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No. 151

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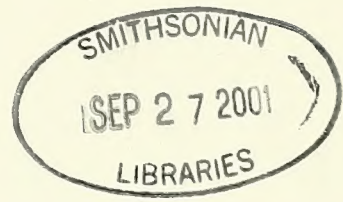
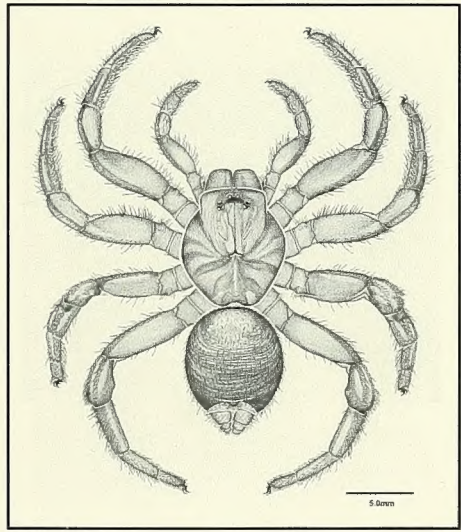
MADAGASCAR

Contributions to the Study of the Biodiversity of Madagascar

Number 1

**A MONOGRAPH OF THE MIGID TRAP DOOR SPIDERS OF MADAGASCAR AND
REVIEW OF THE WORLD GENERA (ARANEAE, MYGALOMORPHAE, MIGIDAE)**

By
Charles E. Griswold and Joel Ledford



California Academy of Sciences
San Francisco, California

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(Above) Female of *Poecilomigas abrahami* (O.P. Cambridge)
from Dlinza Forest, Zululand, South Africa

(Below) Nest of *Moggridgea teresae* Griswold on fallen log
at Kirstenbosch, near Cape Town, South Africa

Photographs by Teresa Meikle

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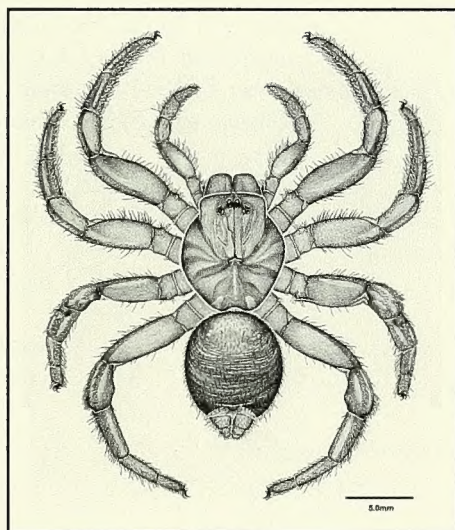
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A MONOGRAPH OF THE MIGID TRAP DOOR SPIDERS OF MADAGASCAR AND REVIEW OF THE WORLD GENERA (ARANEAE, MYGALOMORPHAE, MIGIDAE)

Charles E. Griswold (1)* and Joel Ledford (2)

The Malagasy fauna of the spider family Migidae is monographed and a phylogeny for Malagasy species and exemplars of the world genera is proposed. This phylogenetic analysis corroborates the monophyly of Migoidea (Actinopodidae plus Migidae) and Migidae, and suggests that the Malagasy migids form a monophyletic group (Paramiginae, sensu Petrunkevitch 1939, but not Raven 1985), that *Migas*, *Moggridgea*, and *Poecilomigas* form a monophyletic group (Miginae Simon 1892), that the Calathotarsinae Simon 1903 is paraphyletic with respect to the Miginae, and that the South American migids form a monophyletic group. A key to the world genera and 14 species of Malagasy Migidae is presented. The following new species are described: *Paramigas goodmani*, *P. macrops*, *P. manakambus*, *P. milloti*, *P. oracle*, *P. pectinatus*, and *P. rothorum*, all authored by Griswold and Ledford, and *Paramigas andasibe* Raven. *Paramigas subrufus* Pocock is a new junior synonym of *P. perroti* (Simon). The male of *Thyropoeus malagasus*, the first male known for the genus, is described. *Goloboffia* new genus is proposed for *Migas vellardi* Zapfe 1961, giving *Goloboffia vellardi* new combination.

