JSAG, NMNHS); 6 ♂♂, 10 ♀♀, "Soqotra-Archipel: Soqotra Hoq, Küstenebene bis Höhleneing., Kalk mit einigen Granitfelsen, dichte Veg., 50–320 m 12°36'N, 54°21'E, 5.–6.2.1999 leg.: H. Pohl, SOQ 08" (BMNH, DWBG, HLMD, MPHG); 3 ♀♀, "YEMEN: Socotra Isl. Haghier, 4.-8.X.2000 lgt. V. Bejček & K. Šťastný" (JFPC); 2 ♂♂, 1 ♀, "Yemen, Soqotra-Archipel, Soqotra, Wadi Danegan, Barberfallen, 90 m 12°36'59"N, 54°03'48"E, 28.–30.10.2000 leg.: T. VAN HARTEN & H. POHL SOQ 2000/02a" (HDLM); 2 ♂♂, "Yemen, Soqotra-Archipel, Soqotra, Homhil, Quelle mit Ficus, Licht 12°34'13"N, 54°18'32"E/leg. H. Pohl, 29.10.2000/SOQ 2000/13" (HDLM, MPHG); 1 ♂, "Yemen, Soqotra-Archipel, Soqotra, Wadi Danegan, 90 m 12°36'59"N, 54°03'48"E, 30.10.2000 leg.: T. VAN HARTEN" "SOQ 2000/02" (HDLM); 3 ♂♂, 1 ♀, "Yemen, Soqotra Is.; 28.–29.ix.2003 HOMHIL protected area N 12°34'27" E 54°18'32" 364 m [GPS]; Jan Farkač lgt." / "YEMEN – SOQOTRA 2003 Expedition; Jan Farkač, Petr Kabátek & David Král" (JFPC, NMNHS); 1 ♂, 1 ♀, "Yemen, Socotra Is., WADI AYHAFT, 24.-26.xi.2003, N 12°36'38" E 53°58'49", 190 m, [GPS], leg. P. Kabátek" / "YEMEN – SOQOTRA 2003 Expedition; Jan Farkač, Petr Kabátek & David Král" (DWBG); 1 ♂, 1 ♀, "Yemen, Soqotra Is., 2.xii.2003, Al Haghier mts. W slopes, skant area N12°35'52", E54°00'01" 1240 m [GPS], D. Král leg." / "YEMEN – SOQOTRA 2003 Expedition; Jan Farkač, Petr Kabátek & David Král" (NMPC, RFBN); 1 ♂, "Yemen, Soqotra Is., QAAREH (waterfall), Noged plain, 5.-6.xii.2003, N12°20'10", E53°27'56", 57 m [GPS], leg. P. Kabátek" / "YEMEN – SOQOTRA 2003 Expedition; Jan Farkač, Petr Kabátek & David Král" (DWBG); 1 ♀, "Yemen, Soqotra Is., 6.–7.xii.2003 Noged plain: WADI IREEH N12°23'11", 53°59'47"E, 96 m [GPS]; Jan Farkač lgt." / "YEMEN – SOQOTRA 2003 Expedition; Jan Farkač, Petr Kabátek & David Král" (DWBG); 2 ♀♀, "Yemen: Socotra Isl., Wadi Ayhaft, lat. +1395751.449, lon +824616.2897, 27-30.10.2007, pitfall traps, F. Pella leg." (MBAP); 1 ♀, "YEMEN: Socotra Island E 410 m, 3. ii. 2010 N12°29'41", E 54°09'30" L. Purchart & J. Vybíral lgt." (NMPC); 1 ♀, "YEMEN: Socotra Island E Homhil area, 410-510 m, N12°34'25", E54°18'53" 9–10. ii. 2010 L. Purchart & J. Vybíral lgt." (NMPC); 1 ♂, "YEMEN: Socotra Island Aloove area, Hassan vill. env. 12°31.2'N, 54°07.4'E, 221 m Jiři Hájek leg. 9–10.xi.2010" (NMPC); 2 ♀♀, "YEMEN: Socotra Island Al Haghier Mts. Scant Mt. env. 12°34.6'N, 54°01.5'E, 1450 m J. Bezděk 12-13.xi.2010" (NMPC); 2 ♂♂, 1 ♀, "YEMEN, Socotra Island Hagher Mts., Scand Mt. env. montane evergreen woodland 16.–18.vi.2012 12°34.6'N, 54°01.5'E, 1450 m" / "SOCOTRA expedition 2012 J. Bezděk, J. Hájek, V. Hula, P. Kment, I. Malenovský, J. Niedobová & L. Purchart leg." (NMNHS, NMPC). All paratypes with label: "PARATYPE *Parorthomus* gen. n. *socotranus* sp. n. Guéorguiev, Wrase & Farkač des. 2014" [black print on red label, black framed].

Diagnosis. A brachypterous, black coloured species of Euchroina (Fig. 18), with moderately convex, amariform facies, with testaceus appendages, convex eyes, segment 11 of antennae not reaching basal margin of pronotum, elytra with very slight or reduced humeral denticle, elytral interval 3 with three to four (rarely two or five) discal setiferous punctures adjoining stria 3, with last puncture on posterior third of elytron,

Figure 18. *Parorthomus* gen. n. *socotranus* sp. n., female paratype, habitus.

metaepisterna as long as wide, and median lobe of aedeagus curved to left distally, with apical lamella slightly emarginated at tip.

Values for sizes and ratios among specimens from the type series are shown in Table 1.

Table 1. Data on variation in some values among type specimens of *Parorthomus* gen. n. *socotranus* sp. n.

type	sex	n	BL/mm	PW/HW	Ø	PW/PL	Ø	PW/PBW	Ø	PL/EL	Ø	EL/EW	Ø
HT	♂	1	9.2	1.72	-	1.41	-	1.13	-	0.43	-	1.45	-
PT	♂♂	10	8.2–9.6	1.69–1.86	1.77	1.42–1.49	1.46	1.05–1.13	1.10	0.41–0.45	0.43	1.40–1.49	1.44
PT	♀♀	12	8.4–10.0	1.68–1.86	1.76	1.43–1.51	1.47	1.05–1.14	1.10	0.41–0.44	0.42	1.37–1.45	1.40

Description. Body length 8.2–10.0 mm (9.2 mm in holotype); width 3.2–3.9 mm (3.6 mm in holotype), maximum width behind the middle of elytra. Head, pronotum, elytra, segments III–IV (in the most cases) of antennae, and ventral surface (without mouthparts) black in mature specimens, light to dark brown in immature specimens; labrum, mandibles, mentum, segments I–II and V–XI of antennae, and sometimes sides of pronotum testaceus; maxillary palpomeres, labial palpomeres, and labium rufous; coxae, femora, and tibiae of legs dark brown or testaceus, trochanters and tarsomeres mostly rufous.

Microsculpture distinct on the whole dorsal and ventral surfaces (including coxae, trochanters and femora), consisting of isodiametric and slight transversal meshes, more apparent in females (female specimens almost matt on dorsal surface, males somewhat shiny), reduced on the most part of the clypeus and gula.

Head noticeably longer and narrower with respect to the pronotum, frons smooth, frontal furrows well-marked, divergent posteriorly, reaching the level of anterior supraorbital punctures; neck without constriction posteriorly; eyes fairly large, convex, moderately prominent, with diameter as long as the combined length of segment I-II of the antennae, temporae short, as long as or shorter than half of eye diameter; paraorbital sulci moderately deep, encircling eyes behind; clypeus trapezoidal, separated from frons by fine suture, with anterior margin slightly concave; labrum rectangular; antennae moderately long, pubescent from second fourth of segment IV, the apex of terminal segment not reaching basal margin of pronotum; mentum transverse, deeply emarginate, with large labial pits, median tooth slightly bifid at tip, epilobes narrow, slightly projecting beyond lobes; submentum with medial setae, without lateral ones (Fig. 28).

Pronotum wide, transverse, sub-trapezoid, widest about middle, with margins distinctly, narrowly bordered (the bordering reduced in the middle quarter of apical margin, and sometimes in the middle of basal margin, just between the internal basal impressions); sides somewhat more constricted apically than basally, with two pairs of setiferous punctures, lateral punctures situated at about end of apical third, posterolateral ones situated near hind angles, near to lateral margin and close to basal margin; apical margin moderately emarginate, narrower than basal margin, fore angles rounded, moderately projecting; basal margin nearly straight, slightly concave in the middle, hind angles almost rectangular, rounded at tip; basal impressions somewhat variable in extension and size, internal ones always present, linear, narrow and falcate, diverging toward base, impunctate, deeper and longer than the outer ones, outer impression present or reduced becoming evanescent, when present then mostly faint, foveolate, somewhat punctate; disc slightly convex, midline well-impressed, long, not reaching both anterior and posterior margins.

Elytra sub-elongate, moderately convex, widest at about the second third, fused at suture; shoulders well-marked, obtusely angulate; basal margin complete, reaching stria 1 inwards, forming a very minute denticle at humerus; discal striae moderately impressed, impunctate, parascutellar striae distinct, striae 1-8 joining basal margin; intervals slightly flat, smooth, interval 3 with three to four (rarely two or five) setiferous punctures adjoining stria 3, with last puncture in posterior third of elytron, rarely in about middle of interval 3 (see also Variability); scutellar setiferous puncture present; hind wings reduced to small scales.

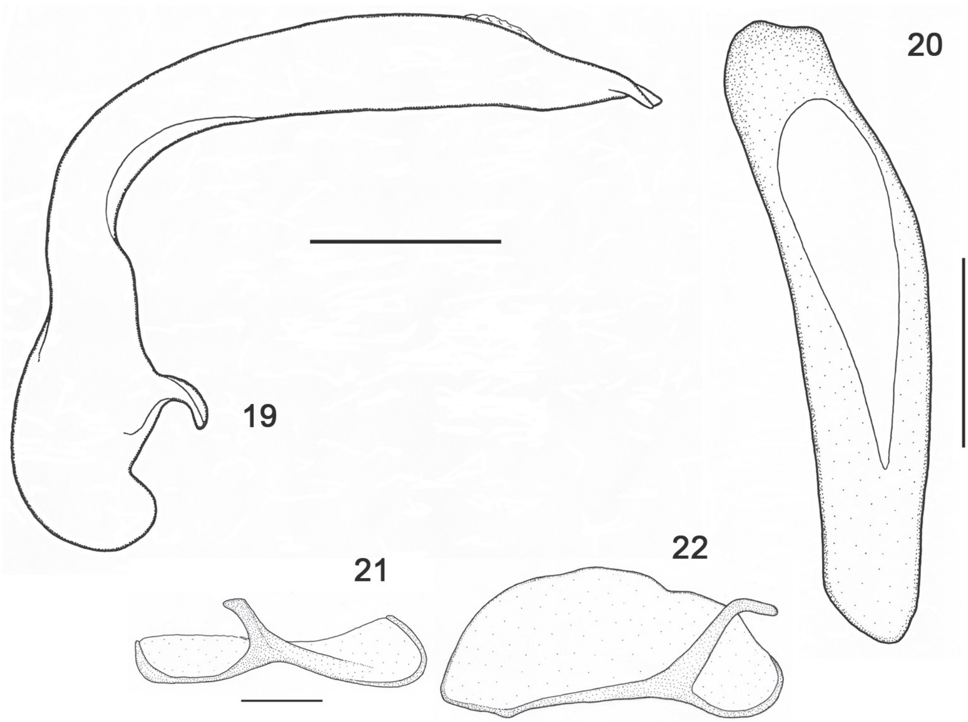
Prosternum, mesosternum, middle of metasternum, proepipleura, epipleura of elytra, and abdominal sternites (excl. sides of sternites 1-3) smooth, impunctate, proepisterna and sides of sternites 1-3 slightly punctured, mesepisterna, metepisterna, and sides of metasternum more or less roughly punctured; intercoxal process of prothorax subquadrate, distinctly bordered at sides and backwards; metaepisterna short, sub-quadrate, moderately narrowed toward behind, its anterior border longer than internal and posterior ones, as long as external border.

Abdominal sternites IV-VI with transverse basal sulci complete (continuous) and well-impressed, abdominal sternum VI with posterior margin rimmed throughout, with one pair of foveate setigerous punctures medially in males and two pairs in females.

Legs slender, relatively long; protibia apically moderately but abruptly enlarged at internal margin in males; mesotibia and metatibia straight in both sexes, mesotibia with slight inner callus distally in males; tarsomeres 1-5 glabrous dorsally, segment 5 setose ventrally; segments 1-3 of male protarsi moderately expanded.

Male genitalia (5 specimens dissected). Median lobe of aedeagus slender (Figs 19-20), narrower at middle, with basal part long, almost rectangularly bent behind apical part, narrowest at middle, from there toward apical lamella rectilinear, right external angle of apical lamella somewhat bent down, left external angle elevated (left lateral view), median lobe from middle part shifted to left, with right margin moderately convex, lengthwise appreciably elevated over left margin, left margin concave towards apex, apical lamella wide, rounded on left side, obtusely angled on right side, with a slight front concavity (dorsal view), ostium slightly deflected to right; right paramere narrow and elongate, smaller than left one, with a slanting lateral process (Fig. 21); left paramere conchoid (Fig. 22).

Female genitalia (3 specimens dissected). Ovipositor (Fig. 23), with valvifer more chitinized proximally and less distally, its distal margin having a setose and moderately chitinized area, basal stylomere large, conical, apical stylomere smaller, falcate, with two dorsolateral ensiform setae and one dorsomedial ensiform seta, sensorial pit distinct with two long nematiform setae; spermathecal complex (Fig. 24) with copulatory bursa proximally slightly gooseneck-like (this character not visible in Fig. 24), sper-



Figures 19–22. *Parorthomus* gen. n. *socotranus* sp. n., paratype, male genitalia: **19** median lobe of aedeagus, left lateral aspect **20** median lobe of aedeagus, dorsal aspect **21** right paramere, internal face **22** left paramere, internal face. Scale bars = 0.5 mm (Figs 19–20), 0.2 mm (Figs 21–22).

matheca with seminal canal and receptaculum slightly differentiated [undifferentiated type, according to Bousquet 1999: 35-36], receptaculum shorter than seminal canal, widened and slightly curved apically, appended spermathecal gland spherical, with elongate diverticulum.

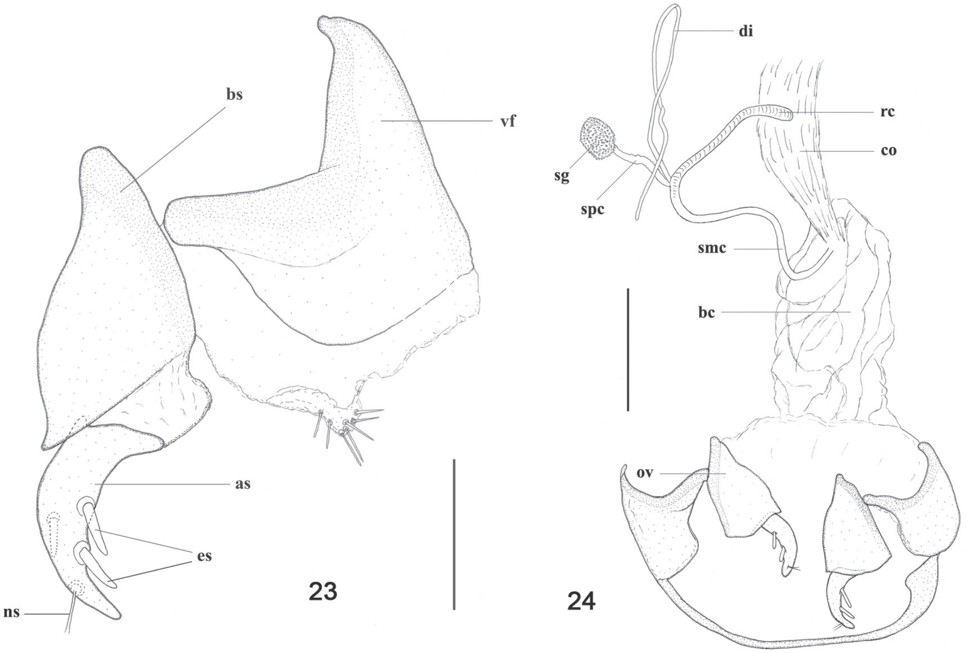
Variability. Interval 3 with three to four (rarely two or five) setiferous punctures adjoining stria 3, with last puncture in posterior third of elytron, rarely in about middle of interval 3. The number of punctures can increase to five or decrease to two, often the number of punctures of the left and the right elytron is unequal. Also the position of the punctures can somewhat vary. While the first two discal punctures always adjoin stria 3 (and so also the majority of the following punctures), sometimes the third puncture is located on the middle of interval or adjoins stria 2, rarely, the fourth discal pore is located on the middle of interval 3 or adjoins stria 2.

For variability of body size and indices see ‘Description’ and Table 1.

Etymology. The specific epithet is an adjective, referring to Socotra, the island where the new species was collected.

Distribution. Up to present only known from Socotra.

Ecology. A mesotopic to eurytopic epigeic beetle, collected from the end of September to the first ten days of February, and on higher ground (Hagher Mts., Scand Mt.



Figures 23–24. *Parorthomus* gen. n. *socotranus* sp. n., paratype, female genitalia, ventral view: **23** left ovipositor **24** female reproductive tract (spermathecal complex and ovipositor). Legend: **as** apical stylomere; **bc** bursa copulatrix; **bs** basal stylomere; **co** common oviduct; **di** diverticulum; **es** ensiform setae; **ns** nematiform setae; **ov** ovipositor; **rc** receptaculum of spermatheca; **smc** seminal canal of spermatheca; **sg** appended gland of spermatheca; **spc** spermathecal canal; **vf** valvifer. Scale bars = 0.2 mm (Fig. 23), 0.5 mm (Fig. 24).

env., 1450 m) some specimens were also found in June. From the list of localities, the species seems to be quite widespread across Socotra from the mouths of wadis (near or far off the water) till the highest mountains. Referring on Bezděk et al. (2012), the dominant habitat at most of the mentioned localities is high shrubland with dominant *Croton socotranus* and *Jatropha unicostata* (in higher altitude with intermixed *Boswellia* spp., *Dracaena cinnabari*, *Euphorbia arbuscula*, etc.) (Jiří Hájek, personal communication).

Systematic and biogeographic considerations. The Socotra Archipelago is a Gondwanan continental fragment, which has experienced a long period of geological isolation. This landmass was separated from the Arabian plate during the rifting which began to open the Gulf of Aden in the Oligocene to Miocene epochs (d'Acremont et al. 2006). It is supposed that Socotra was isolated from Arabia at least 16 million years ago (d'Acremont et al. 2010). The high level of endemism found among the insects in Socotra (Batelka 2012) is in accordance with the estimated geological age and the supposedly continuous stability of its ecosystems.

At present, it is difficult to ascertain whether *Parorthomus* gen. n. *socotranus* sp. n. derived from ancestral populations on the Arabian mainland that probably reached Socotra by transoceanic dispersal in relatively recent geological times, or it is a descendent of an ancestor and evolved *in situ* in the course and after the separation of the island. Notwithstanding, a few taxonomic and biogeographic facts are consistent with the hypothesis that the species is not a phyletically young descendant of continental populations.

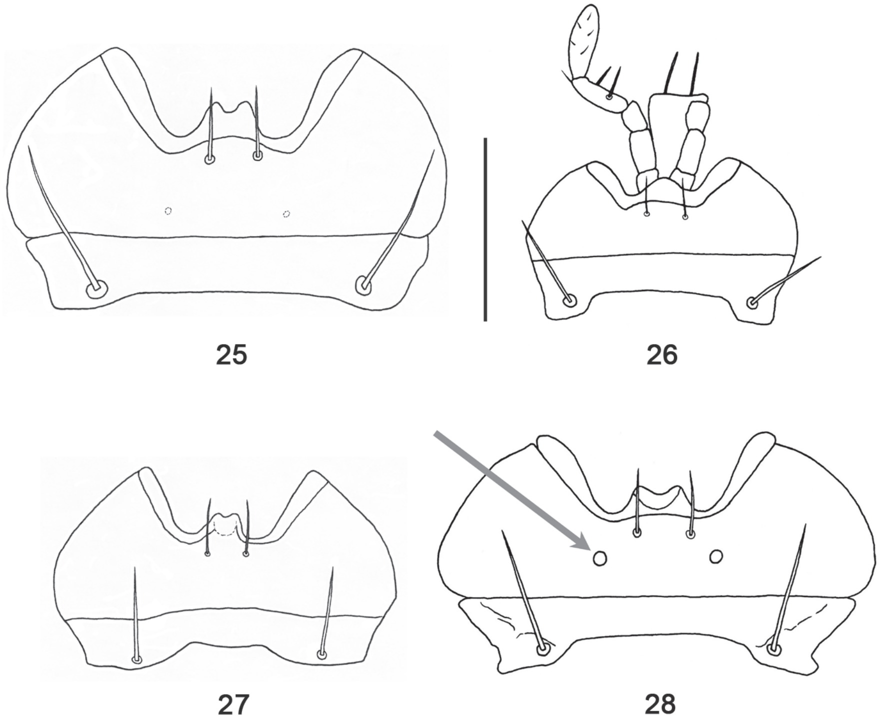
Combinations of distinguishing features (see 'Diagnosis', Key to the genera of the "African Series" of Euchroina) clearly distinguish the new genus from the other related genera. However, some character states: 1/ mentum tooth bifid (Fig. 28); 2/ sides of pronotum straight or slightly convex posteriorly (Fig. 18); 3/ elytra with setiferous punctures in interval 3 (Fig. 18); 4/ intercoxal process of prothorax bordered; 5/ abdominal sternites V-VII with transverse sulci, complete and well-impressed; 6/ tarsomeres 1-5 of all legs glabrous dorsally; 7/ segment 5 of tarsomeres setose ventrally; 8/ aedeagus with sides nearly equally broadened in the distal half, with apical lamella wide, nearly rounded at tip (Fig. 20); 9/ appended spermathecal gland with diverticulum (Fig. 24), show that the new species may be related to two geographically "close" genera, the Afrotropical *Abacillodes* and the Mediterranean *Orthomus*. The two species from the first genus and the new species share characters 1-3 and 5-8. Some species from the second genus and *Parorthomus* gen. n. *socotranus* sp. n. divide states 1-7 and 9 between, while the last taxon and *Orthomus velocissimus* s.l. possess all the listed character states.

The median lobe with sides nearly equally broadened along the distal half and apical lamella wide, rounded or semi-rounded at tip in the new species looks alike the median lobe in the Afrotropical *Abacillodes* (see Straneo 1988: 482, Fig. 1d, 484, Fig. 2b), as well as those in some Mediterranean taxa of *Orthomus* (see Mateu 1957, laminas I-IV, Machado 1992: 262, Fig. 100, Wrase and Jeanne 2005: 894–896, Figs 1b, 2b, 3b, 4b, 5b, 6b, 7b, Pupier and Coulon 2013: 224, Figs 1c–e, 225, present paper Figs 5–8). In contrast, the median lobe of *Parorthomus* gen. n. *socotranus* sp. n. has the distal half considerably curved to the left in dorsal aspect. Hitherto all the representatives of *Orthomus* and *Abacillodes* have the median lobe of the aedeagus straight or nearly straight. Based upon the condition in the other continental, African and Eurasian euchroines (aedeagus of *Abacillius* and *Trichopedius* not yet known or described), we consider the bent aedeagus to be an apotypic character in *Parorthomus* gen. n. The median lobes in the "*gracilipes*" group of *Nesorthomus*, with *N. gracillipes* (Wollaston, 1854) and *N. berrai* Battoni, 1987, have also the above discussed character state, more pronounced in the former and less pronounced in the second species (see Sciaky 1988: Figs 1b, 2b, Machado 1992: 264, Fig. 101A, Donabauer 2008: 111, Figs 1b, 2b, Serrano et al. 2009: 30, Figs 9b, 9d). This case is an instance of convergency. Change in this state has taken place independently in *Nesorthomus*, since the other six species from the genus have a straight median lobe of the aedeagus.

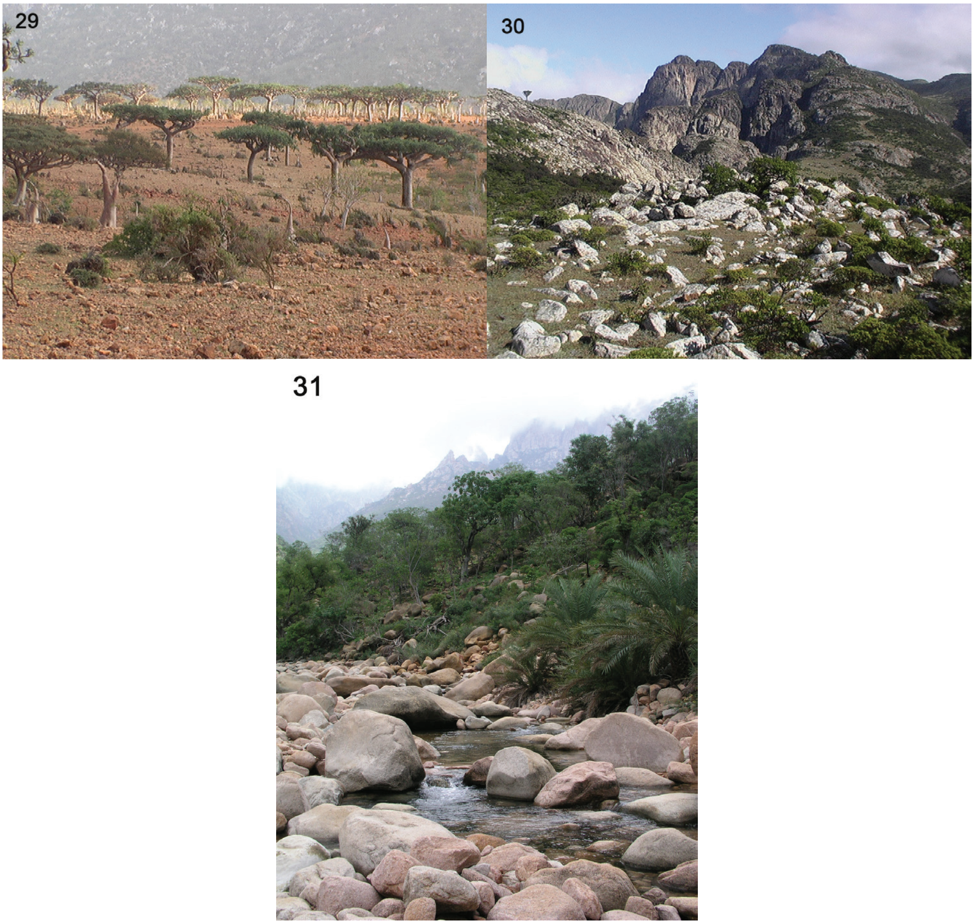
Besides, we infer that the presence of three to four discal setiferous punctures (by exception, two or five punctures on one elytron only) in the elytral interval 3 or stria 3, with the last puncture in posterior third of elytron, is another clear apotypic feature in the new taxon. This state occurs in no other species among the Old World Euchroina, except *Parorthomus* gen. n. *socotranus* sp. n. The most species of the subtribe have two discal punctures in the elytral interval 3, as the second one lies at the posterior third of elytron. The species of *Abacillius* have no discal punctures on the elytron.

Parorthomus gen. n. *socotranus* sp. n. has a unique combination of two apotypic characters, distal third of the aedeagus considerably curved to the left in dorsal aspect (i), and presence of 3-4 discal setiferous puncture in elytral stria 3/interval 3, with the last puncture situated in the posterior third of elytron (ii), which is indication for a long-time existing isolation and merit surely the erection of an own genus. The absence of close relative/s sharing together with the new species these two marked structural features exclude a close relationships and suggests that we deal with an ancient lineage which most probably arisen within the basic stem of the "African Series" of Euchroina (according to Will 2006) long time ago. As well, the lack of extant relatives, akin to the new species, in the Arabian Peninsula or somewhere else is a strong biogeographic argument, which certainly excludes geologically recent migration.

In spite of all, special character states and main ecologic preference in *Parorthomus* gen. n. *socotranus* sp. n. suggest that it is phylogenetically closer to *Orthomus* and *Abacillodes* than to any other genus. The exact phylogenetic position within the euchroines can be disclosed only after investigation of more taxa, especially from the Old World, including also genetic technics and providing cladistic analysis, this could probably also identify its sister taxon.



Figures 25–28. Mentum and submentum, ventral aspect (gray arrow indicating labial pits): **25** *Orthomus barbarus barbarus* (Dejean, 1828), female, Spain, "Laguna Salinas (Alicante)" **26** *Abacillius basilewskyi* Straneo, 1962, holotype **27** *Abacillodes jocquei* Straneo, 1988, holotype **28** *Parorthomus* gen. n. *socotranus* sp. n., male paratype, "Fimihin". Scale bar = 0.5 mm.



Figures 29–31. Habitats of *Parorthomus* gen. n. *socotranus* sp. n. in Socotra. **29** Homhil protected area, November 2003 **30** Al Haghier Mts., December 2003 **31** Wadi Ayhaft, January 2004 (all photographs by JF).

The presence of large labial pits on the mentum is a trait in the new taxon that is worth noting. Each pit has a distinct, deep aperture, its diameter wider than the diameter of the labial pore, and both are situated more medially (Fig. 28). The distinct labial pits, destined to a particular function of use, seem to be a plesiotypic condition in Pterostichini (Bousquet 1999: 33), as well in the Nearctic euchroines (Frania and Ball 2007: 120). The species of *Abacillius*, *Abacillodes* and *Orthomus* possess no or small labial pits (Figs 25–27). In the second case, they have indistinct, shallow apertures, diameters similar to or smaller than the diameters of the labial pores, and both are situated more basally.

So far, 53 species of ground beetles have been recorded from the Socotra Archipelago (Felix et al. 2012, present work). *Parorthomus* gen. n. *socotranus* sp. n. is the only representative of the tribe Pterostichini and the second carabid endemic form at genus level found in this insular fragment (Wranik 2003, Felix ibid.).

Additionally examined material

Abacillius basilewskyi Straneo, 1962
Fig. 26

Abacillius basilewskyi Straneo, 1962: 53 (type locality: "Natal, Drackensberg, Little Berg Summits, Themeda Grasslands, 5500–6000 ft., Cathedral Peak, Forestry reserve")

Type material. Holotype ♀, "Holotypus" [printed on salmon colored label], "Little berg summits Themeda Grassland 5500–6000 ft." [printed], "cathedral peak forestry reserve. natal drakensberg. March 1959 B. R. & P. J. Stuckenberg" [printed], "Col. Mus. Congo don. B. Stuckenberg Coll. P. Basilewsky" [printed & handwritten], "*Abacillius Basilewskyi* n.sp. S.L. Straneo det. 1960 Holotypus" [printed & handwritten], "RMCA ENT 000019508" [printed] (MRAC).

Remarks. Straneo (1949: 7, 1958: 404) recorded that the onychium of the tarsi in *A. aculeatus* is glabrous beneath. Subsequently, he described the same characteristics for *A. basilewskyi* (Straneo, 1962: 54). However, the study of the holotype of the latter species revealed that it possesses the onychium finely setose beneath.

Abacillodes jocquei Straneo, 1988
Fig. 27

Abacillodes jocquei Straneo, 1988: 483 (type locality: "Lichenya Plateau, 2000 m, Mount Mulanje")

Type material. Holotype ♂, "Holotypus" [printed on salmon colored label], "Lichenya Plateau 2000m 5/24.XI.1981" [printed], "Coll. Mus. Tervuren Malawi South. Reg. Mount Mulanje XI. 1981 - R. Jocqué" [printed], "Holotypus *Abacillodes jocquei* Str." [printed & handwritten on red label], "*Abacillodes jocquei* n. sp. det. S.L. Straneo 1987 Holotypus ♂" [printed & handwritten], "RMCA ENT 000019509" [printed] (MRAC).

Remarks. A striking characteristic in the type species of *Abacillodes*, *A. jocquei*, are the elytral intervals 2, 4, and 6, significantly wider than the adjacent uneven intervals. But, this character state is not present in *A. malawianus*, thus it can not be used as a generic distinguishing mark.

Abacillodes malawianus Straneo, 1988

Abacillodes malawianus Straneo, 1988: 483 (type locality: "Lichenya Plateau, 2000 m, Mount Mulanje")

Type material. Holotype ♀, "Holotypus" [printed on salmon colored label], "Lichenya Plateau 2000m 15/17.XI.1981" [printed], "Coll. Mus. Tervuren Malawi South. Reg. Mount Mulanje XI. 1981 - R. Jocqué" [printed], "Holotypus *Abacillodes malawianus* Str." [printed & handwritten on red label], "*Abacillodes malawianus* n.sp. det. S.L. Straneo 1987 Holotypus ♂" [printed & handwritten], "RMCA ENT 000019510" [printed] (MRAC).

Remarks. Straneo (1988: 483) stated the holotype is a male. Actually, it is a female specimen having protarsomeres not dilated and last abdominal sternite with four marginal setiferous punctures.

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RESEARCH ARTICLE

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The genus *Spathius* Nees (Hymenoptera, Braconidae, Doryctinae) in Mexico: occurrence of a highly diverse Old World taxon in the Neotropics

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Abstract

Two new species of the parasitoid wasp genus *Spathius* Nees (Braconidae: Doryctinae) from Mexico, *S. mexicanus* **sp. n.** and *S. chamelae* **sp. n.**, are described and illustrated. These represent the second and third described species of this highly diverse Old World genus in the Neotropics, and the first described species recorded for the Mexican territory.

Keywords

Ectoparasitoid, Central America, Ichneumonoidea, taxonomy, new species

Introduction

The parasitoid wasps genus *Spathius* Nees, 1818 (Braconidae: Doryctinae) is a highly diverse group that currently contains about 400 described species divided into 40 species groups (Nixon 1943, Belokobylskij 2003, Chen and Shi 2004, Belokobylskij and Maeto 2009). This genus is widely distributed along the five continents, though most

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of its species richness concentrates in the Oriental and Palaearctic regions. Most species of *Spathius* whose biology is known are idiobiont ectoparasitoids of the xylophagous larvae of various coleopteran families, particularly Curculionidae, Cerambycidae, Anobiidae, Bostrichidae and Buprestidae. However, some species have been also reared from concealed larvae of Lepidoptera (Sessiidae, Tineidae, Pyralidae and Tortricidae) and Hymenoptera (Xiphydriidae) (Shenefelt and Marsh 1976, Belokobylskij 1992, 2003, Yu et al. 2012).

A molecular phylogenetic study carried out for 50 doryctine genera (Zaldívar-Riverón et al. 2008) revealed that the tribe Spathiini *sensu* Belokobylskij (1992), whose members had been mainly characterised by having a tubular, considerably elongated acrosternite (basal sternal plate) of the first metasomal segment, was polyphyletic. Based on the phylogenetic relationships recovered, these authors left the Spathiini to be composed only by the speciose *Spathius*, pendant to the inclusion of additional doryctine genera in further phylogenetic studies.

The most recent revision for the Nearctic species of *Spathius* registered a total of 18 species (Marsh and Strazanac 2009). In contrast, only one species of this genus has been recorded to occur in the Neotropics, *S. albocoxus* Marsh, described from Costa Rica (Marsh 2002). Recent studies have reported the occurrence of species assigned to *S. albocoxus* in the state of Yucatan, Mexico (Cauich-Kumul et al. 2012; Coronado-Blanco 2013). However, these identifications apparently followed Marsh's (2002) key but without any further detailed character examination and thus they are questionable.

In this paper, we described two new species of *Spathius* from two localities situated near the Pacific and Atlantic coasts of Mexico. These are the first confirmed records of the genus in the Mexican territory as well as two additional species of *Spathius* described for the Neotropics. According of Nixon's (1943) key, these two new species belong to the *S. fasciatus* species group.

Material and methods

The examined material was collected by AZR in the Chamela (state of Jalisco) and Los Tuxtlas (state of Veracruz) biological stations, both owned by the Instituto de Biología, Universidad Nacional Autónoma de México (IB-UNAM). The type material of the new species of *Spathius* described below is deposited in the following collections: IB-UNAM – Colección Nacional de Insectos, Instituto de Biología, Universidad Nacional Autónoma de México (México); ZISP – Zoological Institute, Russian Academy of Sciences (St Petersburg, Russia).

The terminology employed for morphological features and measurements follows Belokobylskij and Maetô (2009). The wing venation nomenclature follows Belokobylskij and Maetô (2009), with Sharkey and Wharton's (1997) terminology shown in parentheses. Photographs were taken with a Leica IC 3D digital camera that was mounted on a Leica® MZ16 microscope and using the Leica Application Suite® imaging system (Museum and Institute of Zoology PAN, Warsaw, Poland).

DNA sequences belonging to the barcoding locus (about 658 bp of the cytochrome oxidase I mitocondrial DNA gene) were generated for specimens of the two new species, and their GenBank numbers are included below. Sequences of the species from Chamela, Jalisco, were previously published (Zaldívar-Riverón et al. 2010), and are also available in the project file "Parasitoid Wasps (Braconidae: Doryctinae) of Chamela–Cuixmala Biosphere Reserve" (ASDOR project) in the projects section of the Barcode of Life Data Systems (www.barcodinglife.org). Sequences of the specimens from Los Tuxtlas, Veraruz, were obtained using the DNA extraction and amplification protocols described in Ceccarelli et al. (2012).

Taxonomic part

Spathius mexicanus Belokobylskij & Zaldívar-Riverón, sp. n.

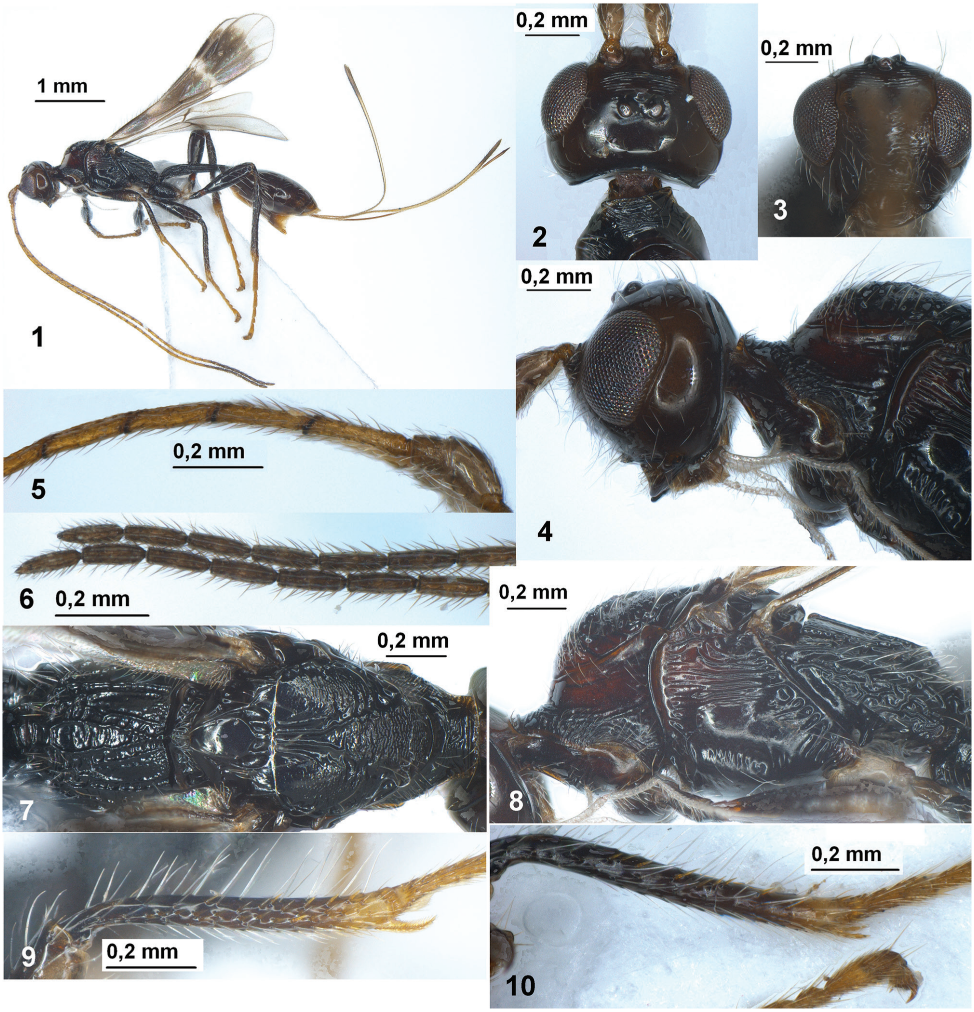
http://zoobank.org/6833714C-2FA6-4B9B-936A-C8BD036D51BC
Figs 1–16

Type material. *Holotype*: female, "México, Veracruz, Los Tuxtlas, 27.VII.2006, A. Zaldívar-Riveron coll.", DNA voucher no. CNIN1193, GenBank accession no. KM099422 (IB-UNAM).

Paratypes: 1 male "México, Veracruz. Estación de Biología Los Tuxtlas, 18.585N, – 95.075W, 151msnm, 09.VI.2011. Red. Remanente selva alta perennifolia. Col. Zaldívar-Riverón, Clebsch, Martínez-Salinas", DNA voucher no. CNIN1196, Genbank accession no. KM099423 (IB-UNAM); 1 female, "México, Veracruz, Estación de Biología Los Tuxtlas, 27.VII.2006" (ZISP); 1 female, 5 males, "México, Veracruz. Estación de Biología Los Tuxtlas, 18.585N, – 95.074W, 141 msnm, 08.VI.2011. Tropical rain forest. Col. Zaldívar-Riverón, Clebsch, Martínez-Salinas" (IB-UNAM, ZISP); 2 females, 1 male, "México, Veracruz. Estación de Biología Los Tuxtlas, 18.585N, – 95.075W, 151 msnm, 09.VI.2011. Col. Zaldívar-Riverón, Clebsch, Martínez-Salinas, Selva altas" (IB-UNAM); 4 females, "México, Veracruz. Estación de Biología Los Tuxtlas, 18.58512N, – 95.075W, 7–11 m, 12.VI.2011. Selva altas. Col. Zaldívar-Riverón, Clebsch, Martínez-Salinas, Selva alta" (IB-UNAM, ZISP).

Description. Female. Body length 3.8–5.2 mm; fore wing length 2.4–3.2 mm.

Head. Head width (dorsal view) 1.5–1.6 times its median length, 1.3–1.4 times width of mesoscutum. Vertex convex. Head behind eyes (dorsal view) distinctly and evenly roundness decreased; transversal diameter of eye (dorsal view) 1.4–1.7 times longer than temple. Ocelli with ocellar triangle base 1.15–1.25 times its sides; POL 1.0–1.3 times Od, 0.35–0.4 times OOL. Eye glabrous, its maximum diameter 1.3–1.4 times minimum diameter. Malar space 0.4–0.45 times maximum diameter of eye, 0.75–0.85 times basal width of mandible. Face slightly convex, its width equal to maximum diameter of eye, 1.1 times height of face and clypeus combined. Clypeal suture distinct and complete. Ventral margin of clypeus with distinct flange. Hypoclypeal depression medium-sized and rounded, its width 0.9 times the shortest



Figures 1–10. *Spathius mexicanus* sp. n. (female). **1** Habitus, lateral view **2** Head, dorsal view **3** Head, front view **4** Head and anterior half of mesosoma, lateral view **5** Basal segments of antenna **6** Apical segments of antenna **7** Mesosoma, dorsal view **8** Mesosoma, lateral view **9** Fore tibia **10** Middle tibia.

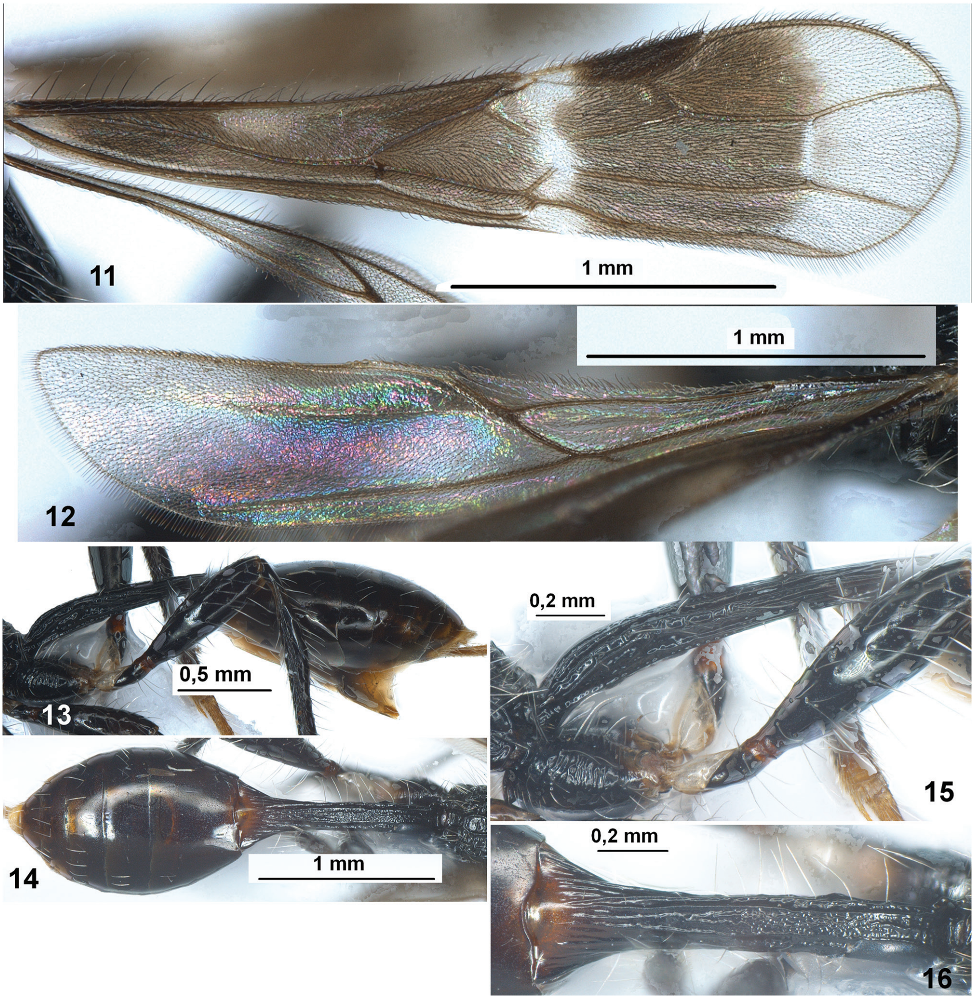
distance from edge to eye, 0.4–0.45 times width of face. Occipital carina dorsally complete, not broken toward ocellar triangle, not reaching hypostomal carina and obliterated on short distance before area posterior to the mandible base. Hypostomal flange rather wide.

Antennae slender, almost filiform, 28–36-segmented, 1.2–1.3 times longer than body. Scape 1.6–1.7 times longer than maximum width. First flagellar segment 4.7–5.2 times longer than apical width, 1.1–1.2 times longer than second segment. Penultimate segment 3.2–3.5 times longer than width, 0.55–0.6 times as long as first segment, 0.9–1.0 times as long as apical segment; the latter subpointed or truncate apically and without spine.

Mesosoma. Mesosoma not depressed, maximum length 1.9–2.0 times its maximum height. Pronotal keel indistinct or fine, without posterior branch. Pronotum (dorsal view) subanteriorly with distinct transverse carina. Pronotal lateral depression shallow, delineated by carinae above and below, wide, almost entirely smooth. Mesoscutum (lateral view) slightly curvedly and highly elevated above pronotum, its median lobe (dorsal view) distinctly convex anteriorly and without anterolateral corners; mesoscutum in dorsal view 1.0–1.1 times as long as wide. Notauli complete, wide, deep anteriorly, becoming shallow posteriorly, coarsely crenulate and sometimes with fine granulation. Scutellar sulcus (prescutellar depression) deep, rather short, with three coarse carinae, finely rugulose, 0.25–0.3 times as long as scutellum. Scutellum slightly convex, with distinct lateral carinae. Subalar depression narrow, very shallow, widely and coarsely striate. Precoxal sulcus (sternaulus) about 0.5 times length of lower part of mesopleuron, slightly curved, wide, deep, distinctly and densely crenulate. Postpectal carina absent. Metanotum with short, wide and rounded apically dorsal tubercle. Metapleural flange (lobe) narrow, long, subpointed or weakly rounded apically. Propodeum without lateral tubercles.

Wings. Fore wing 4.0–4.1 times longer than wide. Pterostigma 4.5–5.0 times longer than its maximum width. Radial vein (r) arising behind middle of pterostigma, from its basal 0.6. Radial (marginal) cell not shortened, metacarp (R1) 1.2–1.3 times longer than pterostigma. Second radial abscissa (3RSa) 3.1–3.4 times longer than first abscissa (R) and forming with it very obtuse angle, almost as long as the weakly curved third abscissa (3RSb), almost as long as first radiomedial vein (2RS). Second radiomedial (submarginal) cell not or slightly narrowed distally, its length 3.6–3.9 times maximum width, 1.6–1.8 times length of brachial (first subdiscal) cell. Second abscissa of medial vein ((RS+M)b) rather long, 0.4–0.5 times as long as recurrent vein (m-cu). Nervulus (cu-a) postfurcal, distance between basal vein and nervulus 0.5–0.6 times nervulus length. Parallel vein (2CUb) not interstitial, arising from anterior quarter or third of distal margin of brachial (first subdiscal) cell. Mediocubital vein (M+CU) in distal half weakly curved to longitudinal anal vein (1-1A). Hind wing 5.1–5.5 times longer than its maximum width. First costal abscissa (C+Sc+R) 0.6–0.7 times as long as second abscissa (Sc+R). First abscissa of mediocubital vein (M+CU) 0.6–0.8 times as long as second abscissa (1M). Recurrent vein (m-cu) more or less distinctly sclerotised, pigmented, distinctly antefurcal, strongly oblique towards base of wing.

Legs. Fore tibia anterior margin with long, dense spines arranged in narrow stripe. Segments of middle tarsus considerably longer than their width. Hind coxa with distinct basoventral tubercle, 1.8–2.0 times longer than maximum width. Hind femur elongate-oval, 3.2–3.5 times longer than wide. Hind tibia with outer apical lobe and two-three slender and long spines. Hind tarsus 0.9–1.0 times as long as hind tibia. Hind basitarsus 0.55–0.6 times as long as remaining segments combined. Second segment of hind tarsus 0.5–0.55 times as long as basitarsus, almost as long as thickened fifth segment (without pretarsus). Tarsal segments slightly thickened. Claws short, thick basally, with short curved apical part.



Figures 11–16. *Spathius mexicanus* sp. n. (female). **11** Fore wing **12** Hind wing **13** Metasoma, lateral view **14** Metasoma, dorsal view **15** Petiole, lateral view **16** Petiole, dorsal view.

Metasoma. Petiole (lateral view) ventrally almost straight, dorsal basal half slightly arched and apical half nearly straight, highest in basal third or fourth; petiole slender in dorsal view, slightly widening at spiracular tubercles and distinctly apically. Length of petiole 2.9–3.1 times its apical width, 2.2–2.4 times length of propodeum; apical width about 2.0 times width at spiracle level, 2.6–2.7 times minimum subbasal width. Second tergite without laterotergites separated. Suture between second and third tergites (second suture) absent. Median length of second and third tergites combined 1.0–1.1 times its basal width, 0.6–0.65 times their maximum width. Ovipositor straight. Ovipositor sheath 2.5–2.9 times longer than petiole, 1.1–1.5 times longer than metasoma, 2.0–2.3 times longer than mesosoma, as long as or slightly longer than fore wing.

Sculpture and pubescence. Vertex entirely smooth. Frons densely and slightly curvedly transverse striate, with fine rugulosity between striae, sometimes almost smooth anteriorly or medioposteriorly. Face distinctly striate-rugose, smooth on median vertical area and laterally. Temple entirely smooth. Mesoscutum distinctly and densely granulate, granulation usually situated in fine semicircular subtransverse aciculation, coriaceous to almost smooth posteriorly, its medioposterior third with several distinct longitudinal striae, median lobe with dense and fine or very fine additional transverse striation; lateral lobes near notauli with distinct or coarse additional rugosity. Scutellum entirely or almost entirely smooth. Mesopleuron medially smooth, longitudinally striate in upper 0.3–0.5. Metapleuron entirely coarsely rugose-reticulate. Propodeum in anterior (dorsal or basolateral) areas almost smooth or sometimes finely reticulate, with more or less coarse additional carina along areola margins; basal (median) carina short or almost absent; areola narrow and long, 3.0–4.0 times longer than wide; petiolate area long and rather narrow, separated from areola by distinct carina; propodeum mainly coarsely transverse striate. Hind coxa entirely or almost entirely coarsely transverse striate, finely sculptured below. Hind femur entirely smooth. Petiole dorsally distinctly and more or less sparsely longitudinally striate and with distinct dense rugulosity between striae, medially rather widely and small reticulate-rugulose. Second and following tergites entirely smooth. Vertex almost entirely with very sparse, long and erect pale setae, sometimes glabrous posteriorly. Mesoscutum glabrous, with very long, sparse and almost erect yellowish setae arranged widely along margins of notauli and in single line laterally. Setae of hind tibia semi-erect, mainly long and rather dense, but dorsally in apical quarter additionally with dense and short setae; length of long setae on its dorsal surface 1.0–1.4 times maximum width of tibia.

Colour. Body black or dark reddish brown to reddish brown partly, head and anterior third of mesosoma dark reddish brown, occasionally head almost entirely or behind eyes yellowish brown and mesosoma red in anterior half. Antennae brownish yellow or yellow in basal third, yellow medially, dark brown to sometimes black on apical six-seven segments. Palpi pale yellow. Legs almost black or dark reddish brown, fore femur apically, always all tibiae apically and all tarsi entirely (including fifth segment) light reddish brown to brownish yellow, middle coxa and sometimes middle trochanter and hind trochanter whitish. Ovipositor sheath brownish yellow or yellow, black apically. Fore wing strongly darkened, with faintly darkened spots basally and in middle of medial cell, with very faintly darkened to almost hyaline transverse stripes in beginning of pterostigma (narrow) and on apex of wing (wide). Pterostigma dark brown to black, pale yellow to whitish yellow in basal quarter.