The trap door spider family Migidae has long attracted attention because of its strikingly disjunct southern continent distribution. Migids are known from Australia, Africa, Madagascar, New Zealand, New Caledonia and the southern cone of South America: virtually all parts of the former supercontinent Gondwanaland except the Indian subcontinent and Antarctica. Migids have figured prominently in discussions of spider biogeography and of southern disjunctions (Pocock 1903; Legendre 1979; Platnick 1981; Nelson & Platnick 1984; Griswold 1991a). Reasonably complete modern treatments exist for the African (Griswold 1987a, 1987b), Australian (Raven 1984; Main 1991), South American (Schiapelli & Gerschman 1975; Goloboff & Platnick 1987; Goloboff 1991), and New Zealand faunas (Wilton 1968). The faunas of Madagascar and New Caledonia have received less attention. Dresco and Canard (1975) briefly reviewed the Malagasy genera. Nothing has been published on the migids of New Caledonia since Berland (1924). With

this paper, the 15th in a series treating the afro-montane spider fauna (Griswold 1985, 1987a, 1987b, 1987c, 1990, 1991b, 1994, 1997a, 1997b, 1998a, 1998b, 2000, 2001; Griswold and Platnick 1987), we monograph the Malagasy migids utilizing all available material.

Madagascar is widely recognized as being of great conservation importance (National Research Council 1980; Rasoanaivo 1990; Myers et al. 2000) because the island is known for high rates of endemism and unique occurrence of primitive members of otherwise widespread taxa (Myers 1988). Ongoing rapid habitat destruction, particularly of forests, makes the collection, description, and study of the evolutionary and biogeographic significance of the Malagasy biota particularly urgent.

The spider fauna of Madagascar remains poorly known. Since the first Malagasy spider (*Augusta glyphica* Guérin 1839) was described more than 150 years ago, nearly 150 papers have been published on Malagasy spiders. The number of spiders recorded from the whole island only slightly exceeds 450 described species (Roth 1992a; Griswold, in press), significantly less than the 626 species recorded from the British Isles (Merrett et al. 1985, Merrett & Millidge 1992). Yet, nearly 400 species (new and described together) have been collected from a single site (Parc National Ranomafana) in the southern part of the island (Roth 1992b), suggesting a rich fauna yet to be de-

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scribed. The important afromontane spider families Cyatholipidae (Griswold 1997a) and Phyxelididae (Griswold 1990) have only recently been recorded from the island. Remarkably, a new family (Halidae) was recently described from Madagascar from hitherto undescribed species (Jocqué 1994). Alderweireldt & Jocqué (1994) suggest that the known component of the Malagasy spider fauna is around 10%. Our knowledge of the evolutionary relationships of Malagasy spiders is poorer still: of the more than 120 papers that deal explicitly with the taxonomy of Malagasy spiders, fewer than 10 present cladograms or other explicit phylogenetic hypotheses. Clearly, much remains to be learned about this rich fauna.

Our studies of the Malagasy migids benefit from two recent developments: (1) a well supported cladistic hypothesis of migid affinities and (2) new migid material collected in the course of general surveys of Madagascar biodiversity. Raven (1985) and Goloboff (1993a) proposed mygalomorph cladograms that confirmed a Migoidea (*sensu* Platnick & Shadab 1976) comprising Migidae and Actinopodidae and suggested Ctenizidae and Idiopidae as close relatives. Our phylogenetic analysis builds on this hypothesis. After initial collections of Malagasy migids in the late 19th century few of these spiders were collected for the next 100 years. Renewed interest in the Malagasy biota and concern for impending extinctions led to new efforts to survey the island. In particular, the efforts of Steve Goodman and Brian Fisher in the 1990s to collect terrestrial arthropods and small vertebrates produced as many migid specimens as collected in the previous 100 years. Nevertheless, our attempts to monograph the Malagasy migids and understand their phylogeny are hindered by absent and ambiguous data. Of the ten world genera two (*Mallecomigas* and *Micromesomma*) are still known only from females. Malagasy migids remain very rare in collections: we have examined only 113 specimens, adults and juveniles alike. Many species are known from single specimens, and collecting data may be absent or ambiguous. Of the 14 Malagasy species that we recognize, only one (*Thyropoeus malagasus*) is known with certainty from both sexes. Indeed, only once have a male and female of a Malagasy migid species been collected in association (in 1996 by Goodman in a pitfall trap at Vohimena)!

Recognizing these shortcomings in the data, we attempt to understand the phylogenetic position of Malagasy migids, review the biology of the family, describe the Malagasy fauna, and provide a key to the world genera and Malagasy species. We are confident that continued exploration of the arthropod faunas of the

southern continents will complete the picture of the Migidae and provide tests of the hypotheses presented herein.