Male. Body length 2.4–4.3 mm; fore wing length 1.9–3.0 mm. Head width (dorsal view) 1.4–1.6 times its median length, 1.3–1.5 times width of mesoscutum. Head behind eyes (dorsal view) slightly roundness decreased. Malar space 0.35–0.4 times maximum diameter of eye. Face partly and finely striate-rugose, widely smooth laterally and below; its width 0.9 times maximum diameter of eye, almost equal to height of face and clypeus combined. Hypoclypeal depression width 0.5 times width of face. Antennae 26–35-segmented; brown to dark brown on apical 9–10 segments. Penultimate segment 3.7–4.3 times longer than their width, 0.6–0.7 times as long as first segment. Maximum length of mesosoma 1.9–2.1 times its maximum height. Scutellar sulcus (prescutellar depression) 0.2–0.4 times as long as scutellum. Propodeal areola sometimes with more long basal carina. Metacarp (R1) 1.25–1.35 times longer than pterostigma. Second radial abscissa (3RSa) 3.7–5.0 times longer than first abscissa (R), 1.15–1.30 times longer than first radiomedial vein (2RS). Hind wing 5.2–5.4 times longer than its maximum width. Hind femur 2.9–3.1 times longer than wide. Length of setae on dorsal surface of hind tibia 1.3–2.0 times maximum width of tibia. Hind basitarsus with distinct inner apical process. Second segment of hind tarsus 0.45–0.50 times as long as basitarsus, 0.8–0.9 times as long as fifth segment (without pretarsus). Length of petiole 3.4–3.9 times its apical width; apical width 1.8–2.0 times width at spiracle level, 2.0–2.3 times minimum subbasal width. Second-fourth tergites with laterotergites separated. Median length of second and third tergites combined 1.3–1.6 times its basal width, 0.75 times their maximum width. Sometimes body paler. Otherwise similar to female.

Distribution. Mexico (Los Tuxtlas, Veracruz).

Diagnosis. *Spathius mexicanus* sp. n. belongs to the *S. fasciatus* Walker species group. This new species is similar to the Costa Rican *S. albocoxus* Marsh, but differs from it by having the palpi white or pale yellow (black in *S. albocoxus*), mesoscutum densely granulate with striation (mainly smooth in *S. albocoxus*), propodeum with areola distinctly delineated by coarse carinae (often without areola in *S. albocoxus*), basal carina of propodeum very short or almost absent (rather long in *S. albocoxus*), hind coxa striate laterally (smooth in *S. albocoxus*), second radial abscissa about as long as first radiomedial vein (distinctly shorter in *S. albocoxus*), and ovipositor distinctly shorter than body (equal to body in *S. albocoxus*).

Spathius mexicanus is also similar to the Oriental *S. dedalus* Nixon and the Nearctic *S. longipetiolatus* Ashmead. However, *S. mexicanus* differs from *S. dedalus* by having the fore coxa and hind tibia mainly dark reddish brown (honey yellow or yellow in *S. dedalus*), fore wing strongly darkened at wide areas (faintly tinted in *S. dedalus*), mesoscutum distinctly granulate (finely granulate in *S. dedalus*), scutellum distinctly convex (almost flat in *S. dedalus*), propodeum with short basal carina (with long basal carina in *S. dedalus*), hind coxa with distinct basoventral tubercle (without basoventral tubercle in *S. dedalus*), second radial abscissa about as long as third abscissa (distinctly shorter than third abscissa in *S. dedalus*), and ovipositor distinctly shorter than body (weakly longer than body in *S. dedalus*). *Spathius mexicanus* differs from *S. longipetiolatus* by having the vertex completely smooth (strongly transversely striate in *S. longipetiolatus*), lateral depression of the pronotum side entirely smooth (with several oblique carinae in *S. longipetiolatus*), sternaulus short (long in *S. longipetiolatus*), propodeum with additional lateral carinae along basal carinae and fork of areola (without carinae in *S. longipetiolatus*), parallel vein distinctly postfurcal (nearly interstitial in *S. longipetiolatus*), second tergite entirely smooth (faintly shagreened at base in *S. longipetiolatus*), legs mainly dark (unicolourous honey yellow in *S. longipetiolatus*), and fore wing with wide dark brown stripe (subhyaline in *S. longipetiolatus*).

Spathius chamelae **Belokobylskij & Zaldívar-Riverón, sp. n.**

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Figs 17–30

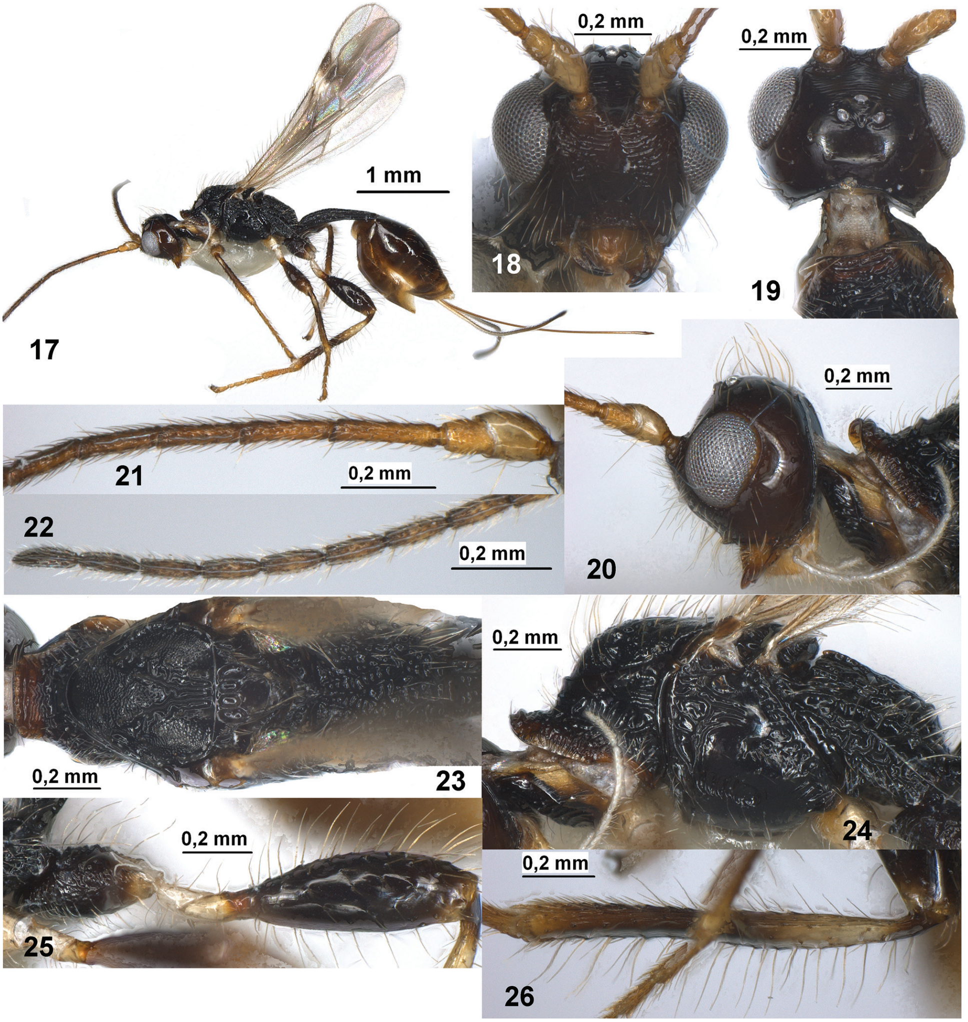
Type material. Holotype: female, "México, Jalisco, Est. Chamela. Camino a Calandria, 19.50485 N – 105.03786 W, 45 m. 18–20.XI.2009. Platos amarillos, Selva baj. cad. Cham-034, Alejandro Zaldívar R.", voucher no. BOLD ASDOR 433, GenBank accession no. (COI) HM434538 (IB UNAM).

Paratypes. 1 male, same data as holotype, voucher no. BOLD ASDOR 432, GenBank accession no. (COI) HM434537 (ZISP); 1 male, "México, Jalisco, Est. Chamela. Camino a Calandria, 19.504N – 105.037W, 52 m. 04.XI.2009. Red de barrido. Selva baja mediana. Cham-019, H. Clebsch / A. Zaldívar", voucher no. BOLD ASDOR 371, GenBank accession no. (COI) HM434515 (IB UNAM); 1 female, "México, Jalisco, Est. Chamela. Camino a Calandria, 19.504N – 105.037W, 45 m. 3–5.IX.2009. Platos amarillos, Selva baj. cad. Cham-013, H. Clebsch / A. Zaldívar R.", voucher no. BOLD ASDOR: 373, GenBank accession no. (COI) HM434517 (ZISP); 1 female, same data, voucher no. BOLD ASDOR: 372, GenBank accession no. (COI) HM434516 (IB UNAM); 1 male, same data, voucher no. CHAM-13-Spath-X-4, ASDOR 375, GenBank accession no. (COI) HM434 (IB UNAM); 1 male, "México, Jalisco, Chamela Fund. Cuixmala El sendero, 19.419N – 104.973W, 61 msnm. 7–IX–2009. Red de barrido. Selva baj. cad. Cham-023, H. Clebsch / A. Zaldívar R." (ZISP).

Description. Female. Body length 3.4–4.3 mm; fore wing length 2.2–2.7 mm.

Head. Head width (dorsal view) 1.5 times its median length, 1.3–1.4 times width of mesoscutum. Vertex convex. Head behind eyes (dorsal view) distinctly and evenly roundness decreased; eye transverse diameter (dorsal view) 1.25–1.4 times longer than temple. Ocelli with ocellar triangle base 1.2–1.3 times its sides; POL 1.6–2.2 times Od, 0.45–0.5 times OOL. Eye with sparse and rather distinct setae, maximum diameter of eye 1.2 times its minimum diameter. Malar space 0.45–0.5 times maximum diameter of eye, 0.8–1.0 times basal width of mandible. Face slightly convex, its width 1.1–1.2 times maximum diameter of eye, 1.1–1.2 times height of face and clypeus combined. Clypeal suture distinct and complete. Ventral margin of clypeus with distinct flange. Hypoclypeal depression medium-sized and rounded, its width 0.8–1.0 times the shortest distance from edge to eye, 0.4–0.5 times width of face. Occipital carina dorsally complete, not broken toward ocellar triangle, not reaching hypostomal carina and obliterated on short distance before area posterior to the mandible base, sometimes fused with hypostomal carina by additional ruga. Hypostomal flange rather wide.

Antennae slender, almost filiform, 30–31-segmented, 1.1–1.2 times longer than body. Scape 1.5–1.6 times longer than maximum width. First flagellar segment 4.0–4.6 times longer than its apical width, 1.1–1.2 times longer than second segment. Penultimate segment 2.5–2.8 times longer than their width, 0.55 times as long as first segment, 0.8–0.9 times as long as apical segment, the latter subpointed apically and without spine.



Figures 17–26. *Spathius chamelae* sp. n. (female). **17** Habitus, lateral view **18** Head, front view **19** Head, dorsal view **20** Head and anterior part of mesosoma, lateral view **21** Basal segments of antenna **22** Apical segments of antenna **23** Mesosoma, dorsal view **24** Mesosoma, lateral view **25** Hind coxa and femur **26** Hind tibia.

Mesosoma. Mesosoma not depressed, maximum length 2.0–2.1 times its maximum height. Pronotal keel distinct, its posterior branch distinct, not fused and at least slightly separated from posterior margin of pronotum. Pronotum (dorsal view) subanteriorly with high and thick transverse carina. Pronotal lateral depression shallow, delineated by carinae below or upper and below, wide, entirely coarsely and densely transverse crenulate. Mesoscutum (lateral view) slightly curvedly and highly elevated above pronotum, its median lobe (dorsal view) distinctly convex anteriorly and without anterolateral corners; mesoscutum in dorsal view about as long as wide. Notauli complete, wide, deep anteriorly, slightly shallow posteriorly, coarsely irregularly crenulate. Scutellar sulcus (prescutellar depression) deep, long, with three coarse carinae, almost smooth between carinae, 0.45–0.5 times as long as scutellum. Scutellum slightly convex, with fine lateral carinae. Subalar depression narrow, shallow, widely and coarsely rugose-striate. Precoxal sulcus (sternaulus) about half length of lower part of mesopleuron, slightly curved, wide, deep, distinctly and sparsely crenulate. Postpectal carina absent. Metanotum with short, wide and pointed apically dorsal tubercle. Metapleural flange (lobe) narrow, long, slightly rounded apically. Propodeum without lateral tubercles.

Wings. Fore wing 4.0–4.3 times longer than wide. Pterostigma 3.8-4.0 times longer than its maximum width. Radial vein (r) arising behind middle of pterostigma, from its basal 0.65–0.7. Radial (marginal) cell not shortened, metacarp (R1) 1.5–1.6 times longer than pterostigma. Second radial abscissa (3RSa) 3.0–5.0 times longer than first abscissa (R) and forming with it obtuse angle, 0.55–0.6 times as long as the almost straight third abscissa (3RSb), 1.1–1.4 times longer than first radiomedial vein (2RS). Second radiomedial (submarginal) cell not narrowed distally, its length 3.0–3.7 times maximum width, 1.3–1.5 times length of brachial (first subdiscal) cell. Second abscissa of medial vein ((RS+M)b) rather or very short, 0.1–0.3 times as long as recurrent vein (m-cu). Nervulus (cu-a) postfurcal, distance between basal vein and nervulus 0.2–0.3 times nervulus length. Parallel vein (2CUb) not interstitial, arising from anterior third of distal margin of brachial (first subdiscal) cell. Mediocubital vein (M+CU) in distal half weakly curved to longitudinal anal vein (1-1A). Hind wing 5.6–6.0 times longer than its maximum width. First costal abscissa (C+Sc+R) about 0.5 times as long as second abscissa (Sc+R). First abscissa of mediocubital vein (M+CU) 0.5–0.6 times as long as second abscissa (1M). Recurrent vein (m-cu) more or less unsclerotised, faintly pigmented, slightly antefurcal, strongly oblique towards base of wing.

Legs. Fore tibia anterior margin with rather long, dense spines arranged in narrow stripe. Segments of middle tarsus longer than their width. Hind coxa with distinct basoventral tubercle, 1.8–2.0 times longer than maximum width. Hind femur elongate-oval, 2.9–3.1 times longer than wide. Hind tibia with outer apical lobe having two-three slender and short spines. Hind tarsus 0.9 times as long as hind tibia. Hind basitarsus with distinct ventral carina, 0.55–0.6 times as long as remaining segments combined. Second segment of hind tarsus 0.55 times as long as basitarsus, 1.1–1.2 times longer than fifth segment (without pretarsus). Tarsal segments slightly thickened. Claws short, thick basally, with short curved apical part.

Metasoma. Petiole (lateral view) ventrally slightly curved, dorsal distinctly and almost evenly arched, in apical half nearly straight, highest near middle; in dorsal view petiole slender, slightly widened at spiracular tubercles and distinctly widened apically. Length of petiole 2.8–2.9 times its apical width, about 2.0 times length of propodeum; apical width about 1.8 times minimum subbasal width. Second tergite without laterotergites separated. Suture between second and third tergites (second suture) absent. Median length of second and third tergites combined 1.2–1.4 times its basal width, 0.7–0.8 times their maximum width. Ovipositor almost straight. Ovipositor sheath

Figures 27–30. *Spathius chamelae* sp. n. (female). **27** Fore and hind wings **28** Metasoma, lateral view **29** Petiole, lateral view **30** Petiole, dorsal view.

2.5–2.9 times longer than petiole, 1.2–1.3 times longer than metasoma, 1.8–2. times longer than mesosoma, almost as long as fore wing.

Sculpture and pubescence. Vertex entirely smooth. Frons densely and slightly curvedly transverse striate, without rugulosity between striae, smooth laterally. Face distinctly striate, with fine rugulosity between striae, smooth latero-ventrally. Temple entirely smooth. Mesoscutum distinctly and densely granulate-reticulate, finely reticulate-coriaceous or sometimes almost smooth posteriorly, its medioposterior third with several distinct longitudinal striae, median lobe laterally and anteriorly with dense and fine transverse striation; lateral lobes near notauli with short and sparse additional rugosity. Scutellum mainly smooth, sometimes finely reticulate-coriaceous or rugulose laterally. Mesopleuron medially smooth, striate in upper 0.2–0.3 and anteriorly, rugulose posteriorly. Metapleuron entirely coarsely rugose-reticulate. Propodeum in anterior (dorsal or basolateral) areas entirely rugose or rugulose, usually with coarse additional carina along areola margins; basal (median) carina rather long; areola narrow and long, 2.0–2.3 times longer than wide; petiolate area long and rather narrow, separated from areola by distinct carina; propodeum mainly coarsely rugose-striate. Hind coxa rugose in dorsal half and with additional transverse striation dorso-posteriorly, finely rugulose to smooth in ventral half. Hind femur smooth, sometimes partly finely striate dorsally. Petiole dorsally distinctly and densely longitudinally striate with distinct dense rugulosity between striae in basal half, medially usually reticulate-rugulose. Second and following tergites entirely smooth. Vertex almost entirely with very sparse, long and erect pale yellowish setae, glabrous medially. Mesoscutum with very long, sparse and almost erect yellowish setae arranged widely along margins of notauli and in single line laterally. Setae of hind tibia almost erect, mainly long and rather sparse, but dorsally in apical quarter additionally with very sparse and short setae; length of long setae 1.5–2.0 times maximum width of tibia.

Colour. Body black, head mainly and mesosoma anteriorly dark reddish brown or partly reddish brown, metasoma behind petiole dark reddish brown, paler laterally, brownish yellow apically; occasionally (in small specimens) body almost entirely reddish brown. Antennae dark reddish brown or reddish brown, almost black apically, without pale subapical segments. Palpi pale yellow or whitish yellow. Legs mainly almost black or reddish brown, fore and middle coxae yellow, all trochanters and trochantelli white or pale yellow, most part of fore femur, base and apex of middle femur (sometimes), apical 0.3–0.4 of fore and middle tibiae and their subbasal short areas, and all tarsi yellow or brownish yellow; hind tibia subbasally in wide area whitish yellow, apically yellow. Ovipositor sheath pale yellow to yellow, black apically. Fore wing infuscate, with narrow hyaline transverse stripe crossing beginning of pterostigma. Pterostigma almost black, pale yellow to whitish yellow in basal third and apically.

Male. Body length 2.3–3.3 mm; fore wing length 1.6–2.2 mm. Antennae 29–32-segmented. Penultimate segment 3.3–3.8 times longer than their width. Mesoscutum distinctly and densely granulate almost entirely. Propodeal areola short, 1.8–2.0 times longer than maximum width. Second radial abscissa (3RSa) 3.0–3.8 times longer than first abscissa (R), 1.1–1.2 times longer than first radiomedial vein (2RS). Hind femur 2.6–2.8 times longer than wide. Hind basitarsus with distinct inner apical process. Second segment of hind tarsus as long as fifth segment (without pretarsus). Length of petiole 3.0–4.0 times its apical width, 2.3–2.5 times longer than propodeum. Second and sometimes basal half of third tergites with laterotergites separated. Median length of second and third tergites combined 1.8–2.0 times its basal width, 0.8–0.9 times their maximum width. Otherwise similar to female.

Distribution. Mexico (Chamela, Jalisco).

Comparative diagnosis. *Spathius chamelae* sp. n. belongs to the *S. fasciatus* Walker species group. This new species is very similar to *S. mexicanus* sp. n., but differs from it in having the POL distinctly larger than Od (shorter in *S. mexicanus*); eye with sparse and short setae (glabrous in *S. mexicanus*); pronotal keel distinct, with its posterior branch present and not fused with posterior margin of pronotum (indistinct or fine and without its posterior branch in *S. mexicanus*); pronotal lateral depression entirely coarsely transverse crenulate (almost entirely smooth in *S. mexicanus*); pterostigma wider (narrower in *S. mexicanus*); second radial abscissa (3RSa) distinctly longer than first radiomedial vein (2RS) (almost equal in *S. mexicanus*); petiole (lateral view) dorsal distinctly arched (slightly arched in *S. mexicanus*); basolateral areas of propodeum entirely rugose, basal (median) carina rather long, and areola less narrow (smooth, basal carina almost absent and areola narrow in *S. mexicanus*); setae on hind tibia long (shorter in *S. mexicanus*); hind tibia subbasally in wide area whitish yellow (mainly almost black in *S. mexicanus*); fore wing faintly infuscate (strongly infuscate in *S. mexicanus*).

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Intertidal and nearshore Nereididae (Annelida) of the Falkland Islands, southwestern Atlantic, including a new species of *Gymnonereis*

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Abstract

The intertidal and nearshore Nereididae of the Falkland Islands are detailed and a new species of *Gymnonereis* described. The new species, *Gymnonereis tenera* **sp. n.**, is the first record of the genus for the Falkland Islands. It is, so far, only known from a few intertidal locations in fine and muddy sands. Main distinguishing characters are: jaw teeth absent (in adults), 3 papillae in Area V–VI, falcigers absent, second ventral cirrus present throughout. *Nereis atlantica* McIntosh, 1885, known only from the description of a single specimen and one doubtful record from the Falkland Islands, is reviewed and transferred to *Perinereis* on the basis of the presence of shield-shaped bars in Area VI of the proboscis and the absence of notopodial falcigers. A key to all seven species discussed is provided.

Keywords

Taxonomy, paragnaths, Polychaeta, *Eunereis*, *Neanthes*, *Perinereis*, *Platynereis*

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Introduction

The Nereididae is one of the largest polychaete families (Hutchings et al. 2000) and, intertidally, one of the most widespread and frequently encountered (Wilson 2000). Although not much literature exists on the intertidal polychaetes of the Falkland Islands, at least one species of Nereididae is recorded in each of the three papers (Pratt 1898, 1901; Fauvel 1916) published. Other records of Falkland Islands Nereididae have been from Antarctic/Southern Ocean research cruises that have also taken samples among and around the islands (Ramsay 1914; Monro 1930, 1936; Hartman 1953, 1967).

In all, eight species of nereidid, in six genera, have previously been recorded from stations listed as being within the Falkland Islands region. However, two of these species, *Platynereis australis* (Schmarda, 1861) and *P. magalhaensis* Kinberg, 1865 have been controversially synonymized (e.g. Benham 1909, 1921; Hutchings and Reid 1990) or kept separate (e.g. Fauvel 1916; Augener 1932; Hartman 1953, 1964) many times historically. Most recently, Read (2007) maintained both names pending investigation of the epitokous stage of *P. magalhaensis* to help resolve the issue. All but one record (Ramsay 1914) of *Platynereis* for the islands are as *P. magalhaensis* and this name is therefore retained in this paper with a discussion of the current situation. *Platynereis australis* is considered unlikely to occur around the islands, hence a description is not included.

Only species that have previously been recorded from Falkland Islands samples taken in less than 30 m (where diving and shallow survey work are most likely to take place) are considered in this paper. For this reason, *Nicon maculata* Kinberg, 1865 is also excluded as it has not been recorded from less than 129 m in the area (Monro 1936; Hartman 1953, 1967). *Eunereis patagonica* (McIntosh, 1885), *Nereis atlantica* McIntosh, 1885 and *Nereis eugeniae* (Kinberg, 1865) were not collected by the survey but are included because they have previously been recorded from shallow depths and could feasibly be recorded from shallow samples taken in the area. The descriptions and reports of each species are considered and details specific to the Falkland Islands reported. *Nereis atlantica* McIntosh, 1885 is reviewed and newly transferred to *Perinereis* Kinberg, 1865.

Most of the nereidids collected were found in mainly coarse or hard habitats, however, a new species of *Gymnonereis* Horst, 1919,a genus not previously recorded from Falkland Island waters, was identified from a small number of localities where it was almost entirely confined to intertidal, fine and muddy sands. *Gymnonereis* is a small genus of only six recognized species: *G. sibogae* Horst, 1918 (type locality: Strait of Makassar, Indonesia), *G. crosslandi* Monro, 1933 (type locality: Gorgona Island, Colombian Pacific), *G. fauveli* Hartmann-Schröder, 1962 (type locality: San Julián, Argentina), *G. phuketensis* Hylleberg & Nateewathana, 1988 (type locality: Andaman Sea, Thailand), *G. minyami* Hutchings & Reid, 1990 (type locality: Victoria, South Australia) and *G. yurieli* Hutchings & Reid, 1990 (type locality: Queensland, Australia). All members of the genus lack paragnaths, having only soft papillae on the oral ring and all, except *G. crosslandi*, exhibit highly vascularized dorsal cirrophores on median chaetigers. The new species is distinguishable from the other members of the genus using combinations of characters detailing the presence or absence of jaw teeth, falcigers and enlarged dorsal cirrophores, the number and distribution of the oral ring papillae, the occurrence of accessory dorsal cirri and the relative lengths of the neuropodial lobes.

A key to the seven species of Nereididae recognized from the near shore (< 30 m) waters of the Falkland Islands is provided.

Terminology

The parapodia of the Gymnonereidinae are more complex than those of the Nereidinae and a diagram is provided in Figure 1 to compare and standardize the terminology used in this paper when describing the different species. In reference to *Gymnonereis*, the terminology used by Hutchings and Reid (1990) has been mostly adopted, with some modification according to Santos et al. (2005), and is detailed further in the Remarks for that section.

The terminology used to describe paragnath forms was reviewed by Bakken et al. in 2009 and has been applied here also. Where necessary, generic diagnoses have been emended to reflect this, with changes highlighted in italics.

Methods

In 2011 and 2013, intertidal and diving survey work was undertaken around the Falkland Islands, covering the two main islands, East and West Falkland, as well as some of the smaller outer islands. Specimens were collected by a variety of methods on the shore and by SCUBA diving. Intertidal habitats were investigated by digging and collecting specimens by hand, by sieving sediment through a 0.5 mm sieve, turning over rocks and removing attached tubes, splitting open rock crevices and by inspecting algal holdfasts. Sampling while diving involved scraping epifaunal turf off rocks, turning over rocks and removing attached tubes, and taking sediment samples that would later be sieved as above.

Specimens were relaxed with a 7% magnesium chloride solution where possible and then fixed with 4% formaldehyde in seawater. After a period of at least 2 days, animals were rinsed with freshwater and preserved in 80% industrial methylated spirits with 2% propylene glycol added.

Morphological examinations and measurements were made using a Nikon Eclipse E400 binocular microscope and a Nikon Labophot-2 compound microscope. Microscope photographs were taken using AutoMontage™ software.

The holotype and most paratypes of *Gymnonereis tenera* sp. n. are accessioned in the zoological collections of National Museum Wales (NMW.Z). Paratypes are also deposited in the Australian Museum (AM), Natural History Museum, London (NHMUK), National Museum of Natural History, Smithsonian Institution, Washington D.C. (USNM) and the Zoological Museum, Hamburg (ZMH). All other specimens are accessioned in the National Museum Wales collections.