MATERIAL AND METHODS

CONVENTIONS—Throughout the text, figures cited from previous papers are listed as “fig.” and those appearing in this paper as “Fig.” All illustrations are by Jenny Speckels (JS), Joel Ledford (JL), Virginia Kirsch (VK) or Charles Griswold (CG) and are attributed in the figure captions. When referring to size, ‘small’ = <10mm, ‘medium’ = 10–20 mm, and ‘large’ = >20 mm. In the discussion of biogeographic history “ma” refers to millions of years before the present. Records of distribution in Madagascar presented in Figure 68 include localities for the juveniles listed in Table 1.

DESCRIPTIONS—Each genus is treated, a brief taxonomic history is provided, major diagnostic features are listed, and published reports on the biology are summarized. For Malagasy and Afrotropical genera the description summarizes all included species; for other genera the description reflects the exemplars (see Table 2) supplemented by the literature. Species descriptions follow the format in Griswold (1987a). Each description is of a single individual of each sex, which is identified either as a type or by the locality at which it was collected. Illustrations cited in the description may not refer to the specimen described but serve to describe the features reported. For each sex there is also a section reporting the variation in the most conspicuous and variable features. For variation in quantitative features three to five adult individuals representing the full range in overall size were chosen to sample the species: the number (N) is reported at the beginning of each section. All measurements are in millimeters. Abbreviations used in the text and figures are listed in Table 3.

Eyes are measured from above. The sternal sigilla are the concave regions near the sternal margin as viewed in oblique lighting, not the discolored area associated with these structures. Spines are recorded as arising from the dorsal (d), prolateral (p), ventral (v) or retrolateral (r) surface of the segment and are recorded from proximal to distal. For example, tibia p 0-0-1, d 1-0-0, r 0-1-1 signifies that the tibia has a proximal spine on the dorsum, a distal spine on the prolateral side, and a median and distal spine on the retrolateral side. The convention r 0-0-1a signifies that the retrolateral spine is at the apex of the segment (a = apical). Especially on the lateral surfaces of the tibiae-tarsi of the female pedipalpus and legs I and II spines may be in diagonal series oriented in a proximo-dorsal to disto-

Table 1: Juvenile *Paramigas* from Madagascar (all specimens are in CASC)**Antsiranana Province:**

Reserve Speciale Manongarivo, 10.8 km SW Antanambao (13°57.7'S, 48°26'E) elev. 400 m, rainforest, sifted litter, 8 November 1998, B.L. Fisher

Reserve Speciale d'Anjanaharibe-Sud, 12.2 km WSW Befingotra (14°45'S, 49°26'E) elev. 1985m, montane rainforest, sifted litter, 25 November 1994, B.L. Fisher

Toamasina Province:

Presquil de Masoala, 5.3 km SSE Ambanizana, Andranobe (15°40'S, 49°58'E) elev. 425 m, rainforest, sifted litter, 21 November 1993, B.L. Fisher

SF Tampolo, 10 km NNE Fenoarivo Atn. (17°17'S, 49°26'E) elev. 10 m, littoral rainforest, sifting litter, 4 April 1997, B.L. Fisher

Fianarantsoa Province:

Reserve Speciale Ivohibe, 8 km E Ivohibe (22°29'S, 46°58.1'E) elev. 1200 m, forest, sifting leaf litter, 15–21 October 1997, B.L. Fisher

Reserve Andringitra, 38 km S Ambalavao (22°12'S, 46°58'E) elev. 1680 m, montane rainforest, sifted litter, 23 October 1993, B. L. Fisher

Reserve Andringitra, 38 km S Ambalavao (22°12'S, 46°58'E) elev. 1875 m, montane rainforest, sifted litter, 29 October 1993, B. L. Fisher

Reserve Andringitra, 8.5 km SE Antanitotsy (22°10'S, 46°58'E) elev. 1990 m, rainforest, sifting litter, 6 March 1997, B. L. Fisher

Toliara Province:

Mahafaly near Eloetse, by Lac Tsimanampetsoa (24°10'S, 43°45'E) 15–16 September 1992, V. & B. Roth

Southern Isoky-Vohimena Forest (22°41'S, 44°50'E) elev. 730 m, tropical dry forest, sifted litter, 21 January 1996, B.L. Fisher