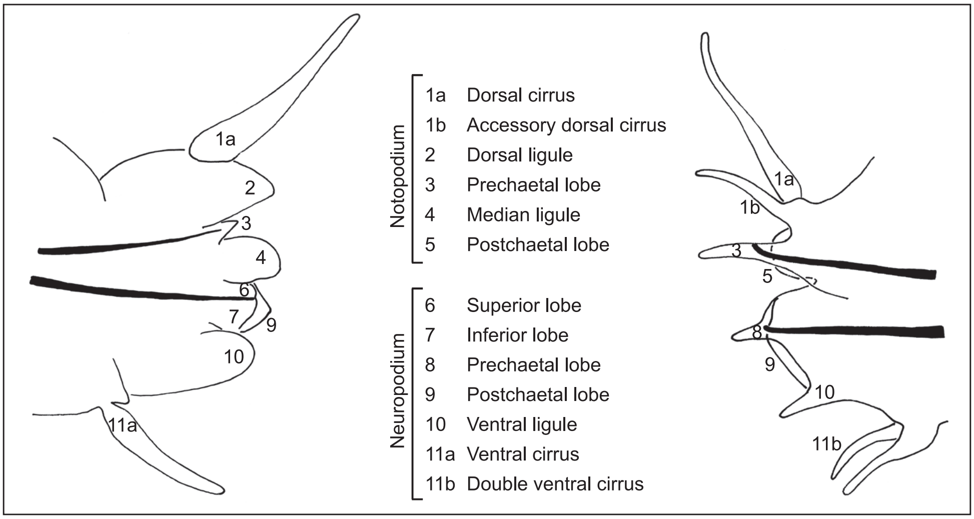

Figure 1. Terminology and diagrammatic representation of **A** a Nereidinae parapodium (modified from Hutchings and Reid 1990) and **B** a Gymnonereidinae parapodium (modified from Hylleberg and Nateewathana 1988), anterior view.

Taxonomy

Family Nereididae Blainville, 1818
Subfamily Gymnonereidinae Banse, 1977

Genus *Gymnonereis* Horst, 1919

Gymnorhynchus Horst, 1918: 247. — Pre-occupied by *Gymnorhynchus* Rudolphi, 1819; Cestoda (paper cited from Pettibone 1970).

Gymnonereis Horst, 1919: 64. — Pettibone 1970: 234. — Banse 1977: 621–622 (in part).

Type species. *Gymnonereis sibogae* (Horst, 1918) by monotypy

Diagnosis (after Hutchings and Reid 1990). Body elongate, depressed, attenuated posteriorly. Prostomium with frontal margin deeply incised between bases of frontal antennae.

Eversible pharynx with jaws having cutting edge smooth or serrated, with papillae on the oral ring. Notopodia with accessory dorsal cirri attached to dorsal cirrophores in anterior region only, with prechaetal lobes and short, rounded postchaetal lobes. Median segments with dorsal cirrophores greatly elongated and highly vascularized (except in *G. crosslandi*) and lacking accessory cirri. Dorsal transverse ridges present or absent. Chaetae homogomph or sesquigomph spinigers and homogomph or sesquigomph falcigers may be present. Chaetae very numerous in anterior chaetigers.

Remarks. Hutchings and Reid (1990) used the term 'sesquigomph', in a review of Australian Gymnonereidinae, to describe those chaetae that have a 3:2 ratio between the boss and opposing prong of the shaft. Such chaetae were referred to as 'slightly hemigomph' by Fauchald (1977) or 'slightly heterogomph' by Hylleberg and Nateewathana (1988) in their descriptions of *Gymnonereis*. Terminology referring to the additional dorsal (=accessory dorsal) cirrus and ventral (=double ventral) cirri follow that of both Hutchings and Reid (1990) and Santos et al. (2005) in the first instance but only Santos et al. (2005) in the second. Finally, the parapodial projections referred to as 'prechaetal ligules' in both Hylleberg and Nateewathana (1988) and Hutchings and Reid (1990) are here termed prechaetal lobes, after Santos et al. (2005), who defined notopodial projections supported by aciculae as lobes and those without aciculae as ligules and found notopodial ligulae to be absent in *Gymnonereis*. This definition has also been applied here to the previously-termed 'neuropodial prechaetal ligules', referred to here as neuropodial prechaetal lobes (Fig. 1).

Gymnonereis tenera **sp. n.**

http://zoobank.org/66F36C23-ECF2-4F01-A2CF-BB12F84D1894
Figures 2A–I, 9A–B

Material examined. East Falkland: Teal Creek, Stn 35d (51°49.248'S, 058°55.561'W), muddy sand, midshore, holotype (NMW.Z.2011.039.0102), 09.12.2011; Sand Bay, Port Harriet, Stn 34d (51°44.231'S, 058°00.585'W), fine sand, mid–low shore, 11 paratypes (9–NMW.Z.2011.039.0093–0095; 1–USNM 1231433; 1–ZMH p-27694), 08.12.2011; Teal Creek, Stn 35b (51°49.231'S, 058°55.573'W), sandy mud, midshore, 18 paratypes (NMW.Z.2011.039.0096), 09.12.2011; Teal Creek, Stn 35c (51°49.236'S, 058°55.563'W), mud, low shore, 22 paratypes (NMW.Z.2011.039.0097–0101), 09.12.2011; West Falkland: Crooked Inlet, Roy Cove, Stn 55b (51°32.546'S, 060°20.562'W), fine sand, high-midshore, 4 paratypes (1–AM W.46477; 1–NHMUK ANEA2014.31; 2– NMW.Z.2012.082.0001), 30.01.2013; Crooked Inlet, Roy Cove, Stn 55c (51°32.595'S, 060°20.367'W), fine sand, midshore, 2 paratypes (NMW.Z.2012.082.0002), 30.01.2013; Crooked Inlet, Roy Cove, Stn 55d (51°32.664'S, 060°20.255'W), fine sand, low shore, 3 paratypes (NMW.Z.2012.082.0003–0004), 30.01.2013; Crooked Inlet, Roy Cove, Stn 55e (51°32.688'S, 060°20.244'W), fine sand, low shore, 2 paratypes (NMW.Z.2012.082.0005), 30.01.2013.

Description. Holotype complete, 98 mm long, 1.5 mm wide (excluding parapodia; measured at widest part of anterior – approximately chaetiger 8), for 160 chaetigers. Complete paratypes 3–143 mm long, 0.15–2.53 mm wide (excluding parapodia) for 28–166 chaetigers. Description based on observations of the holotype and a dissected paratype (NMW.Z.2011.039.0098) used for illustrations. Variation shown by other paratypes described in later section.

Body depressed dorso-ventrally, widest anteriorly on chaetigers 8–10 (more pronounced in smaller specimens), then mostly uniform in width before tapering posteriorly. Colour pink/orange or grey/white in alcohol with black aciculae. Neurochaetae and subacicular notochaetae dark golden in anterior chaetigers, supracicular chaetae

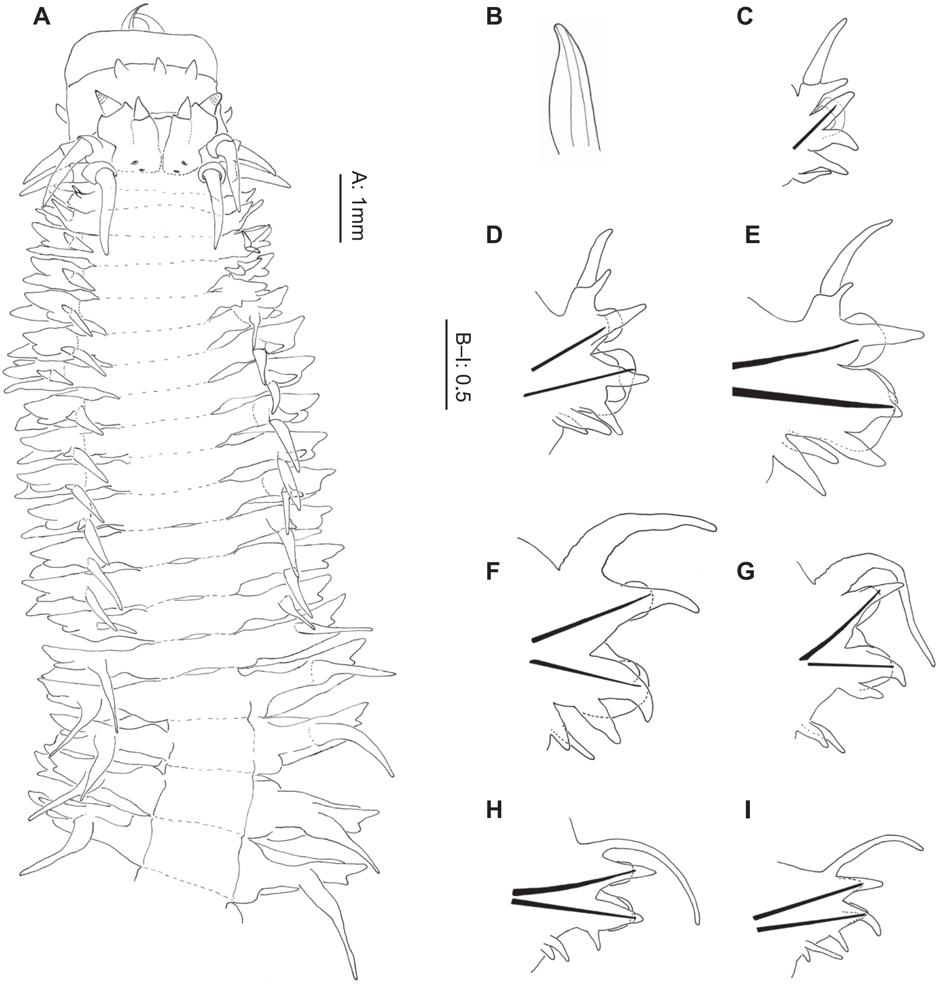

Figure 2. *Gymnonereis tenera* sp. n. (**A** NMW.Z.2011.039.0102 **B–I** NMW.Z.2011.039.0098): **A** holotype, anterior end, dorsal view (right chaetiger 4 aberrant) **B** jaw; C: left parapodium, chaetiger 1, anterior view **D** left parapodium, chaetiger 3, anterior view **E** left parapodium, chaetiger 9, anterior view **F** left parapodium, chaetiger 20, anterior view **G** left parapodium, chaetiger 30, anterior view **H** left parapodium, chaetiger 50, anterior view **I** left parapodium, chaetiger 100, anterior view.

pale amber; all chaetae pale amber from chaetiger 14. Live animals bright red on each side of body, including the parapodia, in region of vascularized, enlarged cirrophores; rest of body often with bright white dorsal bands centrally either side of central blood vessel from end of vascularized cirrophore region, fading in posterior. Where white colouration absent, body transparent, coloured only by visible gut and blood vessels. Methyl green staining of preserved animals shows glandular areas on tips of cirri and parapodial lobes but not on cirrophores or main body. Cuticle very soft when animals alive as well as post-fixation, body breaks easily when handled.

Prostomium with 2 pairs small, black (dark red when alive) eyes, often difficult to discern when preserved (Figs 2A, 9A). Anterior pair smaller, more laterally placed than posterior pair; crescent-shaped with additional small spot in far corners. Posterior pair darker, rounded. Prostomium subrectangular with deep cleft between antennae (Fig. 2A). Palps with large squat palpophores and short triangular palpostyles (0.4 mm long, 0.27 mm wide). Antennae equal length to or slightly longer than palps, more slender in form. Four pairs tentacular cirri, ventral pairs of equal length, 2/3 to 1/2 length of dorsal pairs; 2nd pair dorsal tentacular cirri marginally longer than 1st pair, reaching to chaetiger 4.

Peristomium dorsally more narrow than following segments. Jaws with smooth edges, teeth absent (Fig. 2A–B). Oral ring with triangular papillae arranged as follows (Figs 2A; 9A, B): Area V–VI = 3, VII–VIII = 7; maxillary ring bare.

Chaetigers 1–2 uniramous (Fig. 2C), single black acicula, tip curved, just emergent. Subsequent chaetigers all biramous (Fig. 2D–I), notoacicula not emergent, neuroacicula thicker, emergent anteriorly only up to around chaetiger 50. Dorsal cirri of chaetigers 1–12 with accessory dorsal cirrus (Fig. 2A, C–E), up to 1/3 length of main cirrus, appearing as extension to cirrophore rather than dorsal cirrus. From chaetigers 16–52 (Fig. 2F–G), dorsal cirrophores expanded and vascularized, although start and end of region difficult to define. Remaining chaetigers with dorsal cirrus long, narrow, tapering (Fig. 2H–I).

Double ventral cirri present throughout (Fig. 2C–I), branches unequal, ventral branch reducing in size posteriorly. Dorsal branch 1.5 times as long as ventral branch in anterior region, 4–5 times as long posteriorly.

Chaetiger 1 (Fig. 2C), neuroacicular papilla small, rounded, posterior and slightly dorsal to digitiform prechaetal lobe. Postchaetal lobe broad, rounded, approximately 2/3 length of prechaetal lobe. Acicular lobe similar shape to postchaetal lobe, approximately 1/2 length. Ventral neuropodial ligule of same size and shape as prechaetal lobe.

Chaetiger 3 (Fig. 2D) with basally swollen, digitiform notopodial prechaetal lobe twice as long as broadly rounded notopodial postchaetal lobe; acicular lobe 1/4 length of latter. Notochaetae in 2 unequal bundles, arranged as a smaller semicircle above and larger semicircle below the notopodial prechaetal lobe. Neuropodium as for chaetiger 1, ventral ligule of same size and shape as neuropodial prechaetal lobe. Neurochaetae in 2 semicircular fascicles of greater density than notochaetae. Superior fascicle arranged around neuroacicular papilla with larger, inferior bundle ventral and posterior to neuropodial prechaetal lobe. Arrangement continues to start of vascularized cirrophores then number of chaetae reduces posteriorly, becoming bundles rather than semicircles. Greatest density of chaetae occurs in chaetigers 6–8.

Posteriorly, neuropodial prechaetal lobe reducing in size, ventral ligule even more so. Neuropodial postchaetal lobes also decrease in size proportionately, becoming more conical.

Noto- and neurochaetae consist of both homogomph and sesquigomph spinigers throughout, no falcigers observed. Accurate numbers of chaetae and distribution of homogomph versus sesquigomph chaetae on anterior chaetigers difficult to identify due to density.

Table 1. Approximate chaetal counts of *Gymnonereis tenera* sp. n. (paratype, NMW.Z.2011.039.0098).

Chaetiger	Notochaetae	Neurochaetae
1	0	30
3	20	90
9	39	108
20	19	40
30	20	40
50	10	12
100	8	19

No dorsal flaps connecting chaetigers. Transverse, faintly defined ridges present from chaetiger 11–16.

Pygidium with anus terminal; 2 long cirri ventral to anus. Anal cirri of similar shape to dorsal cirri on body, 1.2 mm long.

Eggs found in 2 specimens, spherical, 120–130 µm diameter.

Variation. Most characters varied with number of chaetigers and continued to change as the number increased. Accessory dorsal cirri were not observed on animals with less than 95 chaetigers (unless regenerating) although they were absent in one specimen of 103 chaetigers (62 complete specimens examined; 27 with less than 95 chaetigers, 35 with 95 or more chaetigers). As chaetiger number increases, additional anterior dorsal cirri have accessory cirri, with animals of more than 160 chaetigers with accessory dorsal cirri as far as chaetigers 10–14. The variation in this character means that it should not be used as diagnostic for the species on its own but only in conjunction with other characters.

The faint transverse ridges connecting parapodia were mostly visible from chaetiger 11 to 15 or 16 but were occasionally observed as far back as chaetiger 20 on the largest specimens.

Determination of the start and end of the expanded cirrophores was difficult, particularly the former, as the transition was not as abrupt as described for some species. The region generally occurred from around chaetigers 11–18 and continued to chaetigers 22–51 over the range of body sizes observed.

Presence and number of the oral papillae did not vary with size although papillae were occasionally lost and a single specimen was identified with 4 papillae in Area V–VI. Relative length of tentacular cirri was also stable with the longest cirri always reaching to chaetiger 4 in all body sizes.

Although jaw teeth were absent in the majority of specimens, juveniles of less than 80 chaetigers (jaws of 26 specimens were examined including 12 juveniles of 33–80 chaetigers in size) were found to have 4–5 small teeth on each jaw with jaws in larger animals becoming more roughly crenated until the largest jaws appeared almost completely smooth.

Etymology. The specific name *tenera* is derived from the latin adjective *tener* meaning 'soft, delicate', referring to the very soft nature of the worm when alive and its fragility when handled.

Habitat. Found intertidally from mid to low shore in soft, fine, sand or mud sediments.

Remarks. With 3 papillae in Area V–VI of the oral ring and the absence of jaw teeth, *Gymnonereis tenera* sp. n. can be distinguished from all other *Gymnonereis* species except for *G. sibogae* and *G. phuketensis*. *Gymnonereis minyami* and *G. yurieli* both have jaw teeth and only 1 papilla in each of Areas V and VI. *Gymnonereis crosslandi* and *G. fauveli* both lack jaw teeth but *G. crosslandi* has only 1 papilla in each of Areas V and VI, accessory dorsal cirri in only chaetigers 1 and 2 (chaetiger 1 to 12 or further in *Gymnonereis tenera* sp. n.) and no enlarged dorsal cirrophores, whilst *G. fauveli* has 5 papillae in Area V–VI and accessory dorsal cirri from chaetiger 3 (as opposed to chaetiger 1 in the new species).

Gymnonereis tenera sp. n. is most similar to both *G. sibogae* and *G. phuketensis* and can only be distinguished from each of these through combinations of characters. Although Hutchings and Reid (1990) listed *G. sibogae* as having sesquigomph falcigers, Horst (1918), in his original description, actually stated that "the neuropodial fascicle does not contain true setae falcigerae, but instead of these some faintly heterogomph setigerous bristles, with a short, lanceolate terminal piece", although his figures of the species (Horst 1924) did not illustrate this. Pettibone (1970) re-investigated and drew all of Horst's specimens and in her detailed description of the first two chaetigerous segments stated that "a few lower neurosetae of some anterior setigers may have blades which end bluntly" and this was figured accordingly (Pettibone 1970, fig. 30c–e). No such short, blunt chaetae were observed on any specimens of *G. tenera* sp. n. A more consistent character is that of the length of the anterior, neuropodial prechaetal lobe. In *G. tenera* sp. n., this lobe is consistently longer than both the neuropodial acicular and postchaetal lobes and of a similar length to the ventral ligule. In *G. sibogae*, the neuropodial prechaetal lobe (termed the prechaetal ligule by Pettibone 1970) is as long as or shorter than the postchaetal lobe and shorter than the ventral ligule for at least the first nine chaetigers (Horst 1924, pl. XXX, fig. 1; Pettibone 1970, fig. 30c–d, fig. 31a,d,e,f, fig. 33b), thereafter becoming only slightly longer. Unfortunately, all of Horst's specimens were incomplete with only 36–56 segments and the species does not appear to have been reported since, making further determination of differences between the two species difficult.

Apart from the character of presence or absence of jaw teeth, the new species is also very similar to *G. phuketensis*, although juveniles of the new species do have a small number of jaw teeth. Hutchings and Reid (1990) listed the character of jaw teeth as being present or absent for *G. phuketensis*, although the original description by Hylleberg and Nateewathana (1988) states only that they are present (adult specimens, no comments on the juvenile form) but that they can be weakly defined. Where jaw teeth are found in *G. tenera* sp. n., however, there are only up to 5 compared to 10 for *G. phuketensis*. Additionally, in *G. phuketensis* the dorsal cirrophores become "abruptly enlarged" from chaetiger 14 (Hylleberg and Nateewathana 1988) compared to a more gradual enlargement from chaetiger 12 for the new species and the second ventral cirrus is absent from around chaetiger 35 on *G. phuketensis* but present throughout on *G. tenera* sp. n.

Subfamily Nereidinae Blainville, 1818

Genus *Eunereis* Malmgren, 1865

Eunereis Malmgren, 1865: 182–183

Type species. *Nereis longissima* Johnston, 1840

Diagnosis (after Bakken and Wilson 2005). Prostomium with entire anterior margin, one pair of antennae, one pair of biarticulated palps with conical palpostyles, four pairs of tentacular cirri with distinct cirrophores.

Two pairs of eyes. One apodous anterior segment, greater than length of chaetiger 1. Maxillary ring of pharynx without paragnaths. Oral ring, conical paragnaths: Area V, present or absent; VI, present or absent, smooth bars present or absent; VII–VIII, present or absent. Dorsal notopodial ligule present, similar in size or markedly reduced on posterior chaetigers. Prechaetal notopodial lobe present or absent; when present, restricted to a limited number of anterior chaetigers. Acicular process present or absent. Dorsal cirrus basally attached to dorsal notopodial ligule throughout all chaetigers, lacking basal cirrophore. Neuropodial postchaetal lobe absent or present. Notoaciculae absent from chaetigers 1 and 2. Notochaetae: homogomph spinigers present, homogomph falcigers present or absent. Neurochaetae, superior fascicle: homogomph spinigers and heterogomph falcigers present. Neurochaetae, inferior fascicle: heterogomph spinigers and heterogomph falcigers with long blades present.

Eunereis patagonica (McIntosh, 1885)

Figure 3

Nereis patagonica McIntosh, 1885: 228–229, Pl. XXXV, figs 13–15, Pl. XVIIA, figs 1–2. — Pratt 1898: 15.

Nereis (*Eunereis*) *hardyi* Monro, 1930: 109–111, fig. 39. — Monro 1936: 134–135.

Eunereis patagonica. — Hartman 1953: 29. — Hartman 1964: 97, Pl. XXX, figs 3–4. — Hartman 1967: 62–64, Pl. 15.

Material examined. Strait of Magellan, stn 313 (52°20'S, 067°39'W), sand, 100.6 m, 2 syntypes (NHMUK 1885.12.1.171) 20.01.1876; South America, off Uruguay, stn 1 (33°00'S, 051°10'W), blackish clay, 80 m, 2 specimens (SMNH 37888), 12.12.1901; south of West Falkland, Burdwood Bank, stn 59 (53°45'S, 061°10'W), gravel & stones, 137–150 m, 13 specimens (9–SMNH 37894; 4–SMNH 37902), 12.09.1902; off Falkland Islands, stn WS 86 (53°53'30"S, 060°34'30"W), 6 syntypes *Nereis* (*Eunereis*) *hardyi* (NHMUK 1930.10.8.841–844), 03.04.1927; Strait of Magellan, stn WS 834 (52°57'45"S, 068°08'15"W), 4 specimens *Nereis* (*Eunereis*) *hardyi* (NHMUK 1936.2.8.1463–1476), 02.02.1932.

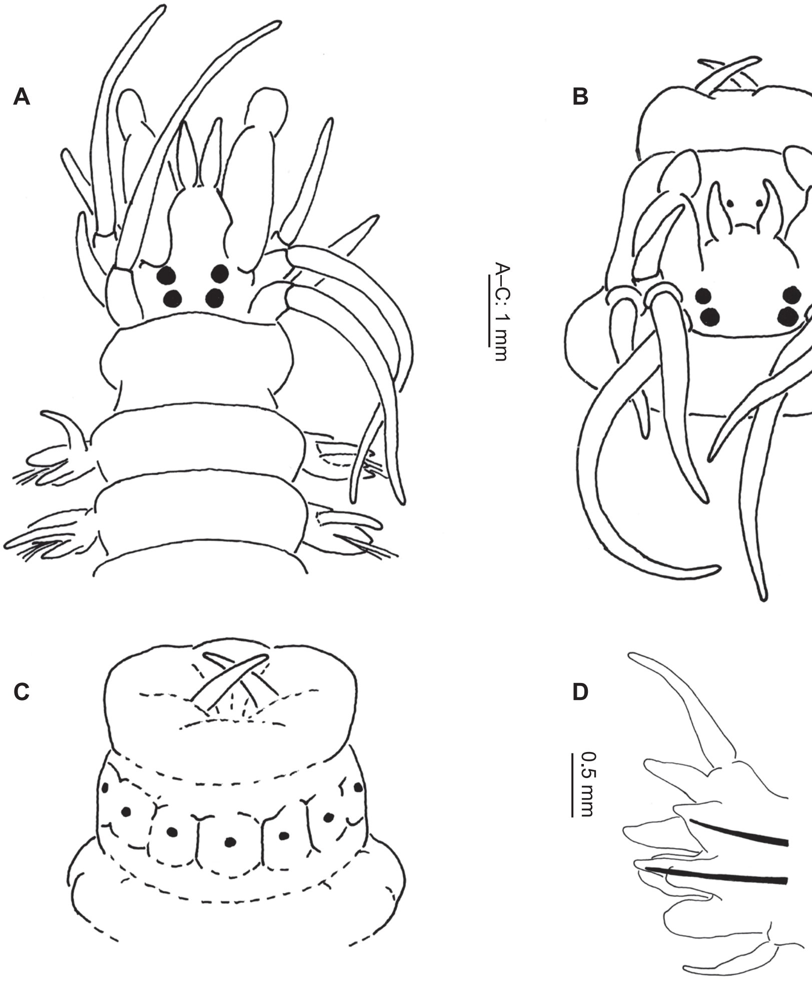

Figure 3. *Eunereis patagonica* (McIntosh, 1885) (after Monro, 1930, as *Nereis* (*Eunereis*) *hardyi*): **A** Anterior end, dorsal view **B** Prostomium and proboscis, dorsal view **C** Proboscis, ventral view **D** Parapodium.

Description. Length up to 130 mm, width to 5 mm (excluding parapodia) for up to 85 chaetigers. Eyes present (Fig. 3A–B). Tentacular cirri reaching to chaetiger 6–8 (postero-dorsal pair). Paragnaths absent from maxillary ring; arranged on oral ring as follows (Fig. 3B–C): Area V =1–2; Area VI = 0; Areas VII–VIII = 7–8 in a row. Jaws dark, 5–10 teeth.

Dorsal cirrus longer than notopodia throughout (Fig. 3D), becoming more pronounced posteriorly. Anterior notopodia with dorsal and median ligules conical, median slightly more stout than dorsal. Small, notopodial prechaetal lobe present in anterior chaetigers.

Neuropodia with postchaetal lobe and ventral ligule equal-sized anteriorly; postchaetal lobe conical, reducing in size posteriorly, ventral ligule rounded in the anterior, conical posteriorly.

Notopodia with homogomph spinigers throughout, falcigers absent. Neuropodia with homogomph spinigers and heterogomph falcigers in superior fascicle, inferior fascicle with heterogomph spiniger and falcigers.

Species builds tough-walled tubes coated in sand grains and other coarse particles.

Remarks. The above description is based on McIntosh (1885), Monro (1930, 1936 as *N. hardyi*), and Hartman (1953, 1967). However, there is some discrepancy between the original descriptions that can now be clarified following examination of the specimens from those accounts. All three authors agree that paragnaths are absent in Areas I and II and that Area VII–VIII has a single row of 7–8. In Area III, paragnaths are absent on the specimens of both Monro (1930, 1936) and Hartman (1953, 1967), however there is a single conical paragnath present on McIntosh's specimen. Paragnaths are absent from Area IV on specimens of McIntosh and Monro as well as Hartman's (1953) Falkland Island specimens (SMNH 37894, 37902) but 3 conical paragnaths are present on her Uruguay specimens (SMNH 37888). The paragnaths described for Area V in Monro (1930, 1936) are present in identical form on Hartman's (1953) Falkland Island specimens, although she placed them in Area VI in her description, however her Uruguay specimens from the same survey have 3 conical paragnaths in the same position. A single paragnath is present in Area V of McIntosh's specimen and it is assumed that the second paragnath has been lost or is absent through aberration as McIntosh states in his description that the single paragnath is "nearly, but not quite median".

It is clear that Hartman's (1953) Uruguay specimens are a different, currently unidentified species but that her Falkland Island specimens are identical to those of Monro (1930, 1936). Hartman's 1967 description also agrees with Monro's and the modified description above reflects these specimens. The presence of the single paragnath in Area III of McIntosh's specimen requires further investigation as to whether this means that the species needs future re-assessment, as this would place the species in a different genus. Unfortunately, the specimen is in poor condition and a second, smaller specimen from the same location is even worse. However, a comparison of parapodia and what chaetae are available (the vast majority are broken on the McIntosh specimens) show them to be comparable. The paragnath arrangement above is therefore based on the specimens of Monro (1930, 1936) and Hartman (1953, 1967) that were actually collected from the Falkland Islands. The designation of McIntosh's specimen requires further investigation although as it only deviates from the others in the presence of that single paragnath in Area III it is possible it is aberrant.

Eunereis patagonica was first recorded from the Falkland Islands by Pratt (1898) from samples that were probably from intertidal or shallow water samples, however no actual habitat, depth or locality details were given. The only other records from the Falkland Islands are those of Monro (as *Nereis hardyi*: 1930, 1936) and Hartman (1953, 1967) from offshore (106–150 m) samples, as well as an even deeper record at 1879–1886 m by Hartman (1967).

Outside of the region, the species was recorded by Hartman (1967) from 31 m (Cape Horn) to 300 m (South Shetland Islands) together with an additional record of a pelagic epitoke from the Pacific Antarctic Ridge at 3660 m considered to have been carried beyond its viable range.

The species is here believed unlikely to be found intertidally around the Falkland Islands but with potential to be found in the region's nearshore (< 30 m) waters; Pratt's 1898 record (if accurate), likely being from this region.

Habitat. Sand, shell, stones; 31–1886 m (?3660 m)

Distribution. Tierra del Fuego, Strait of Magellan, Cape Horn, Falkland Islands, South Shetland Islands, South Orkney Islands, ?Pacific Antarctic Ridge

Genus *Neanthes* Kinberg, 1865

Neanthes Kinberg, 1865: 171

Includes. *Nectoneanthes* Wilson, 1988: 5.

Type species. *Neanthes vaalii* Kinberg, 1865, by original designation

Diagnosis (after Bakken and Wilson 2005). Prostomium with entire anterior margin, one pair of antennae, one pair of biarticulated palps with conical palpostyles, four pairs of tentacular cirri with distinct cirrophores. Eyes present or absent. One apodous anterior segment, greater than length of chaetiger 1. Maxillary ring of pharynx, conical paragnaths: Areas I–IV, present or absent; IV, smooth bar-like paragnaths present or absent. Oral ring, conical paragnaths: Areas V and VI present as distinct groups or not separated; V–VIII, present or absent. Dorsal notopodial ligule present, similar in size on anterior and posterior chaetigers or markedly reduced on posterior chaetigers. Prechaetal notopodial lobe present or absent, smaller than dorsal notopodial ligule on anterior chaetigers, usually reduced or absent posteriorly, present throughout all chaetigers or restricted to a limited number of anterior chaetigers. Acicular process present or absent; present on anterior chaetigers, reducing in size posteriorly. Dorsal cirrus basally or mid-dorsally to subterminally attached to dorsal notopodial ligule on posterior chaetigers, lacking basal cirrophore. Neuropodial postchaetal lobe absent or present. Notoaciculae absent from chaetigers 1 and 2. Notochaetae: homogomph spinigers. Neurochaetae, superior fascicle: heterogomph spinigers present or absent, homogomph spinigers present, heterogomph falcigers on anterior chaetigers present, on posterior chaetigers present or absent. Neurochaetae, inferior fascicle: heterogomph spinigers present or absent, homogomph spinigers present or absent, heterogomph falcigers present.

Neanthes kerguelensis (McIntosh, 1885)

Figures 4, 9C–D

Nereis kerguelensis McIntosh, 1885: 225–227, Pl. XXXV, figs 10–12, Pl. XVIA, figs 17–18. — Augener 1924: 330–333.

Neanthes kerguelensis. — Hartman 1954: 30. — Hartmann-Schröder 1962: 394–395. — Hartman 1967: 64. — Hutchings and Turvey 1982: 113. — Wilson 1984: 216–218. — Bakken and Wilson 2005: 528.

Material examined. East Falkland: Stanley foreshore, stn 1a (51°41.454'S, 057°51.870'W), under rocks in coarse sand, midshore, 3 specimens (NMW.Z.2011.039.0120), 15.11.2011; Stanley foreshore, stn 1b (51°41.459'S, 057°51.840'W), under rocks in coarse sand, midshore, 9 specimens (NMW.Z.2011.039.121), 15.1.2011; Stanley foreshore, stn 1c (51°41.459'S, 057°51.823'W), under rocks in coarse sand, low shore, 3 specimens (NMW.Z.2011.039.0122), 15.1.2011; The Canache, east of Stanley, stn 2c (51°41.716'S, 057°47.107'W), under rocks in gravel & coarse sand, mid-low shore, 6 specimens (NMW.Z.2011.039.0123), 16.1.2011; Hookers Point, stn 4 (51°41.994'S, 057°46.747'W), in & under pink encrusting algae, low shore, 3 specimens (NMW.Z.2011.039.0124), 15.1.2011; Hookers Point, stn 6b, (51°41.994'S, 057°46.747'W), algal holdfast scraping, low shore, 1 specimen (NMW.Z.2011.039.0125), 21.11.2011; Sea Lion Island: East Loafers Bay, stn 20a (52°26.306'S, 059°06.229'W), in & under pink encrusting algae, mid-low shore, 4 specimens (NMW.Z.2011.039.0126), 28.11.2011; East Falkland: west Stanley, stn 21 (51°41.402'S, 057°52.580'W), under small stones in coarse sand & gravel, 6 specimens (NMW.Z.2011.039.0127–0128), 01.12.2011; Egg Harbour, Shag Rookery Point, stn 27 (51°49.345'S, 059°26.719'W), under rocks in soft silty sand, 6 m, 2 specimens (NMW.Z.2011.039.0129), 03.12.2011; Kelp Harbour, stn 29a (51°47.715'S, 059°18.400'W), coralline coarse sand, mid-low shore, 15 specimens (NMW.Z.2011.039.0136), 04.12.2011; Stanley marina, stn 32 (51°41.600'S, 057°48.073'W), *Macrocystis* holdfast, 30 cm, 2 specimens (NMW.Z.2011.039.0132), 05.12.2011; Sand Bay, Port Harriet, stn 34f (51°44.130'S, 058°00.550'W), under rocks within mussel bed, midshore, 7 specimens (NMW.Z.2011.039.0130), 08.12.2011; Teal Creek, east of Darwin, stn 35d (51°49.248'S, 058°55.561'W), under rocks in sand, midshore, 4 specimens (NMW.Z.2011.039.0131), 09.12.2011; Cape Bougainville, stn 38b (51°18.727'S, 058°27.607'W), under rocks in gravel in rock pool, mid-low shore, 1 specimen (NMW.Z.2012.082.0019), 13.01.2013; North Arm, stn 48a (52°07.768'S, 059°22.131'W), mussel bed over silty coarse sand, midshore, 13 specimens (NMW.Z.2013.082.0020), 22.01.2013; West Falkland: Moonlight Bay, Port Stephens, stn 51c (52°06.232'S, 060°50.368'W), in crevices, midshore, 10 specimens (NMW.Z.2012.082.0021), 26.01.2013; The Creek, Hill Cove, stn 56d (51°30.061'S, 060°07.618'W), under algae-covered rocks in fine sand, midshore, 4 specimens (NMW.Z.2012.082.0022), 31.01.2013; Shallow Bay, stn 57e (51°30.032'S, 060°07.726'W), in crevices & under stones, low shore, 3 specimens (NMW.Z.2012.082.0023), 01.02.2013.

Description. Ninety-six entire specimens examined: length 5.9–61.3 mm, width 0.7–3.3 mm (excluding parapodia, measured at 8th chaetiger) for 29–70 chaetigers.

Colour pale cream in alcohol, some with dark brown, uniform shading remaining over anterior chaetigers.

Body depressed dorso-ventrally, of mostly uniform width, tapering in last few chaetigers. Prostomium longer than broad (Fig. 4A), antennae and palps about equal in length, with antennae 1/4 width of palpophores. Palpostyles very short, 1/5 length of palpophores. Four pairs tentacular cirri, postero-dorsal pair extending 2–7 chaetigers, usually 2–3. Two pairs small, equal-sized, black eyes, anterior pair more laterally placed.

Pharynx with conical paragnaths (Fig. 9C, D), variable in size, sometimes faint, not easily lost. Paragnaths arranged as follows: I = 1 (absent or too small to see in specimens of less than 45 chaetigers); II = 1–8; III = 1–9; IV = 6–17; V = 0; VI = 1 (2 on one specimen only); VII–VIII = 3–8. Jaws dark brown to black, 7–10 teeth.

Notopodia with dorsal and median ligule throughout. Of almost equal size, globular anteriorly (Fig. 4B), dorsal ligule becoming conical, median ligule becoming digitiform, in median chaetigers. Notopodial prechaetal lobe present from chaetigers 5–6 (Fig. 4B), increasingly fused to median ligule, absent posteriorly, difficult to determine more precisely due to the very gradual fusion, generally obvious for at least 10 chaetigers.

Dorsal cirrus 1–1.5 times length of dorsal ligule anteriorly (Fig. 4B), increasing to 2–2.5 times length posteriorly (Fig. 4C).

Neuropodia with postchaetal lobe and ventral ligule throughout; postchaetal lobe rounded anteriorly, reduced in size and digitiform posteriorly, ventral ligule globular anteriorly, conical posteriorly (Fig. 4B, C). Ventral cirrus approximately 3/4 length of ventral ligule, becoming equal in length posteriorly (Fig. 4B, C).

Parapodia biramous from chaetiger 3, sub-biramous on chaetigers 1–2. Notochaetae homogomph spinigers only. Neurochaetae with homogomph spinigers and heterogomph falcigers (Fig. 4D, E) in both superior and inferior (from 3) fascicles throughout. No heterogomph spinigers found.

Pygidium terminal; 2 long, tapering anal cirri inserted ventrally.

Remarks. In a detailed study of Australian and sub-Antarctic specimens of *N. kerguelensis*, Wilson (1984) described a wide variation in the numbers of paragnaths in Areas II, III and IV. This, combined with the apparent widespread occurrence across both hemispheres and from intertidal to 5000 m depths, would suggest that records of this species may, in fact, represent a species complex. Greater investigation in each area is required to properly resolve this.

The variation in paragnath numbers exhibited by the Falkland Islands specimens is within the boundaries of that described by Wilson (1984), although it falls consistently at the lower end of those ranges. In addition, the majority of specimens had tentacular cirri that extended only to chaetigers 2–4 (Wilson 1984: 4–8 chaetigers) although some did extend up to chaetiger 7, and the neuropodial postchaetal lobe was present throughout the body as opposed to only the anterior 20–30 chaetigers (Wilson 1984).

There are currently no published genetic sequences for *N. kerguelensis*. However, a comparison of some of these different populations using molecular techniques may help resolve these discrepancies.

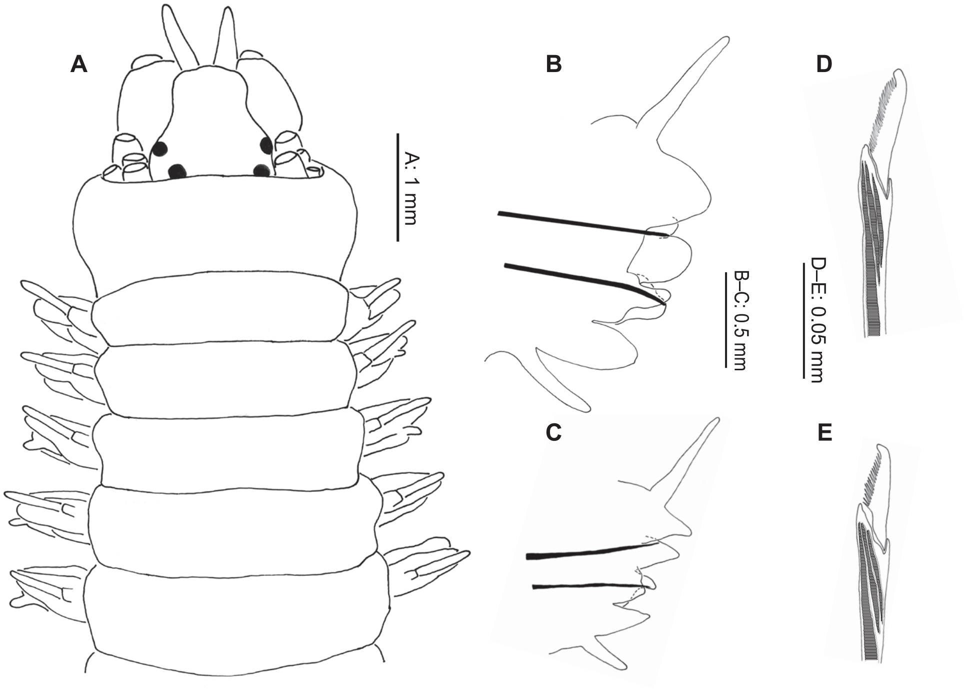

Figure 4. *Neanthes kerguelensis* (McIntosh, 1885) (NMW.Z.2011.039.0127): **A** anterior end (tentacular cirri removed), dorsal view **B** right parapodium, chaetiger 10, posterior view **C** right parapodium, chaetiger 47, posterior view **D** neuropodial heterogomph falciger, chaetiger 10 **E** neuropodial heterogomph falciger, chaetiger 47.

Habitat. Wilson (1984) describes the habitat as "associated with fouling communities, intertidal in rocks and sand on sheltered and exposed coasts, soft bottom benthos to 115 m deep". Previous records from the Falkland Islands exist from intertidal to 197 m depth and from this survey from intertidal to 20 m depth in almost every habitat sampled (including algal holdfasts, epifaunal turf, coarse sand, gravel and under rocks), except for mud and fine-medium clean sands.

Distribution. Recorded widely across the southern hemisphere including Australia, New Zealand, Tasmania, Fiji, Taiwan, Antarctic Peninsula, sub-Antarctic Islands (incl. Kerguelen, Macquarie, South Shetlands, South Orkneys), Chile and the Falkland Islands. Previous records from the Falkland Islands exist from Pratt (1898), Fauvel (1916), Ramsay (1914), Monro (1930) and Hartman (1953) and the species was recorded from almost every location sampled during this survey.

Neanthes kerguelensis is also recorded from the Northern hemisphere from the Mediterranean and Azores (von Marenzeller 1902) and the UK (Comely 1973). The latter record, however, is discounted as the author describes his specimen as having 6–7 paragnaths in Area VI which would not identify it as this species.

Genus *Nereis* Linnaeus, 1758

Nereis Linnaeus, 1758: 654.

Type species. *Nereis pelagica* Linnaeus, 1758 (by original designation)

Diagnosis (after Bakken and Wilson 2005). Prostomium with entire anterior margin, one pair of antennae, one pair of biarticulated palps with conical palpostyles, four pairs of tentacular cirri with distinct cirrophores. Eyes present or absent. One apodous anterior segment, greater than length of chaetiger 1. Maxillary ring of pharynx, conical paragnaths: Areas I–III, present or absent; IV, present, smooth bar-like paragnaths present or absent. Oral ring: conical paragnaths present or absent. Dorsal notopodial ligule similar in size in anterior and posterior chaetigers or markedly reduced on posterior chaetigers. Prechaetal notopodial lobe present or absent, smaller than dorsal notopodial ligule on anterior chaetigers, usually reduced or absent posteriorly. Dorsal cirrus basally attached to dorsal notopodial ligule throughout all chaetigers, lacking basal cirrophore. Neuropodial postchaetal lobe absent. Notoaciculae absent from chaetigers 1 and 2. Notochaetae: homogomph spinigers, homogomph falcigers present. Neurochaetae, superior fascicle: homogomph spinigers present, heterogomph falcigers on anterior chaetigers present or absent, on posterior chaetigers present. Neurochaetae, inferior fascicle: heterogomph spinigers present or absent, heterogomph falcigers present or absent.

Nereis eugeniae (Kinberg, 1865)

Figure 5

Nicon eugeniae Kinberg, 1865: 178.

Nereis eugeniae. — Ehlers 1897: 67–70, Pl. IV, figs 94–105. — Ehlers 1901: 105, Pl. XII, figs 18–22. — Ramsay 1914: 43. — Monro 1930: 104. — Hartman 1964: 100–101, Pl. XXX, figs 9–10. — Hartman 1967: 65.

Description. Length up to 170 mm, width up to 3 mm including parapodia for up to 125 chaetigers. Eyes absent or present. Paragnaths arranged as follows (Fig. 5A, B): Area I = 0; Area II = small group (up to 11); Area III = absent or sparse, irregular row (2–6); Area IV= absent or group (0–18); Area V = 0–1; Area VI = small group (3–6); Areas VII–VIII = sparse, irregular row (0–11). Jaws dark, 5–7 teeth.

Dorsal cirrus longer than notopodia throughout, becoming more pronounced posteriorly. Anterior notopodia (Fig. 5C) with dorsal and median ligules equal in size, dorsal ligule reducing in size posteriorly. Small notopodial prechaetal lobe present in anterior chaetigers.

Neuropodia with postchaetal lobe and ventral ligule conical; postchaetal lobe shorter than notopodial ligules and ventral ligule in anterior chaetigers, becoming more equal in size posteriorly (Fig. 5D).

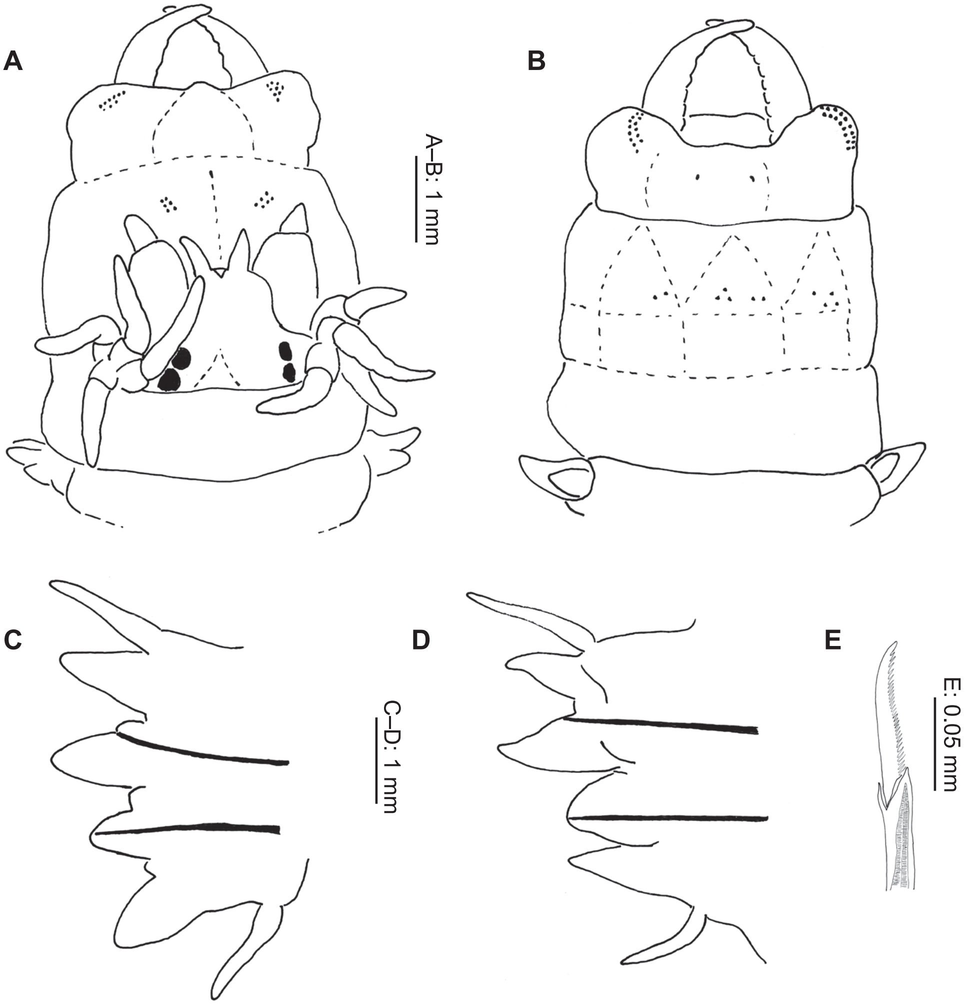

Figure 5. *Nereis eugeniae* Kinberg, 1865 (after Ehlers 1897): **A** anterior end, dorsal view **B** chaetiger 12 **C** chaetiger 37 **D** neuropodial heterogomph spiniger, posterior chaetiger **E** neuropodial heterogomph falciger, posterior chaetiger.

Anterior notopodia with homogomph spinigers only, 2–3 homogomph falcigers present from median chaetigers on. Neuropodia with homogomph spinigers and heterogomph falcigers in superior fascicle, inferior fascicle with heterogomph spinigers and falcigers (Fig. 5E).

Remarks. The above description is an amalgamation of the information provided by Ehlers (1897), Monro (1930) and Hartman (1964, 1967), although of these, only Monro published on specimens from the Falkland Islands. The type locality for the species is the Strait of Magellan, but Kinberg (1865) gave little detail about the animal itself. The species was later comprehensively re-described and drawn by Ehlers (1897). Descriptions by different authors are quite variable, particularly regarding the paragnaths arrangements. Ramsay (1914) gave no details about his specimens except to say that they "agreed in all respects" with Ehlers' description whereas Monro (1930) noted that, in contrast to Ehlers' description, the paragnaths of Areas VII–VIII "form a single very sparse irregular row and in a number of the larger examples they appear to be altogether absent"

Nereis eugeniae was not collected by this survey, however it has been recorded from several offshore locations around the islands from 1–115 m (Ramsay 1914; Monro 1930) and Monro (1930) described the species as being "common off the Falkland Islands". There are no intertidal records for the area, however *N. eugeniae* has been recorded intertidally from Chile (Ehlers 1901; Hartman 1967). Although not recorded here, the species is known to be present in shallow water around the islands and could potentially be found intertidally also.

Habitat. Sand, shell, stones, cobbles; intertidal–156 m.

Distribution. Strait of Magellan, Chile, Falkland Islands, Kerguelen Islands, Patagonia.

Genus *Perinereis* Kinberg, 1865

Perinereis Kinberg, 1865: 175–176. — Hutchings et al. 1991: 245.

Includes. *Arete* Kinberg, 1865; *Gnatholycastis* Ehlers, 1920.

Type species. *Perinereis novaehollandiae* Kinberg, 1865; by subsequent designation (Hartman 1948)

Diagnosis (after Bakken and Wilson 2005, emended). Prostomium with entire anterior margin, one pair of antennae, one pair of biarticulated palps with conical palpostyles, four pairs of tentacular cirri with distinct cirrophores. Two pairs of eyes. One apodous anterior segment, greater than length of chaetiger 1. Maxillary ring of pharynx, conical paragnaths: Area I, present or absent; II, present or absent; III, present; IV, present or absent, smooth bar-like paragnaths present or absent. Oral ring, conical paragnaths: Area V, present or absent; VI, present or absent, *smooth or shield-shaped* bars present; VII–VIII, present. Dorsal notopodial ligule similar in size in anterior and posterior chaetigers, or markedly elongate on posterior chaetigers. Prechaetal notopodial lobe present or absent, smaller than dorsal notopodial ligule on anterior chaetigers, usually reduced or absent posteriorly. Dorsal cirrus basally or mid-dorsally to subterminally attached to dorsal notopodial ligule on posterior chaetigers, lacking basal cirrophore. Neuropodial postchaetal lobe absent or present. Notoaciculae absent from chaetigers 1 and 2. Notochaetae: homogomph spinigers. Neurochaetae, superior fascicle: homogomph spinigers and heterogomph falcigers present. Neurochaetae, inferior fascicle: heterogomph spinigers present or absent, heterogomph falcigers present.

Perinereis atlantica (McIntosh, 1885), comb. n.

Figure 6

Nereis atlantica McIntosh, 1885: 219–221, Pl. XXXV, figs 1–3, Pl. XVIa, figs 10–11. — Pratt 1898: 16.
?*Nereis atlantica*. — Hartman 1964: 99, Pl. XXX, figs 7–8.

Material examined. St Vincent, Cape Verde Islands (NHMUK.1885.12.1.161), holotype, July 1873.

Description. Examination of the holotype (Fig. 6A–C), shows the description and illustrations by McIntosh to be quite accurate. The only refinements are as follows:

Body dorso-ventrally depressed, mostly of uniform width, gradually tapering in last 20–30 chaetigers to pygidium.

Paragnaths arranged as follows, all conical except for Area VI (Fig. 6B–C): Area I = 1 large, Area II = 6–8, Area III = 8, Area IV = 15–16 arranged in 3–4 rows, Area V = 1 small, Area VI = 1 shield-shaped bar with rounded apex, Area VII–VIII = 3 rows with 6 (distal row), 9 (middle row) & 4 (proximal row) evenly-spaced cones, middle and proximal cones more flattened and blunt than those of the distal row. Jaws robust, dark brown with 4 teeth (Fig. 6B).

Dorsal ligule expanded posteriorly to a greater extent than figured by McIntosh but not as much as *P. falklandica*.

Notochaetae all homogomph spinigers, neurochaetae homogomph and heterogomph spinigers and heterogomph falcigers (from observations of a limited number of chaetae, most broken so distribution between inferior and superior fascicles unknown). Falciger tips become shorter posteriorly but otherwise do not change in form along the body.

Pygidium terminal; 3 long, thin anal cirri of equivalent length to last 11 chaetigers (1 cirrus apparently lost as McIntosh's original description states 4 anal cirri, 2 each side of anus). Pygidium and last 3 chaetigers with appearance of regeneration.

Remarks. This species was described from a single specimen collected at Cape Verde Islands in the southeast Atlantic. McIntosh (1885) noted that the species appeared most closely related to *Perinereis*, however, the large, bar-shaped paragnaths characteristic of that genus were present in Area V not VI, Area VI being empty. He related the species most closely to *Nereis floridana* Ehlers, 1868, now *P. floridana* (Ehlers, 1868) and would most likely have also placed *N. atlantica* into *Perinereis* if *P. floridana* had already been placed there. The lack of notopodial falcigers would also now place it outside of *Nereis*. It is believed that the specimen is aberrant, with the large bars of Area VI here situated much closer together than would normally be expected and appearing to be in Area V instead (the aberration appears to be more than just an artifact of contraction). The additional cone behind one of the bars could be skewed out of position from Area V or may be an aberrant additional cone in Area VI (it is here assumed to be out of position from Area V due to an

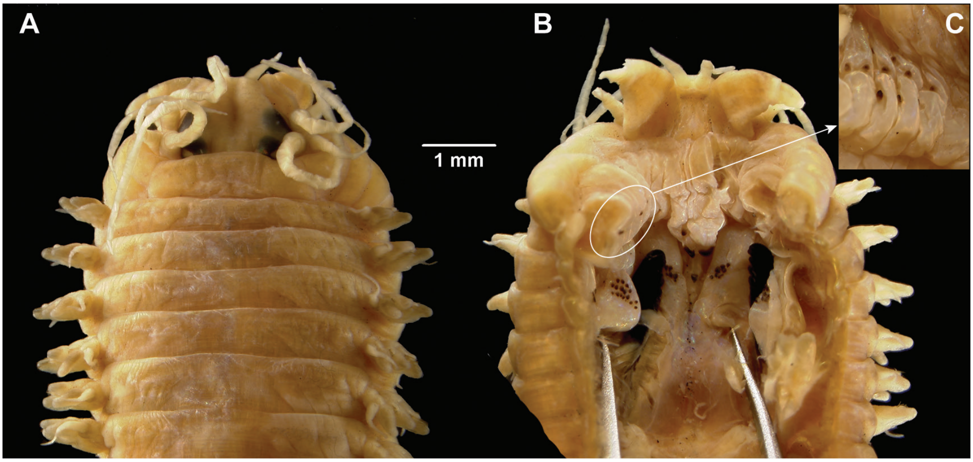

Figure 6. *Perinereis atlantica* (McIntosh, 1885) (NHMUK.1885.12.1.161): **A** anterior end, dorsal view **B** anterior end, ventral view **C** enlarged view of partial Area VII–VIII of proboscis.

aberration). An additional sign of possible aberration is that of the 4 (currently 3) anal cirri on a regenerating pygidium. More material will be required from the type locality to determine the true form and validity of the species. Until then, *Nereis atlantica* is transferred to *Perinereis* based on the large, bar-shaped paragnaths and the lack of notopodial falcigers.