Forêt de Petriky, 12.5 km W Tolagnaro (25°03.73'S, 46°52.16'E) elev. 10 m, littoral rainforest, sifting litter, 22 November 1998, B.L. Fisher

ventral direction, with the smallest spines most dorsal and the largest most ventral (Figs. 1, 24A): in this case the convention P 1-1-2-4-3 signifies that on the proteral surface there are two proximal spines in a row followed by diagonal series of 2, 4 and 3 spines. We define “thorns” as socketed setae that taper to the apex and that are less than 5× as long as the diameter at the base (Fig. 25D; Griswold 1987a, figs. 23–26). Thorns have a nearly smooth surface. Cuspules are socketed setae that are narrow at the base, widest medially, and blunt to pointed at the apex, and deeply grooved (Griswold 1987a, figs. 358, 359) or smooth (Figs. 43C–D).

Localities in Madagascar may be hard to trace due to many identical or similar place names, abbreviation of place names on labels, illegible labels, and name changes over time. We have tried our best to decipher difficult labels. The recent compilation of field stations where insects have been collected in Madagascar (Viette 1991) has been very helpful.

SPECIMEN PREPARATION—Vulvae were examined in lactic acid. In some cases they were cleaned by exposure to trypsin or cleared with Clorox® bleach. Examination was via Wild M5Apo, Olympus SZH10, Leica MZApo and Leitz Ortholux II microscopes.

Prior to examination with a Hitachi S-520, JEOL T-200 or Cambridge Stereoscan Scanning Electron Microscope (SEM), large structures were air-dried and delicate structures (spinnerets, whole mounts of juveniles) were critical-point-dried.

PHYLOGENETICS—On the preferred cladogram (Fig. 65) all nodes were assigned a letter (e.g., A, B). Throughout the discussions of the phylogenetic analysis and relationships among taxa these letters are used to refer both to nodes on the cladogram (e.g., node N) and clades distad to that node (e.g., clade N, comprising *Migas*, *Moggridgea* and *Poecilomigas*). For further discussion see ‘phylogenetic methodology’ under ‘Phylogenetics’ below.

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Table 2: Exemplars and other taxa examined for migid phylogenetic analysis (note: M=male; F=female).**Outgroups:**

- Actinopus rufipes* (Lucas, 1834): F from Brazil, Barra de Pirai, Rio de Janeiro, det. Bucherl (AMNH)
Actinopus sp.: F from Tobago, Grafton Estate (AMNH)
Actinopus sp.: FF from Colombia, Meta, Puerto Lleras, Lomalinda, elev. 300m., 73°22'W, 3°18'N, 15 April 1986, B. T. Carroll (CASC), MM, same locality, March 1987 (CASC)
Actinopus sp.: M from Argentina, Corrientes, 29 April 1964, E. S. Ross (CASC)
Bothriocyrtum californicum (O.P. Cambridge, 1874): M from USA, California, Los Angeles Co., campus of University of California at Los Angeles, November 1955, M. Maher (CASC); F from Los Angeles Co., Eagle Rock, July 1991, C.E. Griswold (CASC)
Idiops sp.: MF from South Africa, Natal, Pietermaritzburg, 1–15 October 1985, C. & T. Griswold (CASC)

Non-Malagasy Migidae:

- Calathotarsus coronatus* Simon, 1903: specimens from Chile, Valparaiso, Parque Nacional La Campana, Cerro La Campana, M from elev. 980m., 11 November 1986, F from 1080 m., 26 August 1981, R. Caderon (AMNH); also M from Santiago Prov., Quilicura, September 1979, Pena (AMNH) and F from El Canelo, elev. 950 m., 8 September 1966, E. Schlinger & M. Irwin (CASC)
Calathotarsus simoni Schiapelli & Gerschman, 1975: F from Argentina, Buenos Aires, Cerro Negro, Sierra de la Ventana, April 1974, Césari (AMNH)
Heteromigas dovei Hogg, 1902: MF from Australia, Tasmania, Patersonia, 29 January 1926, V. V. Hickman (QMB)
Migas vellardi Zapfe, 1961: holotype M from La Herradura, Coquimbo Province, Chile (UCS); F from Chile, Coquimbo Region, Guanaqueros, 10 January 1984, E. Maury & P. Goloboff (MACN 8338)
Mallecomigas schlingeri Goloboff & Platnick, 1987: holotype F from Chile, Araucanía Region, elev. 610m in Cordillera de Nahuelbuta, 18 km W Angol, 10 February 1967, E.I. Schlinger (UCS at CASC). Note: This specimen has been transferred to UCS.