Since its description, the only other record of the species has been by Pratt (1898) from Hill Cove on West Falkland (southwest Atlantic) although Hartman (1964) cast doubt on the validity of this record due to the distance from its original locality. Unfortunately, both McIntosh and Pratt gave only general locality details for their specimens and no details of habitat or depth. However, as Pratt's specimens generally came from shore or shallow water samples it is assumed that her *N. atlantica* were either intertidal or nearshore. Attempts to locate the specimens at Manchester (where she worked), Cambridge (where the other specimens she published on were loaned from) and the Natural History Museum, London have proved fruitless. The record from the Falkland Islands is therefore also considered doubtful in this paper. It is possible that, with *Perinereis falklandica* undescribed at that time and, as a student working on Bryozoa and not Annelida, Pratt mistakenly identified *P. falklandica* as *N. atlantica*. Unfortunately, without the specimens no confirmation of this is possible. Certainly, aside from Pratt's record, no other specimens like *P. atlantica* have ever been reported from the Falkland Islands.

With the shield-shaped bars now re-described into Area VI, the species would fall into 'Group 1A' of Hutchings et al. (1991) along with *P. floridana*: *Perinereis* species with 1 bar in Area VI and dorsal notopodial lobe not greatly expanded.

Habitat. Unknown.

Distribution. Cape Verde Islands, ?Falkland Islands.

Perinereis falklandica (Ramsay, 1914)

Figure 7, 9E–F

Nereis (*Perinereis*) *falklandica* Ramsay, 1914: 44–46, pl. 3, figs 3–10.
Perinereis falklandica. — Fauvel 1941: 280–281. — Hartman 1953: 29. — Day, 1954: 18. — Wesenberg-Lund 1962: 80–83, figs 30–31. — Hartmann-Schröder 1962: 410–411. — Hartmann-Schröder 1965: 298–299. — Rozbaczylo and Castilla 1973: 218–220, fig 2. — Rozbaczylo and Bolados 1980: 214–216. — Sampertegui et al. 2013: 30, fig. 1.

Material examined. East Falkland: The Canache, east of Stanley, stn 2c (51°41.716'S, 057°47.107'W), under rocks in gravel & coarse sand, mid-low shore, 9 specimens (NMW.Z.2011.039.0108–0109), 16.1.2011; Hookers Point, stn 6a, (51°41.994'S, 057°46.747'W), under pink encrusting algae, low shore, 3 specimens (NMW.Z.2011.039.0110), 21.11.2011; Hookers Point, stn 6c, (51°41.994'S, 057°46.747'W), under pink encrusting algae, low shore, 3 specimens (NMW.Z.2011.039.0111), 21.11.2011; Hookers Point, stn 6d, (51°41.994'S, 057°46.747'W), in silty gravel washings from rock pool, low shore, 1 specimen (NMW.Z.2011.039.0112), 21.11.2011; Egg Harbour, stn 25 (51°50.353'S, 059°27.351'W), rocks & mussel bed in silty coarse sand, mid-low tide, 12 specimens (NMW.Z.2011.039.0114), 03.12.2011; Sea Lion Island: East Loafers Bay, stn 20a (52°26.306'S, 059°06.229'W), in & under pink encrusting algae, mid-low shore, 1 specimen (NMW.Z.2011.039.0113), 28.11.2011; Saunders Island: The Neck, stn 42d (51°18.485'S, 060°14.504'W), under stones on rock ledges, mid-shore, 3 specimens (NMW.Z.2012.082.0011), 17.01.2013; West Falkland: Shallow Bay, stn 57b (51°30.032'S, 060°07.726'W), in crevices & under stones, high-mid shore, 2 specimens (NMW.Z.2012.082.0012), 01.02.2013; Shallow Bay, stn 57c (51°30.032'S, 060°07.726'W), in crevices & under stones, low shore, 5 specimens (NMW.Z.2012.082.0013), 01.02.2013.

Description. Thirty-nine entire specimens examined; length 19.5–73.6 mm, width (excluding parapodia) 1.5–4.3 mm for 65–89 chaetigers.

Colour in alcohol, dark brown body with pale parapodia, colour becoming paler more posteriorly, variably according to specimen. Head very dark green/brown with pale median line (Fig. 9E). Live colour green-brown with pale markings as described in alcohol.

Body dorso-ventrally depressed, uniform width for most of length, tapering slightly over last few chaetigers. Head with prostomium longer than broad (Fig. 7A), antennae short, stout, 2/3 length of broad palps. Four pairs short, tentacular cirri, pale with dark cirrophores, reaching to chaetiger 2–4. Two pairs small, black eyes, equal size, anterior pair more laterally placed (Fig. 7A). Eyes difficult to discern once preserved due to dark prostomial colour, particularly anterior pair.

Proboscis with conical (except for Area VI) paragnaths (Fig. 9E, F), variable in size and number, arranged as follows: Area I = 1 large, central surrounded by triangle of 32–150 small, faint, blunter cones; II = broad triangle of large and small cones, 9–28 each

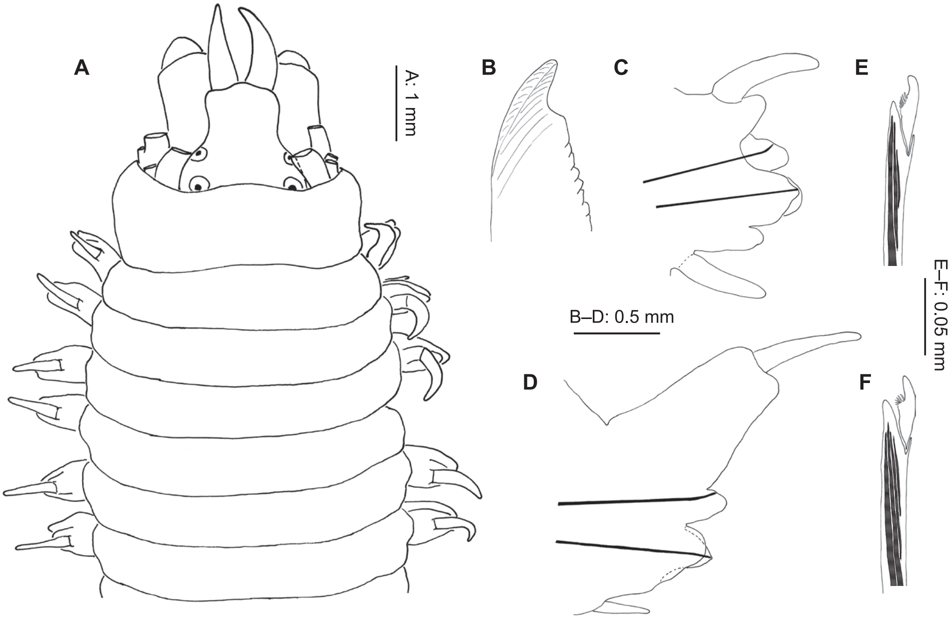

Figure 7. *Perinereis falklandica* Ramsay, 1914 (NMW.Z.2011.039.0108): **A** anterior end (tentacular cirri & right chaetiger 4 removed), dorsal view **B** jaw **C** right parapodium, chaetiger 4, posterior view **D** right parapodium, chaetiger 71, posterior view **E** neuropodial heterogomph falciger, chaetiger 4 **F** neuropodial heterogomph falciger, chaetiger 71.

side; III = oval patch of 11–20 medium-sized cones; IV = curved lines of 23–40 small–large cones; V = 1 large, blunt cone (1 aberrant specimen with 1 large & over 20 small cones); VI = 1 large, shield-shaped bar with pointed apex; VII–VIII = 2–3 single, large cones laterally, almost reaching Area VI, becoming a broad swath ventrally of 110–300 large and small blunt cones. Jaws dark black/brown with 5–10 teeth and large distal fang (Fig. 7B).

Anterior notopodia with dorsal and median ligules rounded anteriorly (Fig. 7C), becoming conical in median chaetigers; dorsal ligule swollen and elongated from around chaetiger 50 (Fig. 7D).

Neuropodia with conical postchaetal lobe and ventral ligule anteriorly, ventral ligule smaller, almost absent posteriorly.

Notochaetae homogomph spinigers throughout, figured specimen with 13 on chaetiger 4, reducing posteriorly to 6 on chaetiger 71 (of 89). Neurochaetae with homogomph spinigers in superior fascicle only (chaetiger 4: 5, chaetiger 71: 6), heterogomph falcigers present in both superior (chaetiger 4: 5; chaetiger 71: 3) and inferior (chaetiger 4: 15, chaetiger 71: 8) fascicles throughout, little change in form along body (Fig. 7E, F). Inferior fascicle with falcigers arranged in a C-shape on anterior chaetigers, thereafter in a transverse line.

Pygidium terminal; two short, anal cirri inserted ventrally.

Habitat. In this study, all specimens were from intertidal, mid-low shore locations, in hard substrates such as coarse sand/gravel, under rocks, in crevices and under pink encrusting algae.

Of the handful of other records in the literature, the species is mostly found intertidally in hard, often exposed habitats. Ramsay (1914) collected his specimens from 15 fathoms (27.4 m), the deepest record of this species.

Distribution. Falkland Islands, Magellan region (Orange Bay), Tristan da Cunha, Chile

Remarks. *Perinereis falklandica* has not been reported very widely in the literature since Ramsay described it from the Falkland Islands in 1914, although it was found to be quite common in coarse, intertidal habitats during this survey. Only one other record exists for the locality, being that of Hartman (1953), from a single intertidal sample at Port Louis. This is undoubtedly due to the fact that, other than Ramsay's original record, the species has rarely been identified from sublittoral samples and little intertidal work has been undertaken in the Falkland Islands. Outside of the Falkland Islands, with the exception of a single record from Tristan da Cunha (Day, 1954), it is mostly known from the coast of Chile (Fauvel 1941 (Magellan Strait); Wesenberg-Lund 1962; Hartmann-Schröder 1962, 1965; Rozbaczylo and Castilla 1973; Rozbaczylo and Bolados 1980; Sampertegui et al. 2013).

The validity of the species has not been questioned and it is easily distinguishable from other species. Type material was therefore not examined.

Descriptions of the specimens from the different localities are mostly uniform with the only variation being in the number of paragnaths found in Area V of the proboscis. Most authors have reported a single, large cone in this region with the exception of Day (1954; 1–3 cones), Rozbaczylo and Castilla (1973; 1–5 cones) and Sampertegui et al. (2013; 1–3 cones). All of the specimens in the current study exhibited only a single cone with the exception of one aberrant specimen with 1 large and 27 small cones. The latter specimen agrees with the usual description of *P. falklandica* in all other respects and is considered aberrant. The number of paragnaths in Areas I–IV and VII–VIII are highly variable and the range exhibited by the specimens in the current study fall within the larger range reported by Sampertegui et al. (2013).

Hutchings et al. (1991) placed *P. falklandica* into their 'Group 1B': *Perinereis* species with 1 bar in Area VI and dorsal notopodial lobe greatly expanded on posterior chaetigers.

Genus *Platynereis* Kinberg, 1865

Includes. *Iphinereis* Malmgren, 1865; *Pisenoë* Kinberg, 1865; *Leontis* Malmgren, 1867; *Nectonereis* Verrill, 1873; *Uncinereis* Chamberlin, 1919.

Type species. *Platynereis magalhaensis* Kinberg, 1865, by subsequent designation (Hartman 1948)

Diagnosis (after Read 2007, emended). Proboscis with chitinous paragnaths in form of parallel, *tight* rows of minute *rods* usually present on all areas except I, II and V. Prostomium with 2 antennae, biarticulate palps and 2 pairs of eyes; 4 pairs of tentacular cirri. Peristomial segment apodous and first 2 parapodia sub-biramous. Chaetae include spinigers and falcigers. Homogomph notopodial falcigers usually present, in least in juveniles.

Remarks. The above description is emended with respect to the paragnath terminology introduced by Bakken et al. (2009). However, it should be noted that Bakken et al. (2009) only confirmed the form of paragnaths as tight rows of rods, as opposed to the previously described pectinate bars, for 3 species of *Platynereis* that did not include *P. magalhaensis*. This is now, however, confirmed for *P. magalhaensis* below.

Platynereis magalhaensis Kinberg, 1865

Figures 8, 9G–I

Kinberg, 1865: 177. — 1910: 53, Pl. XX, fig. 6. — Pratt 1901: 2. — Fauvel 1916: 434–436, Pl. VIII, figs 21–22. — Monro 1930: 106–107, fig. 37. — Hartman 1948: 60–61.
Platynereis patagonica Kinberg, 1865: 177.
Platynereis antarctica Kinberg, 1865: 177.
Pisenoë maculata Kinberg, 1865: 176.
Nicon loxechini Kinberg, 1865: 178–179.
Nereis antarctica Verrill, 1876.
Nereis eatoni McIntosh, 1876: 320.
Nereis (*Platynereis*) *eatoni* McIntosh, 1885: 223–224, Pl. XXXV, figs 5–6.
Nereis magalhaensis. — Ehlers 1897: 63–65, Pl. V, figs 106–107.

Material examined. East Falkland: Stanley foreshore, stn 1c (51°41.459'S, 057°51.823'W), under rocks in coarse sand, low shore, 1 specimen (NMW.Z.2011.039.0145), 15.1.2011; The Canache, east of Stanley, stn 2e (51°41.731'S, 057°47.001'W), medium sand, low shore, 4 specimens (NMW.Z.2011.039.0146), 16.1.2011; Cochon Island: stn 10 (51°36.287'S, 057°47.684'W), under rocks, 9.5 m, 14 specimens (NMW.Z.2011.039.0147–0149), 24.11.2011; stn 11 (51°36.377'S, 057°489'W), under rocks, 9.6 m, 10 specimens (NMW.Z.2011.039.0150), 24.11.2011; stn 13 (51°36.322'S, 057°47.132'W) epifaunal turf scraping, 13.6 m, 3 specimens (NMW.Z.2011.039.0141), 25.11.2011; stn 15a (51°36.449'S, 057°47.150'W), under rocks, 18.0 m, 1 specimen (NMW.Z.2011.039.0151), 26.11.2011; stn 16b (51°36.366'S, 057°47.082'W), epifaunal turf scraping, 12.5 m, 1 specimen (NMW.Z.2011.039.0142), 26.11.2011; Kidney Island: stn 18b (51°37.517'S, 057°45.301'W), fine-medium sand, 4.6 m, 2 specimens (NMW.Z.2011.039.0152), 27.11.2011; East Falkland: west Stanley, stn 21 (51°41.402'S, 057°52.580'W), under small stones in coarse sand & gravel, 2 specimens (NMW.Z.2011.039.0153), 01.12.2011; Egg Harbour, stn 22 (51°47.471'S, 059°24.360'W), under rocks, 13.9 m, 4 specimens (NMW.Z.2011.039.0157), 02.12.2011; Egg Harbour, stn 23 (51°49.477'S, 059°23.926'W), under rocks, 11.6 m, 5 specimens (NMW.Z.2011.039.0143), 03.12.2011; Egg Harbour, Shag Rookery Point, stn 27 (51°49.345'S, 059°26.719'W), under rocks, 6 m, 1 specimen (NMW.Z.2011.039.0154), 03.12.2011; Kelp Harbour, stn 30 (51°47.021'S, 059°19.848'W), under rocks, 9.3 m, 4 specimens (NMW.Z.2011.039.0144), 04.12.2011; Sand Bay, Port Harriet, stn 34f (51°44.130'S, 058°00.550'W), under rocks within mussel bed, midshore, 4 specimens (NMW.Z.2011.039.0155), 08.12.2011; Teal Creek, east of Darwin, stn 35d (51°49.248'S, 058°55.561'W), under rocks in sand, midshore, 1 specimen (NMW.Z.2011.039.0156), 09.12.2011; Race Point Farm, Port San Carlos, stn 37a (51°30.276'S, 059°00.137'W), in crevices, mid-low shore, 3 specimens (NMWZ.2012.082.0041–0042), 12.01.2013; Race Point Farm, Port San Carlos, stn 37b (51°30.277'S, 059°00.080'W), in crevices, low shore, 2 specimen (NMWZ.2012.082.0043), 12.01.2013; Race Point Farm, Port San Carlos, stn 37c (51°30.276'S, 059°00.137'W), under stones, low shore, 1 specimen (NMWZ.2012.082.0044), 12.01.2013; Race Point Farm, Port San Carlos, stn 37d (51°30.276'S, 059°00.137'W), among rocks & gravel in muddy sand, low shore, 1 specimen (NMWZ.2012.082.0045), 12.01.2013; Cape Bougainville, stn 38a (51°18.720'S, 058°27.603'W), in pink encrusting algae in open crevices, low shore, 2 specimens (NMW.Z.2012.082.0047), 13.01.2013; Cape Bougainville, stn 38b (51°18.727'S, 058°27.607'W), under rocks in gravel in rock pool, mid-low shore, 2 specimens (NMW.Z.2012.082.0048), 13.01.2013; Saunders Island: Sealer Cove harbor, stn 44c (51°21.760'S, 060°04.896'W), under rocks in sandy gravel, low shore, 2 specimens (NMW.Z.2012.082.0049); 18.01.2013; Sealer Cove harbor, stn 44d (51°21.760'S, 060°04.896'W), under rocks in sandy gravel, low shore, 3 specimens (NMW.Z.2012.082.0050); 18.01.2013; East Falkland: North Arm, stn 48a (52°07.768'S, 059°22.131'W), mussel bed over silty coarse sand, midshore, 1 specimen (NMW.Z.2013.082.0051), 22.01.2013; North Arm, stn 48b (52°07.829'S, 059°22.079'W), coarse loose sand, mid-low shore, 1 specimen (NMW.Z.2013.082.0052), 22.01.2013; New Haven, stn 49b (51°43.855'S, 059°12.894'W), under rocks in sandy gravel, mid-low shore, 1 specimen (NMW.Z.2012.082.0054), 24.01.2013; West Falkland: Moonlight Bay, Port Stephens, stn 51d (52°06.266'S, 060°50.334'W), in crevices, mid-low shore, 1 specimen (NMW.Z.2012.082.0055), 26.01.2013; Hot Stone Cove Creek, Dunbar, stn 54g (51°22.883'S, 060°30.886'W), associated with large tunicate attached to rock, low shore, 1 specimen (NMW.Z.2012.082.0056), 29.01.2013; Shallow Bay, stn 57c (51°30.032'S, 060°07.726'W), in crevices & under stones, mid shore, 2 specimens (NMW.Z.2012.082.0057), 01.02.2013.

Description. Eighty-three entire specimens, juveniles to adults, were examined: length 1.9–105.1 mm, width 0.27–4.7 mm (excluding parapodia, measured at chaetiger 4–5) for 16–115 chaetigers. Description based on adult specimens only, defined by the absence of notopodial falcigers.

Colour pale in alcohol.

Body shape depressed dorso-ventrally, mostly of uniform width to posterior, then tapering in last few chaetigers.

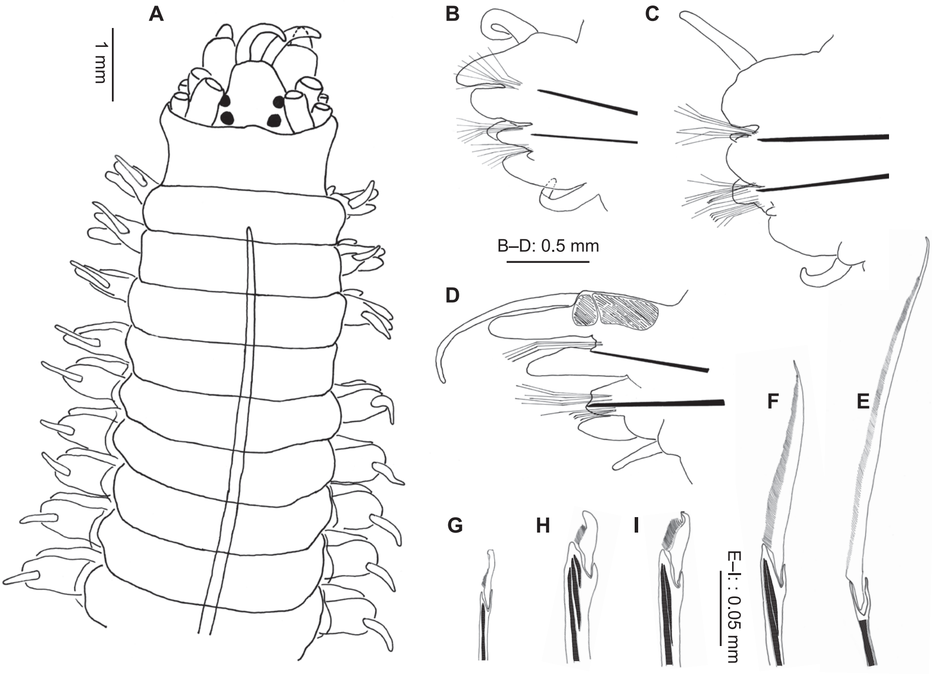

Figure 8. *Platynereis magalhaensis* Kinberg, 1865 (**A–F**, **H–I** NMW.Z.2011.039.0159 **G** NMW.Z.2011.039.0149): **A** anterior end (tentacular cirri & right chaetiger 4 removed), dorsal view **B** right parapodium, chaetiger 4, posterior view **C** right parapodium, chaetiger 10, posterior view **D** right parapodium, chaetiger 71, posterior view; right parapodium, chaetiger 4, posterior view **E** notopodial homogomph spiniger, chaetiger 10 **F** neuropodial heterogomph spiniger, chaetiger 10 **G** juvenile notopodial heterogomph falciger, chaetiger 20 **H** neuropodial heterogomph falciger, chaetiger 10 **I** neuropodial heterogomph falciger, chaetiger 71.

Prostomium longer than broad (Fig. 8A), antennae and palps about equal in length; antennae 1/2–1/3 width of palpophores. Four pairs tentacular cirri, postero-dorsal pair longest, reaching to chaetiger 11–14, rarely 16. Two pairs small, dark brown to black eyes, anterior pair marginally smaller, more laterally placed (Fig. 8A). Mid-dorsal nuchal cushion present, projecting forward slightly on to head from apodous peristomial segment (Fig. 8A). Peristomium approximately one third longer than following segments.

Proboscis with tight lines of rod-like paragnaths in Areas III, IV, VI, VII and VIII, absent in Areas I, II and V. Largest group in area IV with up to 9 long rows, innermost 3–4 rows incomplete. Area III with 3 small groups of up to 4 lines in each. Area VI, the smallest group, often faint, difficult to discern, with up to 3 short lines of rods (Fig. 9G, indicated by arrow). Area VII–VIII with 5 groups of up to 3 curved lines in each (Fig. 9I). Jaws dark brown with up to 12 teeth (Fig. 8G, I).

Parapodia subbiramous on chaetigers 1–2, biramous from chaetiger 3. Parapodial ligules thickened and rounded on chaetigers 5–11, sometimes, to a lesser extent, starting from chaetiger 4 and extending to chaetiger 12, occasionally 13, in larger animals (Fig. 8B, C).

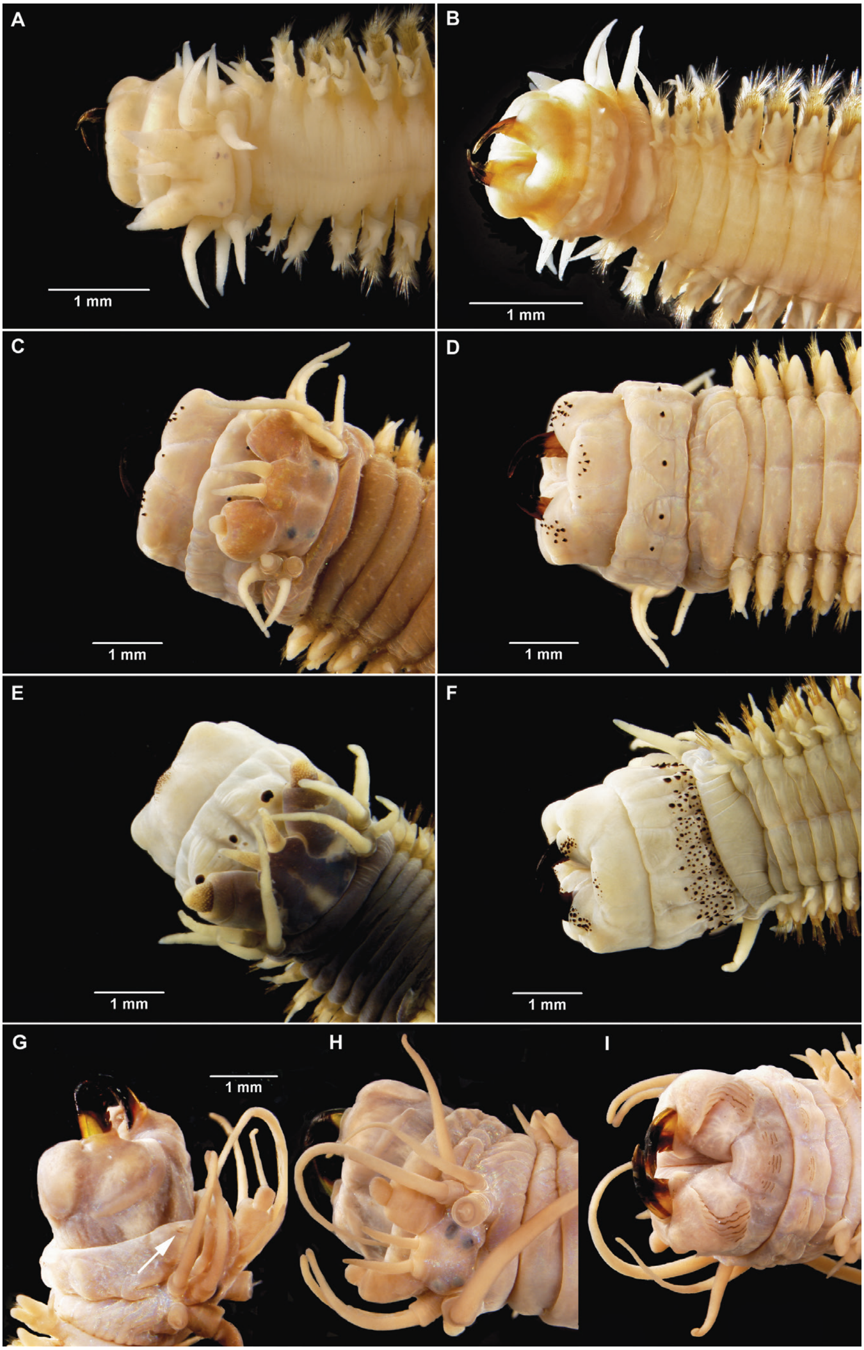

Figure 9. Images of the paragnaths of the species collected. *Gymnonereis tenera* sp. n. (NMW.Z.2011.039.0093): **A** dorsal view **B** ventral view; *Neanthes kerguelensis* (NMW.Z.2011.039.0129) **C** dorsal view **D** ventral view; *Perinereis falklandica* (NMW.Z.2011.039.0113) **E** dorsal view; F. ventral view; *Platynereis magalhaensis* (NMW.Z.2011.039.0158) **G** lateral view (arrow indicating Area VI paragnaths) **H** dorsal view **I** ventral view.