Migas exemplars:

- Migas gatenbyi* Wilton, 1968: M (fragmentary) from New Zealand, Wellington, Town Belt, Oriental Bay, 41°17'S, 174°46'E, 11 January 1995, L.J. Boutin (CASC), F from same locality, 17 April 1995, L.J. Boutin (CASC)
Migas taierii Todd, 1945: M from New Zealand, Patearoa (AMNH)

Other Migas:

- Migas affinis* Berland, 1924: holotype M from New Caledonia, Forêt du Mt. Panié, 27 May 1911, Roux & Sarrasin (MNHN AR 4132)
Migas distinctus O.P. Cambridge, 1879: F from New Zealand, Portobello (AMNH)
Migas giveni Wilton, 1968: F from New Zealand, N. Island, Waipoua Forest, Yakas Track, 2 February 1994, E.I. Schlinger (CASC)
Migas nitens Hickman, 1927: F from Cornelian Bay, Tasmania, 28 August 1930, V. V. Hickman (MNHN AR4131)
Migas paradoxus L. Koch, 1873: F from New Zealand, C. L. Wilton (AMNH)
Migas variapalpus Raven, 1984: M from Australia, Queensland, O'Reilly's, Lamington National Park, elev. 935m, 28°13'S, 153°08'E, 12 July 1992, C.E. Griswold (CASC)
Migas sp.: M from Tauranga, New Zealand (OMD)
Moggridgea crudeni Hewitt, 1913: F from Alicedale, South Africa, F. Cruden (AMSA)
Moggridgea dyeri O. P. Cambridge, 1875: M from Uitenhage, South Africa, F. Cruden (AMSA)
Moggridgea intermedia Hewitt, 1913: MF from South Africa, Western Cape, Diepwalle Forest Station, 21 km. N. Knysna, 33°57'S, 23°09'E, elev. 540 m, 12 December 1996, C.E. Griswold (CASC)
Moggridgea pseudocrudeni Hewitt, 1919: M from Alicedale, South Africa (AMSA)
Moggridgea peringueyi Simon, 1903: M from South Africa, Cape, Oudtshoorn. 29 October 1949, B. Malkin (CASC); F (holotype) from South Africa, Cape, Matjiesfontein (MNHN 19274)
Moggridgea rupicola Hewitt, 1913: MMF from South Africa, Alicedale (AMSA)
Moggridgea tingle Main, 1991: paratypes, from Walpole National Park in Western Australia, M from Big Tingle Tree, 16 July 1908 (WAM 89/330), FF from Valley of the Giants. 14 January 1990 (WAM 90/1112) and Deep River crossing at Manjinup, 14 January 1990, B.Y. Main (WAM 90/1113)
Poecilomigas abrahami (O.P. Cambridge, 1889): F from South Africa, Natal, Sordwana Bay, elev. 0 m, 50 mi. E of Ubombo, 5 April 1958, E. S. Ross (CASC); F from South Africa, Uitenhage (AMSA); MM from South Africa, Natal, Pietermaritzburg, Town Bush, elev. 3000 ft., 29°33'S, 30°21'E, 8 January 1984, T. Meikle (CASC), same data (NMSA).
Poecilomigas basilleupi Benoit, 1962: MF from Tanzania, Tanga Region, West Usambara Mts., Mazumbai, 4°49'S, 38°30'E, elev. ca. 1400 m, 10–20 November 1995, C. Griswold, D. Ubick, & N. Scharff, (CASC)

Table 3: List of Anatomical and Other Abbreviations Used in the Text and Figures.

a	apical
AER	anterior eye row
ALE	anterior lateral eyes
AME	anterior median eyes
d	dorsal
HS	spermathecal head
ITC	inferior tarsal claws
OAL	ocular area length
OAW	ocular area width
p	prolateral
PER	posterior eye row
PLE	posterior lateral eyes
PME	posterior median eyes
r	retrolateral
SS	spermathecal stalk
STC	superior tarsal claws
v	ventral

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MATERIAL EXAMINED

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TAXONOMY

Migidae

Diagnosis.—Distinguished from all other mygalomorphs by having the combination of characters rastellum absent (Figs. 2B, 5B, 9B), fangs quadrate and keeled (Figs. 2C, 43A), thoracic fovea straight to recurved (Figs. 1, 2A), and PLS with spigots on median and distal articles only (Figs. 3A–B).

Description.—Small to large sized mygalomorphs, 5–45 mm in length. Sparsely setose. Carapace smooth in female (Fig. 1), rugose in males (Figs. 6, 52), length 1–1.25 × width; caput low to arched. Ocular area 0.40–0.65 × width carapace; AER straight to slightly recurved (Figs. 2A, D). Thoracic fovea recurved, in some specimens straight (Figs. 29, 52), 0.12–0.40 × width carapace. Chelicerae lacking rastellum, fangs quadrate, with keels (Fig. 43A), in most species obliquely oriented (Fig. 2C), pro and retromargins of fang furrow with teeth (Figs. 24E, 43B). Sternum length 1.0–1.50 × width, with 1 pair sigilla opposite coxae II–III (Fig. 5B). Cuspules (socketed, blunt macrosetae) present on labium and pedipalpal coxae at least of females (Figs. 2C, 43C, D); serrula absent (Fig. 43C). Leg formula 4123 or 1423; legs I and II of females with strong series of spines (Figs. 1, 57) on pro- and retrolateral margins of tibiae, metatarsi, and, in some species, tarsi, these spines in most species forming diagonal rows; legs III and IV with dense patterns of spinules and stout setae, especially dorsally and prolaterally on patellae and on metatarsus III (Figs. 25A–C, 44D); scopulae absent from females, present beneath at least some tarsi in males (Figs. 30B, 31F,

60A). STC with tooth or single row of teeth, ITC with or without teeth. Trichobothrial pattern: pedipalpal tarsus with a dorsal row of 4–6, row may divide proximally, tibiae with dorsobasal converging rows of 3–6, metatarsi with group of several near dorsoapex, posteriad of this point trichobothria form a single dorsal row that may extend to metatarsal base, tarsi with numerous trichobothria (10–25) on their dorsal surface (Fig. 27D); trichobothrial base distally embedded, with proximal hood, smooth or weakly corrugiform (Figs. 24C, 42D, 55C; Griswold 1987a, figs. 41–42). Tarsal organ in apical half of segment (Fig. 27D), oval to round, weakly domed, with concentric ridges (Figs. 24D, 42D, 55D; Griswold 1987a, figs. 43–44). Posterior lateral spinnerets 3–segmented, basal segment longest, median and distal approximately equal in length, distal segment domed, length less than 2/3 diameter, median segment with 12–40 spigots, apical with 30–50; anterior lateral spinnerets single segmented, separated at base by diameter, 0.5 × length PLS, with ventroapical group of 4–20 spigots (Figs. 3A–B); male with rectangular field of epiandrous spigots anterior of epigastric furrow, spigots evenly spaced, separated by approximately ½ their length. Spermathecae (Figs. 17A–C, 35A–E) paired, simple, unbranched, straight to distally curved, with pores throughout, unsclerotized or sclerotized. Male with or without clasping processes on legs, with (Fig. 30B) or without (Fig. 11D) megaspine at retroapex of metatarsus I, pedipalpus with bulb simple, piriform (Figs. 7A–C, 11A–C, 16A, 20A, B, 32A–D, 54A–C).

KEY TO WORLD GENERA AND MALAGASY SPECIES OF MIGIDAE

- | | |
|--|---------------------|
| 1 Females | 2 |
| – Males | 19 |
| 2(1) Tarsi I and II lacking spines (Figs. 13C, 15C, 16B, 18). | 3 |
| – Tarsi I and II with spines (Figs. 1, 14C) | 5 |
| 3(2) Patellae I, II, and IV with ventral setae normal, tapering from base to apex (Fig. 13C); fang with basal tooth (Fig. 59D). | 4 |
| – Patellae I, II, and IV with ventral patches of lamellate setae (Figs. 15C, 16B, 61D); fang without basal tooth | <i>Moggridgea</i> |
| 4(3) Dark dorsal and lateral maculations forming transverse bands or annuli on tibiae and metatarsi (Fig. 18); metatarsus IV preening comb absent. | <i>Poecilomigas</i> |
| – Tibiae and metatarsi lacking such dorsal and lateral | |