From mid-body dorsal ligule lengthened and glandular (Fig. 8D). Dorsal cirrus longer than dorsal ligule throughout body, minorly so anteriorly, becoming more pronounced and elongate posteriorly (Fig. 8B–D).

Notochaetae homogomph spinigers (Fig. 8E), up to 25–30 per fascicle in midbody, reduced to around 5 in last few chaetigers. Single heterogomph notopodial falciger, bifid with connecting tendon from tip (Fig. 8G), present in juveniles up to around 60–65 chaetiger stage, absent in adults. First occurrence of notopodial falciger retreats posteriorly as size increases, from around chaetiger 8 (of 16) to chaetiger 62 (of 64).

Neurochaetae homogomph and heterogomph spinigers (Fig. 8F) and heterogomph falcigers (Fig. 8H, I). Superior fascicle spinigers homogomph, up to 8, inferior fascicle spinigers heterogomph, up to 6 (usually 2–3). Falcigers heterogomph, from chaetiger 5 onwards; up to 7 above acicula, up to 17 below; greatest numbers midbody reducing posteriorly.

Pygidium terminal; two long, thin anal cirri inserted ventrally.

Tube soft, with coarse grains of sand, shell and foraminifera adhered to it.

Remarks. *Platynereis magalhaensis* was the most common nereidid collected by diving with most rocks turned over having tubes attached to the underside. It was also widespread intertidally, again in tubes attached to rocks or algal holdfasts.

The original description of *P. magalhaensis* by Kinberg (1865) was brief with little detail except a general description of the head, and a statement that the tentacular cirri reached to the 15th segment and there were 12 teeth on the jaws. Several authors since then have expanded the description using either newly collected specimens (e.g. Ehlers 1897; Fauvel 1916) or by re-examining Kinberg's type material (Hartman 1948). The species can be distinguished from most other *Platynereis* species on a combination of the absence of paragnaths in Areas I, II and V and the absence of notopodial falcigers (in adults). However, *P. magalhaensis* remains difficult, if not impossible, to separate morphologically from the *P. australis* 'group' — *P. australis* (Schmarda, 1861), *P. karaka* Read, 2007, *P. kau* Read, 2007, *P. mahanga* Read, 2007 — resulting in a conflict of opinion with some authors synonymizing it with *P. australis* while others prefer to keep them separate.

Most recently, a detailed comparison of the *P. australis* group with *P. magalhaensis* was published by Read (2007), following which he concluded that while morphologically inseparable as atokes, as epitokes the species could be differentiated on the basis of characters such as number of pre-natatory segments and male pygidial form and thus *P. magalhaensis* should still be considered a valid species.

Unfortunately, no epitokous forms were among the specimens collected from the Falkland Islands so this aspect cannot be confirmed in this study. However, the few records of epitokes that do exist for this region (Ehlers 1897; Augener 1923; Monro 1930) indicate that the species is likely to be distinct from *P. australis* and Read (2007) additionally stated that records of *P. australis* outside of New Zealand should be reassessed. The species collected from the Falkland Islands is therefore viewed as being appropriately placed under the name *P. magalhaensis*. However, further study of the epitokous form from the islands is necessary to help clarify the situation.

Key to intertidal and nearshore Nereididae in the Falkland Islands

1 Chitinous paragnaths present on pharynx; single ventral cirrus present throughout **2**

– Chitinous paragnaths absent from pharynx; double ventral cirri present .... ***Gymnonereis tenera* sp. n.**

2 Paragnaths present as shield-shaped bars and /or variably-sized cones; chaetiger 5–10 parapodial lobes not noticeably different from lobes on remaining chaetigers **3**

– Paragnaths present as tight rows of rods; chaetigers 5–10 with globular parapodial lobes .... ***Platynereis magalhaensis* Kinberg, 1865**

3 Area VI with paragnaths as cones, shield-shaped bar with rounded apex or absent; posterior notopodial dorsal lobes not noticeably enlarged **4**

– Area VI with 1 large, shield-shaped bar with pointed apex; posterior dorsal notopodial lobes greatly enlarged .... ***Perinereis falklandica* Ramsay, 1914**

4 Falcigers absent in notopodia **5**

– Falcigers present in at least some notopodia **6**

5 Paragnaths absent on maxillary ring and Area VI; ventral fascicle of neuropodia includes heterogomph spinigers .... ***Eunereis patagonica* (McIntosh, 1885)**

– Paragnaths present on maxillary ring and Area VI; all spinigers homogomph, no heterogomph spinigers present .... ***Neanthes kerguelensis* (McIntosh, 1885)**

6 Conical paragnaths in Area VI, single sparse row of paragnaths in Area VII–VIII (sometimes absent); falcigers present in dorsal fascicle of neuropodia .... ***Nereis eugeniae* (Kinberg, 1865)**

– Shield-shaped bar in Area VI, more than 1 row of paragnaths in Area VII–VIII; falcigers absent from dorsal fascicle of neuropodia .... ***Perinereis atlantica* McIntosh, 1885, comb. n.***

* The single record from the Falkland Islands (Pratt 1898) is considered doubtful

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Sarandibrinus, a new genus of Saprininae subfamily from Madagascar (Coleoptera, Histeridae) (Second contribution to the knowledge of the Histeridae of Madagascar)

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Abstract

Sarandibrinus araceliae, a new genus and species of the Saprininae subfamily is described from southern Madagascar. The new taxon exhibits autapomorphic characters for the Saprininae subfamily and is unusual especially for its large and deep prosternal foveae and the shape of spiculum gastrale. The description is accompanied by color habitus images, SEM micrographs, mouthparts and antenna line drawings and drawings of the male genitalia. Key to the genera of the Saprininae of Madagascar and the adjacent archipelagos is given. *Hypocaccus* (*Baeckmanniolus*) *rubiciliae* (Lewis, 1899) is newly reported from Madagascar and *Hypocaccus* (*Nessus*) *perparvulus* (Desbordes, 1916) is new to Mauritius.

Résumé

Sarandibrinus araceliae, nouvelle espèce d'un genre nouveau de la sous-famille des Saprininae, est décrite du sud de Madagascar. Le nouveau taxon présente des caractères autapomorphiques pour les Saprininae spécialement par la présence de grandes fovéoles prosternales et par la forme de son spiculum gastrale. La description est accompagnée de photographies d'habitus en couleurs, de micro-photographies au microscope à balayage (SEM) et de dessins des antennes, des pièces buccales et des genitalia. Une clé des genres de Saprininae de Madagascar et des archipels voisins est donnée. *Hypocaccus* (*Baeckmanniolus*) *rubiciliae* (Lewis, 1899) est signalé comme nouveau pour Madagascar et *Hypocaccus* (*Nessus*) *perparvulus* (Desbordes, 1916), comme nouveau pour l'île Maurice.

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Keywords

Sarandibrinus, Coleoptera, Histeridae, Saprininae, taxonomy, Madagascar

Introduction

With only 7 genera and 22 species (see Table 1) of the Saprininae subfamily reported from the fourth largest island of the Earth, Madagascar, including the adjacent archipelagos of Comoros, Mascarene Islands and Seychelles (Mazur 2011, Lackner and Gomy 2013 and present paper), this family is unquestionably poorly represented in the area in question. This statement can be put into perspective with the nearby-situated continent of Africa, which houses 26 genera with 100+ species of the Saprininae (Mazur 2011 and unpublished data). Among the Malagasy taxa – some of which are currently still being studied – only 6 species and one genus currently known are

Table 1. Distribution of the members of the Saprininae subfamily on Madagascar (Mad), Seychelles (Sey), Comoros (Com), and Mascarene (Masc) archipelagos. Taxa marked with * are endemic for the area in question and taxa marked with † are new for the islands/archipelagos in question.

		Mad	Sey	Com	Masc
	HISTERIDAE Gyllenhal, 1808				
	Saprininae Blanchard, 1845				
1	*Euspilotus* (*Hesperosaprinus*) *modestus* (Erichson, 1834)	-	-	-	+
2	*Euspilotus* (*Neosaprinus*) *rubriculus* (Marseul, 1855)	-	-	-	+
3	*Gnathoncus* sp.	+	-	-	-
4	*Hypocacculus* (s. str.) *metallescens* (Erichson, 1834)	-	-	-	+
5	*Hypocaccus* (*Nessus*) *perparvulus**† (Desbordes, 1916)	+	-	-	+
6	*Hypocaccus* (*Nessus*) *vulturnus* (Reichardt, 1932)	-	-	-	+
7	*Hypocaccus* (*Nessus*) sp.	+	-	-	-
8	*Hypocaccus* (s. str.) *brasiliensis* (Paykull, 1811)	+	+	-	+
9	*Hypocaccus* (*Baeckmanniolus*) *disjunctus* (Marseul, 1855)*	+	+	+	-
10	*Hypocaccus* (s. str.) sp.	+	-	-	-
11	*Hypocaccus* (*Baeckmanniolus*) *rubiciliae* (Lewis, 1899)†	+	-	-	-
12	*Malagasyprinus caeruleatus** (Lewis, 1905)	+	-	-	-
13	*Malagasyprinus diana** (Lackner & Gomy, 2013)	+	-	-	-
14	*Malagasyprinus perrieri** (Lackner & Gomy, 2013)	+	-	-	-
15	*Saprinus* (s. str.) *basalis* Fairmaire, 1898	+	-	-	-
16	*Saprinus* (s. str.) *chalcites* (Illiger, 1807)	-	-	-	+
17	*Saprinus* (s. str.) *cupreus* Erichson, 1834	+	-	-	-
18	*Saprinus* (*Phaonius*) *erichsonii* (Marseul, 1855)	+	+	-	+
19	*Saprinus* (s. str.) *fulgidicollis** Marseul, 1855	+	-	-	-
20	*Saprinus* (s. str.) sp.	+	-	-	-
21	*Saprinus* (s. str.) *spendens* (Paykull, 1811)	+	+	-	-
22	*Sarandibrinus araceliae** sp. n.	+	-	-	-
	Total	17	4	1	8

endemic to Madagascar (Mazur 2011; Lackner and Gomy 2013; present contribution). The other taxa occurring on the archipelagos or on Madagascar show either traits of regional distribution (western Indian Ocean), or are of different biogeographic origins (Afrotropical, Mediterranean, Oriental and even Neotropical). Some of these species have probably been introduced to Madagascar and the nearby Mascarene Islands, Comoros or Seychelles by human activity during recent centuries (Gomy 1983). The recent description of the first endemic genus *Malagasyprinus* (Lackner and Gomy 2013) containing three endemic and allopatric species emphasized the uniqueness of Malagasy Saprininae. With the description of another autapomorphic genus below, we further document the distinctness of the Malagasy Saprininae, which has been largely unrecognized hitherto.

Material and methods

All dry-mounted specimens were relaxed in warm water for several hours or overnight, depending on the body size. After removal from original cards, the beetles were side-mounted on triangular points and observed under a Nikon 102 stereoscopic microscope with diffused light. Some structures were studied using methods described by Ôhara (1994): the mouthparts, antenna and male genitalia were macerated in a hot 10% KOH solution for about 15 minutes, cleared in 80% alcohol, macerated in lactic acid with fuchsine, incubated at 60 °C for two hours, and subsequently transferred into a mixture of glacial acetic acid 1 part and methyl salicylate 1 part heated at 60 °C for 15 minutes and cleared in xylene. Specimens were then observed in α-terpineol in a small glass dish. Digital photographs of the male terminalia and antenna were taken by a Nikon 4500 Coolpix camera and edited in Adobe Photoshop CS5. Based on the photographs or direct observations, the mouthpars, genitalia and antennal structures were drawn using a light-box Hakuba klv-7000. SEM micrographs were taken at the Laboratory of the Electron Microscopy at the Faculty of Biology, Charles University, Prague, Czech Republic. Habitus photographs were made by F. Slamka (Bratislava, Slovakia). All available specimens were measured with an ocular micrometer. Beetle terminology follows that of Ôhara (1994) and Lackner (2010). Separate lines of the same label are marked by slash (/). The following acronyms of museums and private collections are used throughout the text:

CAS	California Academy of Sciences, San Francisco, USA (D. Kavanaugh);
CYG	Yves Gomy collection, Nevers, France;
TLAN	Tomáš Lackner collection, temporarily housed at NCB Naturalis, Leiden, Netherlands.

Abbreviations used in measurements:

PEL	Length between anterior angles of pronotum and apices of elytra;
APW	Width between anterior angles of pronotum;

PPW	Width between posterior angles of pronotum;
EL	Length of elytron along sutural line;
EW	Maximal width between outer margins of elytra.

Taxonomy

Sarandibrinus gen. n.

http://zoobank.org/DFCA5BA0-849E-47D6-8BF4-0C676960CA3A

Type species. *Sarandibrinus araceliae* sp. n.

Diagnosis. Small, castaneous, shining Saprininae; basal half of elytra glabrous, apical half covered with rugulose-lacunose punctation. Head comparatively large, frontal and supra-orbital striae absent, sensory structures of antennal club in form a single ball-shaped vesicle situated on internal distal side of the antenna under the apical slit-like orifice, pronotum wholly punctate, pronotal hypomeron ciliate; prosternal foveae large, round and deep. Meso- and metaventrite as well as first visible abdominal ventrite wholly punctate; spiculum gastrale only slightly constricted laterally instead of possessing a clear 'head' and 'stem' (sensu Caterino and Tishechkin 2013).

Differential diagnosis. By the absent frontal and supra-orbital striae this taxon can be confused with two other sympatric genera: *Gnathoncus* Jacquelin du Val, 1858 (differing from it by the cuticular colour as well as presence of prosternal foveae) or *Euspilotus* Lewis, 1907, differing from it likewise by the metallic dorsum, ciliate pronotal epipleuron (both species of *Euspilotus* known from the region have glabrous pronotal hypomeron) or coarsely punctate frontal disk, with punctures forming elongate rugae (both *Euspilotus* species known from the region have their frontal disks covered with scattered punctures, never forming elongate rugae. The best differentiating character between the three taxa is probably the number of vesicles inside the antennal club: *Gnathoncus* possesses five, *Euspilotus* two or three, respectively, while *Sarandibrinus* has only one vesicle. The single vesicle character is present also in the sympatric genera *Hypocaccus*, *Hypocacculus* and *Malagasyprinus*, but the vesicle is pear-shaped vs. ball shaped in *Sarandibrinus*. *Hypocaccus*, *Hypocacculus* and *Malagasyprinus* furthermore, possess frontal and supraorbital striae, while *Sarandibrinus* lacks both. By the large oblique and deep prosternal foveae this taxon can be confused with the recently described genus *Malagasyprinus* Lackner & Gomy, 2013, differing from it by the cuticular colour (castaneous vs. dark blue/green) as well as absence of frontal and supra-orbital striae (*Malagasyprinus* possesses supra-orbital striae and its frontal stria is widely interrupted and prolonged onto clypeus). See also Key to the genera of the Saprininae from Madagascar (below).

Biology. The series of the new taxon was collected by sifting the litter in spiny forest (thicket) as well as by flight intercept (or yellow pan, Malaise) traps in desert scrub forest.

Distribution. Madagascar, Toliara Province (Fig. 22).

Etymology. The name of this new genus has been formed using the word "Sarandib" – one of the ancient names given by Arabs to the far-flung island that later became Madagascar and "*rinus*" – the two final syllabus of the name "*Saprinus*" to demonstrate its position as belonging to the Saprininae subfamily.

***Sarandibrinus araceliae* sp. n.**

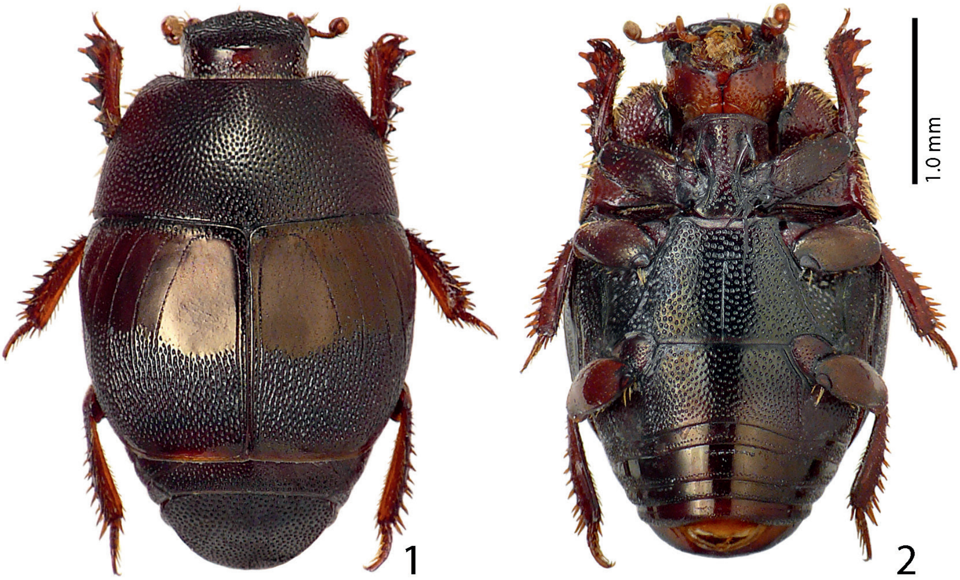
http://zoobank.org/D5441788-EE72-4883-80BD-C9BB89099526
Figs 1–21

Type locality. Madagascar, Toliara prov., Mahavelo Forest; Ifaty (Fig. 22).

Type material examined. Holotype, ♂, side-mounted on a rectangular mounting card, male genitalia extracted and glued to the same card as specimen, with the following labels: "♂" (hand-written); followed by: "MADAGASCAR: Toliara / Prov., Forêt de Mahavelo / Isantoria River, elev 115 m / 5.5. km 37°NE Ifotaka / 31.i.2002" (printed); followed by: "25°45'13"S, 46°9'5"E / coll: Fisher, Griswold et al. / Calif. Acad. of Sciences / sifted litter - spiny forest / thicket, code: BLF5278" (printed); followed by: "CASENT / 8065358" (printed); followed by: "Sarandibrinus / araceliae sp. n. / Det. T. Lackner & Y. / Gomy 2014 HOLOTYPE" (red, hand-written label) (CAS). Paratypes: 1 ♂ & 4 ♀♀, same data, but: "CASENT / 8065359"; "CASENT / 8065357"; "CASENT / 8065361"; "CASENT / 8065360" (two female paratypes, "8065360" & "8065361" are sputter-coated with gold); 1 ♀, with the following labels: "MADAGASCAR: Prov. / Toliara; Ifaty / 23˚09'S, 43˚37'E / 17–22 Sept. 1993" (printed); followed by: "Flight intercept / yellow pan trap in / Malaise trap in / desert scrub forest" (printed); followed by: "W. E. Steiner & R. Andriamasimanana / collectors" (printed); followed by: "Sarandibrinus / araceliae sp. n. Det. / T. Lackner & Y. Gomy / 2014 PARATYPE" (red, hand-written label); 1 ♀, with the following labels: MADAGASCAR: "Toliara Prov. / Parc National d'Andohahela / Forêt de Manantalinjo 33.6 km / 63° ENE Amboasary, 7.6 km / 99° E Hazofotsy, 12-16 I 2002" (printed); followed by: "24°49'1"S, 46°36'36"E / coll: Fisher, Griswold et al. / California Acad. of Sciences / sifted litter - in spiny forest / thicket, elev. 150m BFL4810" (printed); followed by: "CASENT / 8065685" (printed); followed by: "Sarandibrinus / araceliae sp. nov. / Det. T. Lackner & / Y. Gomy 2014 PARATYPE" (red label, written); (1 ♂ in coll. CYG; 1 ♀ in coll. TLAN; rest of the paratypes in coll. CAS).

Description. Body length: PEL: 2.20–2.50 mm; APW: 1.00–1.25 mm; PPW: 1.75–2.00 mm; EW: 1.75–2.20 mm; EL: 1.35–1.60 mm. Body (Figs 1–2) roundly oval, convex, elytra widest at humeri; cuticle of elytra castaneous, shining, without metallic luster; pronotum darker; body ventrally dark brown to almost black; abdominal ventrites (except for first visible) rufescent; legs, mouthparts and antennae light brown to castaneous.

Antennal scape (Fig. 3) slightly thickened, lower margin carinate, with several rather long ramose setae and several scattered punctures; club (Fig. 4) oval, without visible articulation, dorsal surface on basal 2/3 glabrous, apical 1/3 with dense short



Figures 1–2. 1 *Sarandibrinus araceliae* gen. & sp. n., habitus, dorsal view **2** ditto, ventral view.

Figure 3. *Sarandibrinus araceliae* gen. & sp. n., head, dorsal view.

sensilla intermingled with sparser longer erect sensilla; ventrally (Fig. 4) setose patch covers larger part of antennal club as dorsally, on each (distal and proximal) side with a single slit-like orifice; sensory structures of antennal club in form a single ball-shaped vesicle situated on internal distal side of the antenna under the slit-like orifice (Fig. 13).

Mouthparts: mandibles obscurely variolate, punctate, mandibular apex pointed; sub-apical tooth of left mandible not examined; labrum (Fig. 12) convex, densely imbricate, its convexity interrupted by slight median concavity; labral pits situated near anterior margin, each with two well-sclerotized long setae; terminal labial palpomere thickened, about 1.5 times as long as penultimate, its width about half its length, truncate apically; mentum (Fig. 5) trapezoidal, anterior margin deeply inwardly arcuate, on each side with four long ramose setae, lateral margins with single row of much shorter ramose setae, disk of mentum imbricate; cardo of maxilla with few short setae; stipes triangular, with three long ramose setae; terminal maxillary palpomere thickened, truncate apically, about twice times as long as penultimate; its width about half its length.

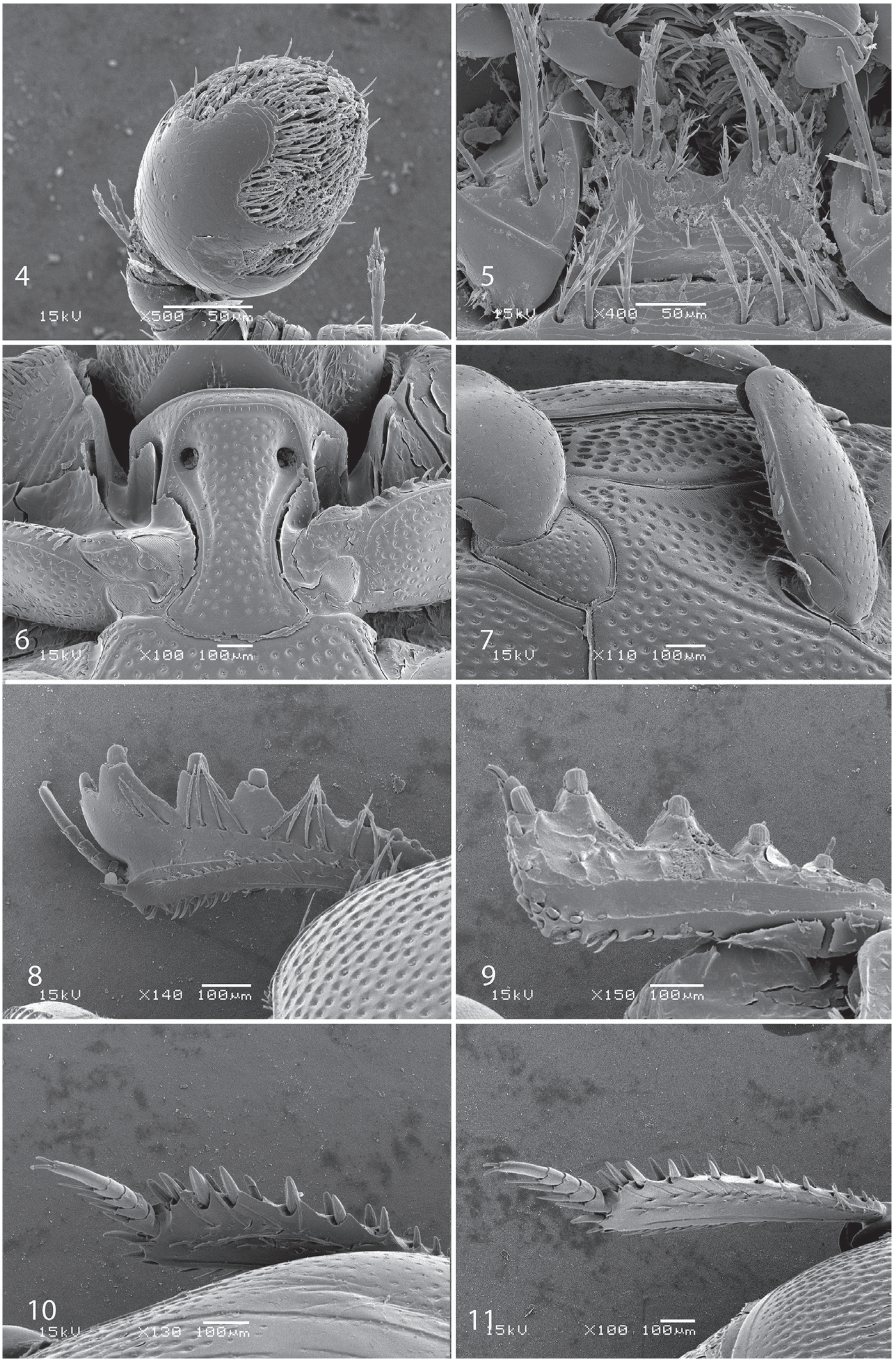
Clypeus (Fig. 3) rather short, flat, sub-quadrate, punctate, punctures linked with carinate strioles; frontal and supraorbital striae absent, in several specimens inter-linked carinate strioles appear as fragments of frontal stria; sculpture of frontal disc (Fig. 3) identical to that of clypeus; eyes flattened, almost invisible from above; occipital stria absent.

Pronotal sides (Fig. 1) moderately narrowing anteriorly; apical angles obtuse; anterior margin of pronotum broadly arcuate; pronotal depressions absent; marginal pronotal stria thin, slightly carinate and complete, somewhat weakened behind head; pronotal disc entirely covered by unusually deep and dense punctures, interspaces between them shorter than half their own diameter; pronotal hypomeron with fine dense yellow setae; scutellum well visible.

Elytral epipleura in several punctures; marginal epipleural stria fine, complete; marginal elytral stria straight, well impressed and slightly carinate, continued as weakened but complete apical elytral stria that is connected to complete sutural elytral stria. Humeral elytral stria short, deeply impressed on basal fourth, but difficult to discern due to very coarse and dense punctures and irregular strioles surrounding it; inner subhumeral stria present as a rather long medio-apical fragment; elytra with thin striae 1–4; striae in weak punctures, reaching approximately elytral half apically; fourth dorsal elytral stria basally connected with sutural elytral stria under broad arch; sutural elytral stria well-impressed and complete, in fine punctures, on apical half almost not discernible due to the extremely dense confluent punctation, apically connected with apical elytral stria, between it and elytral suture a row of fine punctures present; these fine punctures present also along entire elytral base and slightly entering elytral intervals basally; elytral humeri and flanks densely punctate, elytral disc on basal half (roughly) with large oval 'mirror' occupying approximately entire elytral intervals 1–4; apical half of elytra (roughly) covered with extremely coarse confluent punctures and longitudinal rugae, basally slightly entering also elytral intervals; extreme elytral apex impunctate.

Propygidium and pygidium densely and coarsely punctate, punctures separated by about their own diameter.

Anterior margin of median portion of prosternum (Fig. 6) almost straight; marginal prosternal stria present, almost complete; prosternal process between carinal prosternal striae slightly concave, with dense large setigerous punctation; carinal prosternal striae well-impressed, broadly divergent anteriorly, terminating in deep and large prosternal foveae; lateral prosternal striae carinate, sub-parallel, connected in front of apices of carinal prosternal striae, surface mesad of them with a regular row of fine microscopic setae.



Figures 4–11. 4 *Sarandibrinus araceliae* gen. & sp. n., antennal club, ventro-lateral view **5** *Sarandibrinus araceliae* gen. & sp. n., mentum, ventral view **6** *Sarandibrinus araceliae* gen. & sp. n., prosternum **7** *Sarandibrinus araceliae* gen. & sp. n., lateral disk of metaventrite + metepisternum **8** *Sarandibrinus araceliae* gen. & sp. n., protibia, dorsal view **9** ditto, ventral view **10** *Sarandibrinus araceliae* gen. & sp. n., mesotibia, dorsal view **11** *Sarandibrinus araceliae* gen. & sp. n., metatibia, dorsal view.

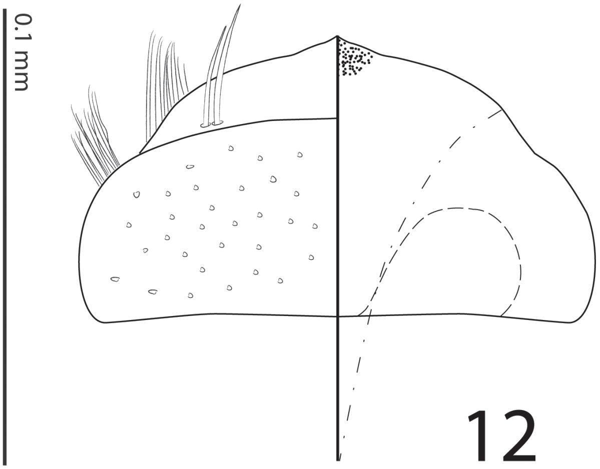


Figure 12. *Sarandibrinus araceliae* gen. & sp. n., labrum: left half depicting dorsal view and right half depicting epipharynx.

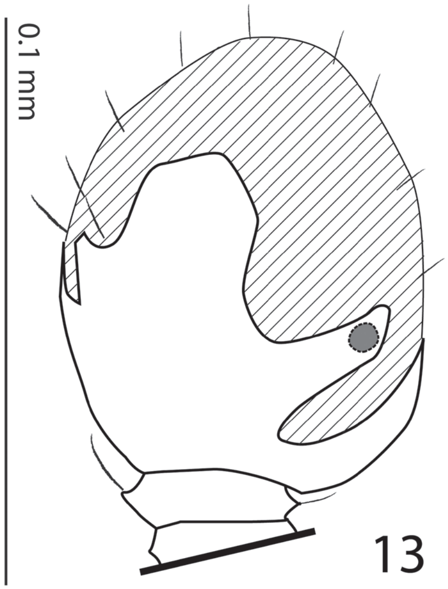


Figure 13. *Sarandibrinus araceliae* gen. & sp. n., antennal club, ventral view showing sensory structures of the antenna.

Anterior margin of mesoventrite broadly inwardly arcuate; discal marginal mesoventral stria present only laterally, antero-medially obliterated; disc of mesoventrite with dense deep large punctures separated by less than their own diameter; meso-metaventral sutural stria absent; meso-metaventral suture well discernible; intercoxal disc of metaventrite in male with slight longitudinal median concavity almost indiscernible in female, completely covered by punctures identical to those of mesoventrite;

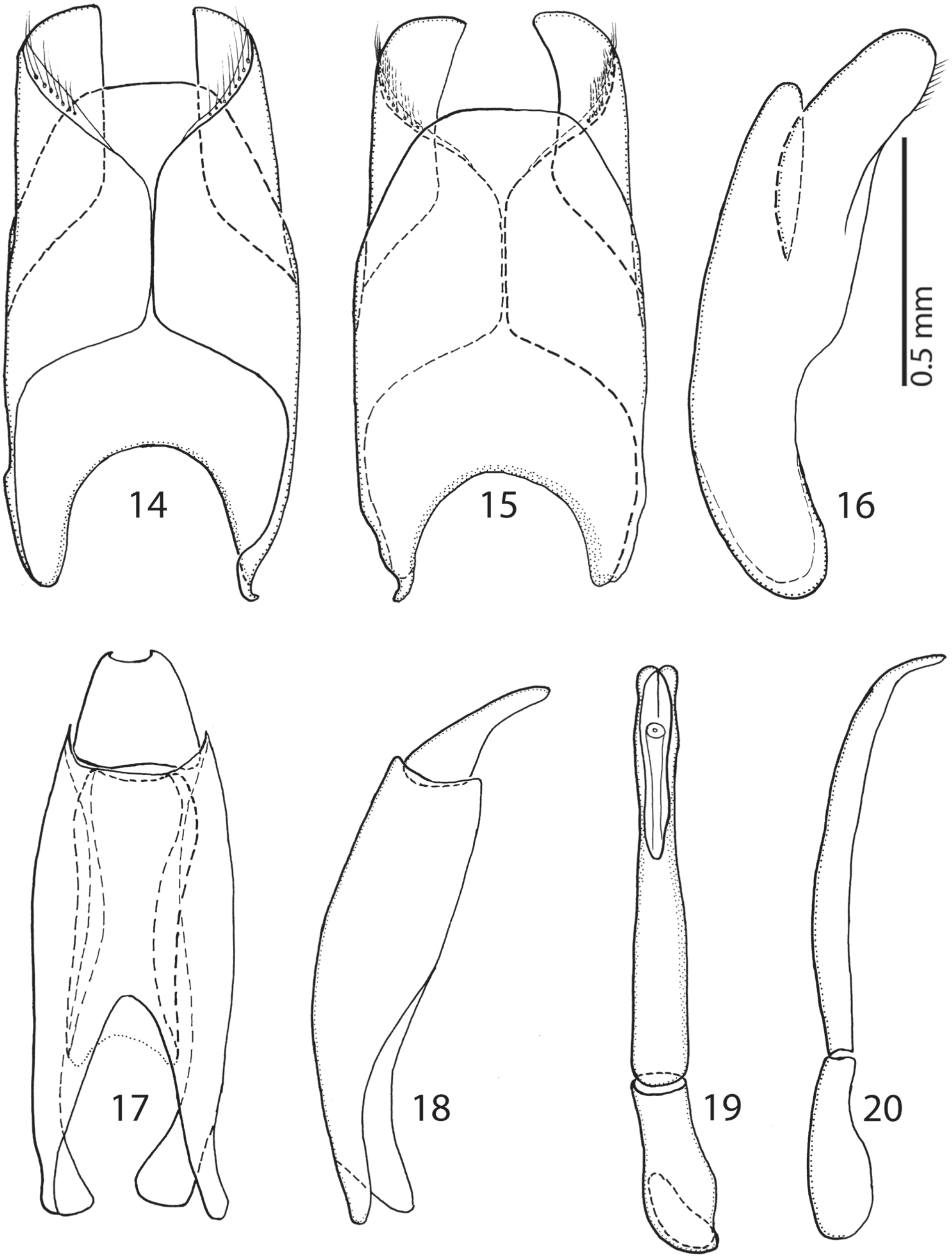
lateral metaventral stria (Fig. 7) well impressed, carinate, almost straight, stopping short of metacoxa; lateral disc of metaventrite slightly concave, with punctation similar to that of metaventrite; metepisternum + fused metepimeron (Fig. 7) with even denser and deeper punctation; metepisternal stria absent.

Intercoxal disc of the first abdominal ventrite almost completely striate laterally; disc with punctation similar to that of lateral disc of metaventrite.

Protibia (Figs 8–9) slightly dilated, outer margin apically with single low tooth topped by denticle, followed by three large triangular teeth topped by denticle and another two low teeth topped by denticle; all five teeth diminishing in size gradually in proximal direction, followed by a three tiny denticles growing out directly from outer margin of protibia; setae of outer row regular, ramose, rather long; protarsal groove rather shallow; anterior protibial stria incomplete, bearing short and regular setae of intermedian row; another complimentary short stria originating approximately near tarsal insertion present; tarsal denticles absent; protibial spur (Fig. 8) short, straight, growing out from near the tarsal insertion; apical margin of protibia posteriorly with two widely separated tiny denticles; outer part of posterior surface with a sparse row of minute denticles situated on low protuberances, separated from imbricate median part of posterior surface by a definite ridge; posterior protibial stria complete, terminating in three tiny inner denticles; inner row of setae double, setae dense and short.

Mesotibia (Fig. 10) slender, outer margin with a dense row of approximately 7 prominent denticles situated inside low teeth; setae of outer row sparse, about as long as denticles themselves; setae of intermedian row shorter and finer than those of outer row, regular; posterior mesotibial stria almost complete; anterior surface of mesotibia variolate-punctate, with another row of approximately 7 denticles shorter than those of outer row; anterior mesotibial stria complete, terminating in single tiny inner anterior denticle; mesotibial spur rather long; apical margin of mesotibia with three short denticles; mesotarsomeres telescopically becoming narrower apically, each bearing two thick setae ventrally; claws of apical tarsomere slightly bent, approximately one-third its length; metatibia (Fig. 11) slenderer and longer than mesotibia, in most respects similar to it, but denticles of outer margin not growing out from inside low teeth and setae of outer row shorter than those of mesotibia.

Male genitalia. Eighth sternite (Figs 14–15) apically with tiny vela adorned with a row of long, sparse setae; halves separated medially. Eighth tergite (Fig. 15) apically outwardly arcuate; eighth sternite and tergite fused laterally (Fig. 16). Ninth tergite (Figs 17–18) when compared to tenth tergite conspicuously long, acutely inwardly arcuate basally; tenth tergite (Fig. 17) apically slightly inwardly arcuate. Spiculum gastrale of both known male specimens (on basal part) damaged during the manipulation with genitalia, so we are only able to depict its 'reconstruction' here (Fig. 21): median part only slightly constricted, typical 'head' and 'stem' (sensu Caterino and Tishechkin 2013) absent. Aedeagus (Figs 19–20) with rather large basal piece, its length ratio to the length of the parameres approximately 1:3. Aedeagus on the whole slender; parameres of the aedeagus fused on the basal half (approximately), aedeagus constricted medially and laterally curved.



Figures 14–20. 14 *Sarandibrinus araceliae* gen. & sp. n., male terminalia: 8th sternite and tergite, ventral view **15** ditto, dorsal view **16** ditto, lateral view **17** *Sarandibrinus araceliae* gen. & sp. n., male terminalia: 9th + 10th tergites, dorsal view; spiculum gastrale, ventral view **18** *Sarandibrinus araceliae* gen. & sp. n., male terminalia: 9th + 10th tergites, lateral view **19** *Sarandibrinus araceliae* gen. & sp. n., male terminalia: aedeagus, dorsal view **20** ditto, lateral view.

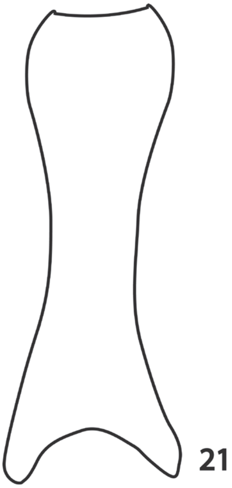


Figure 21. *Sarandibrinus araceliae* gen. & sp. n., male terminalia: reconstruction of the spiculum gastrale, ventral view.

Etymology. This species is dedicated to Mrs. Araceli Cancino, wife of the famous Belgian comics illustrator Midam, in appreciation of the publication of the three volumes of "Carnets de Grrreeny".

New records on the distribution of the Saprininae from Madagascar and Mauritius

Hypocaccus (*Baeckmanniolus*) *rubiciliae* (Lewis, 1899)
Described from Tanzania, reported also from the Republic of South Africa (Natal) (Mazur 2011). New to Madagascar (Fig. 22).

Madagascar south-west: 21 exs., Toliara, "Plage de La Batterie", 19.vii.1969, under algae (Y. Gomy leg.). 5 exs., Toliara env., "Fitsitika", 20.vii.1969, beach, under algae (Y. Gomy leg.). Madagascar North: 22 exs., Majunga, "Village touristique", 29.VII.1968, beach, under coastal wrack (Y. Gomy leg.).

Hypocaccus (*Nessus*) *perparvulus* (Desbordes, 1916)
Described from Madagascar, new to Mauritius.

Mauritius, 1 ex., Pointe aux Sables, 15.i.1971, in a coop (Y. Gomy leg.). Gomy (1983) erroneously reported this specimen under the name *Hypocaccus* (*Nessus*) *grandini* (Marseul, 1870).

Key to the genera of the Saprininae of Madagascar

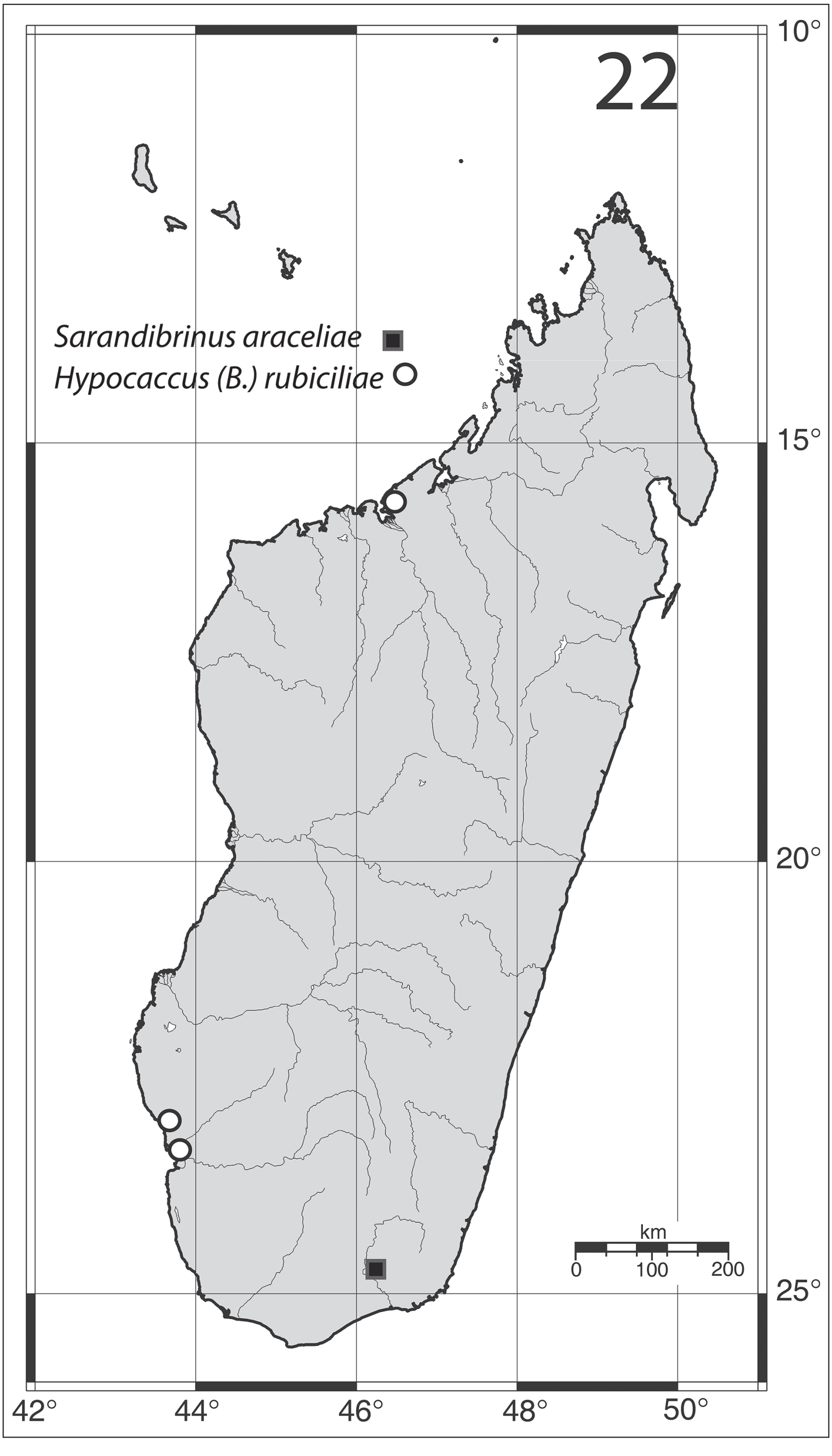


Figure 22. Distribution of *Sarandibrinus araceliae* gen. & sp. n. and *Hypocaccus* (*Baeckmanniolus*) *rubiciliae* Lewis, (1899) on the Island of Madagascar.

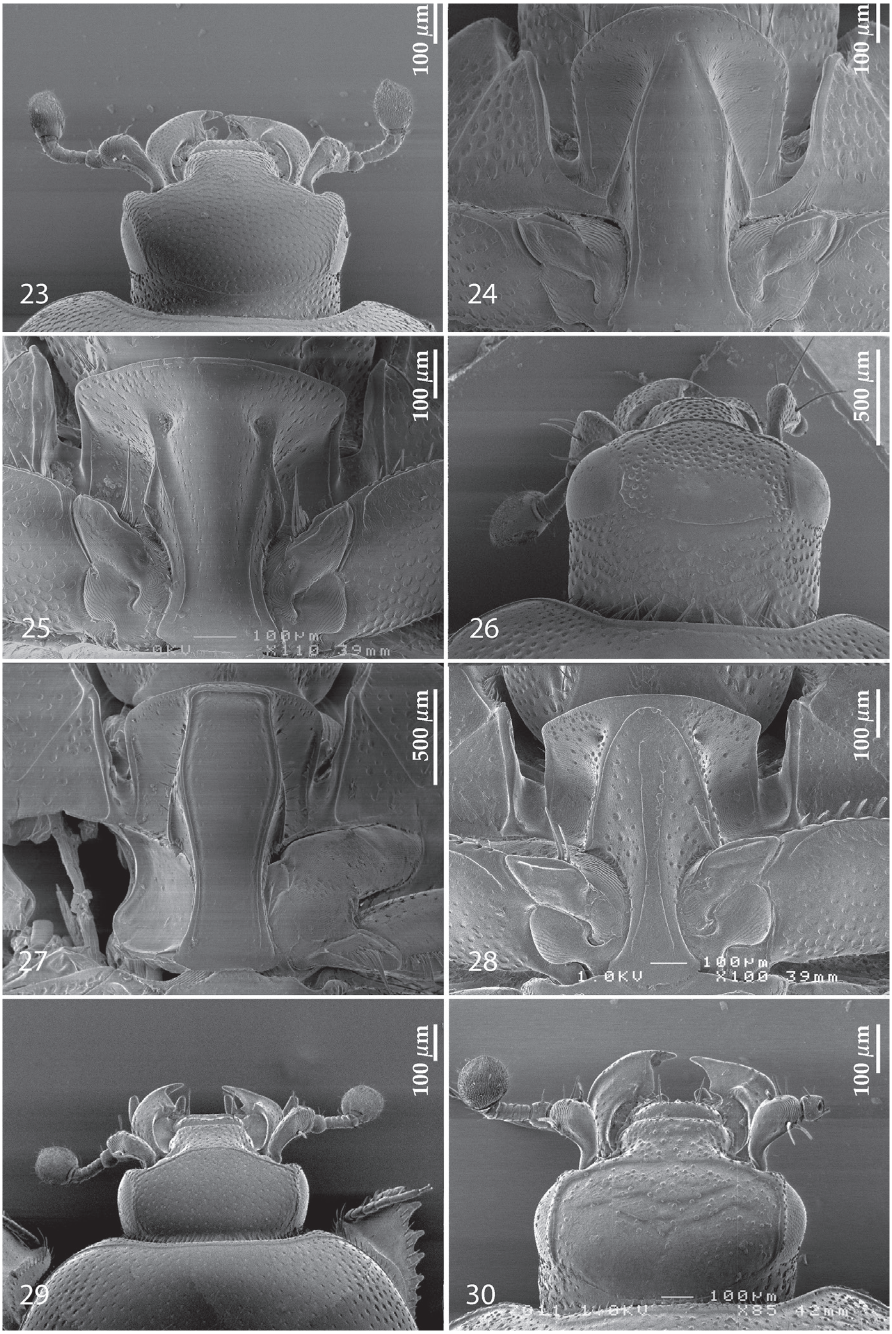
(For the sake of wider usage this key contains also taxa known to occur on the nearby archipelagos of Mascarene Islands, Comoros and Seychelles.)

1 (6)	Head without any trace of frontal or supra-orbital striae (Fig. 3)
2 (3)	Frons very densely and coarsely punctate (Fig. 3); punctures forming elongate rugae .... ***Sarandibrinus* gen. n.**
3 (2)	Frons with fine, scattered punctation; punctures never forming elongate rugae (Fig. 23)
4 (5)	Carinal prosternal striae joined anteriorly (Fig. 24); elytra with characteristic short hooked appendix between fourth dorsal and sutural elytral striae, marginal elytral stria double .... ***Gnathoncus* Jacquelin Du Val, 1858**
5 (4)	Carinal prosternal striae divergent anteriorly (Fig. 25), in some cases joined by a deep sulcus; elytral disk between fourth dorsal elytral and sutural elytral striae without a hooked appendix; marginal elytral stria single .... ***Euspilotus* Lewis, 1907**
6 (1)	Frontal and/or supra-orbital striae present (Fig. 26)
7 (8)	Prosternal foveae absent (Fig. 27) .... ***Saprinus* Erichson, 1834**
8 (7)	Prosternal foveae present (Fig. 28)
9 (10)	Frontal stria widely interrupted medially, prolonged onto clypeus (for fig. see Lackner and Gomy 2013, fig. 6). Prosternal foveae oblique, large and deep (for fig. see Lackner and Gomy 2013, fig. 4). Punctation of pronotum and elytra very coarse and dense, forming elongate rugae overall .... ***Malagasyprinus* Lackner & Gomy, 2013**
10 (9)	Frontal stria complete (Fig. 29), prosternal foveae small to moderately large (Fig. 28), never deep; punctation of dorsum never forming elongate rugae
11 (12)	Frons (Fig. 29) with distinct punctation, without obvious chevrons or transverse rugae. Body size from 1.50–2.00 mm .... ***Hypocacculus* Bickhardt, 1914**
12 (11)	Frons (Fig. 30) smooth with chevrons or with more or less regular transverse rugae. Body size usually larger than 2.00 mm .... ***Hypocaccus* Thomson, 1867**

Discussion

The newly erected genus exhibits a mixture of plesiomorphic and apomorphic characters. Among the plesiomorphic ones (sensu Lackner, unpublished) is undoubtedly the absence of both supra-orbital and frontal striae; these striae are without exception absent with the taxa near the root of the recently performed phylogenetic analysis aimed at resolving the relationships of the higher taxa of the Saprininae subfamily (Lackner, unpublished).

The presence of large, deep oblique prosternal foveae is undoubtedly an apomorphic character (as it is present mainly among more 'derived' Saprininae; see also Discussion in Lackner and Gomy 2013 for details), as is the single ball-shaped vesicle present inside the antennal club. A prosternum with such large and deep oblique



Figures 23–30. 23 *Euspilotus* (*Neosaprinus*) *rubriculus* (Marseul, 1855), head, dorsal view **24** *Gnathoncus rotundatus* (Kugelann, 1792), prosternum **25** *Euspilotus* (*Hesperosaprinus*) *modestus* (Erichson, 1834), prosternum **26** *Saprinus* (*Saprinus*) *fulgidicollis* Marseul, 1855, head, dorsal view **27** ditto, prosternum **28** *Hypocaccus* (*Hypocaccus*) *brasiliensis* (Paykull, 1811), prosternum **29** *Hypocacculus* (*Hypocacculus*) *metallescens* (Erichson, 1834), head, dorsal view **30** *Hypocaccus* (*Hypocaccus*) *brasiliensis* (Paykull, 1811), head, dorsal view.

prosternal foveae is found only in another Malagasy endemic, genus *Malagasyprinus* Lackner & Gomy, 2013, which makes their inter-relationships intriguing. We have included both taxa in the matrix of morphological characters of the higher taxa of the Saprininae subfamily developed recently by the senior author and our analyses placed them distant from each other, which suggests that they most likely do not share a common ancestor. Both taxa were, however, members of a large clade consisting of taxa that share a single, pear-shaped vesicle inside their antennal club. Relationships among members of this clade were mostly unresolved and they represent taxa mostly spread in the Old World, with several psammophilous members described from North America (Lackner, unpublished). The number of vesicles inside the antennal club among the Saprininae tends to decrease with the more 'derived' taxa, while the taxa placed near the root of the tree (Lackner, unpublished) usually possess more than two vesicles inside their antennal clubs. However, the presence of a single vesicle, which is a synapomorphy of the true 'derived' Saprininae is always pear-shaped regarding its shape, whereas the taxa placed near the root of the cladogram have their vesicles always ball-shaped (although usually numerous; Lackner, unpublished). From this respect the vesicle character in *Sarandibrinus* is ambiguous, as it is single in number, but ball-shaped instead of pear-shaped.

The curiously shaped spiculum gastrale (Fig. 21), resembling that of a monotypic Namibian endemic *Paraphilothis mirabilis* Vienna, 1994 (Lackner, unpublished) presents an interesting question here, seen from the phylogenetic standpoint. It is likely that such a structure evolved twice independently within the Saprininae subfamily, as the two taxa *Sarandibrinus* and *Paraphilothis* are not related according to our analyses. *Paraphilothis mirabilis* was recovered closer to the root of the cladogram, distant from the above-mentioned clade of taxa possessing a single pear-shaped vesicle in their antennal club. *Paraphilothis* has been observed to possess four ball-shaped vesicles inside its antennal club (Lackner, unpublished). Emerging ideas of the higher phylogeny of the Saprininae subfamily suggest that there remains still a significant work to be performed.

Last, but not least, we should probably mention the unusual collecting conditions of this new taxon. Although Saprininae are very plastic in their ecologies (Lackner, forthcoming), there has not been so far any record of collecting a member of the Saprininae by the method of litter sifting or yellow pan trapping. It is obvious that the island of Madagascar, known for its high endemism among the living organisms has still a lot to offer from its store.

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