- maculations (Fig. 13C); metatarsus IV preening comb present in some species (Fig. 59C) *Migas*
- 5(2) Tibia III cylindrical, convex dorsally at base (Figs. 4, 8, 14D, 59A); caput setose, with rows or at least a few setae posteriad of the ocular area (Figs. 8, 12A) 6
 – Tibia III concave dorsally at base (Figs. 1, 25A–C); caput lacking setae except some species with pair of prefoveal setae (Figs. 2A, 23A, 50) 9
- 6(5) Patellae lacking ventral lamellate setae (Figs. 12C, D); fang unarmed (Figs. 5B, 12B) 7
 – Patellae with ventral lamellate setae (Fig. 14C); fang with basal tooth (Fig. 14B) *Goloboffia vellardi* (Zapfe)
- 7(6) Pedipalpal tibia cylindrical, tapering to apex, unmodified, without cluster of spines (Fig. 8); OAW less than $0.5 \times$ width of caput (Figs. 8, 12A) 8
 – Pedipalpal tibia swollen ventrally, with dorsoapical cluster of spines (Figs. 4, 5C); OAW greater than $0.5 \times$ width of caput (except *C. pihuychen*) (Fig. 4) *Calathotarsus*
- 8(7) Cuspules on pedipalpal coxae restricted to base near labium (Fig. 12B) *Mallecomigas schlingeri* Goloboff & Platnick
 – Cuspules on pedipalpal coxae extending for length of coxae (Fig. 9B) *Heteromigas*
- 9(5) Sternal sigilla deeply excised, lunate (Figs. 51B, 58B) 10
 – Sternal sigilla flat (Figs. 23B, 34B) 11
- 10(9) Fang unarmed (Fig. 58B); eyes reduced, PLE diameter less than $0.4 \times$ ALE (Fig. 57); total length greater than 30mm. *Thyropoeus mirandus* Pocock
 – Fang with basal tooth (Fig. 51B); eyes normal, PLE diameter greater than $0.5 \times$ ALE (Fig. 50); total length less than 20mm. *Thyropoeus malagasus* (Strand)
- 11(9) Leg coxae with only ordinary, slender setae (Fig. 34B); carapace lateral margin evenly rounded posteriorly (Fig. 33) 12
 – Leg coxae II and III with thorns (Figs. 23B, 25D); carapace lateral margin narrowed posteriorly (Fig. 22) *Micromesomma cowani* Pocock
- 12(11) Dorsally legs I and II with slender procumbant setae at apices of tibiae and bases of metatarsi (Figs. 27A–C, 41B) 13
 – Dorsally legs I and II with thorns at apices of tibiae and bases of metatarsi (Fig. 33) *Paramigas goodmani*, new species
- 13(12) Dense vestiture of long, curved, silky hairs beneath at least tibiae and metatarsi I and II (Figs. 33, 41B, 47C) 14
 – Long, curved, silky hairs sparse or absent from beneath tibiae and metatarsi I and II (Figs. 1, 28B) . . 15
- 14(13) Spermathecae elongate, length greater than $1.67 \times$ head diameter, head diameter less than $2.30 \times$ diameter stalk (Figs. 35A–C, 47 G–H) *Paramigas perroti* (Simon)
 – Spermathecae short, length less than $1.67 \times$ head diameter, head diameter greater than $2.14 \times$ diameter stalk (Figs. 40A, B, 41C, D) *Paramigas oracle*, new species
- 15(13) Tibia I with fewer than 30 ventrolateral spines (Fig. 46B); prefoveal setae small (Fig. 46A) to absent (Fig. 48); spermathecae short, length less than $1.20 \times$ head diameter, head diameter greater than $3.50 \times$ diameter stalk (Figs. 45A–C) 16
 – Legs I and II densely spinose, tibia I with more than 40 ventrolateral spines (Fig. 1); prefoveal setae large (Fig. 39A); spermathecae long, length greater than $1.63 \times$ head diameter, head diameter less than $1.81 \times$ diameter stalk (Figs. 35E, 39C) *Paramigas milloti*, new species
- 16(15) Carapace with conspicuous prefoveal setae (Figs. 44A, 46A) 17
 – Prefoveal setae minute to absent (Figs. 28A, 48). 18
- 17(16) Legs I and II dorsally with patches of procumbant setae at apices of tibiae and bases of metatarsi sparse (<10) (Fig. 44C) *Paramigas pauliani* (Dresco & Canard)
 – Legs I and II dorsally with patches of conspicuously serrate, procumbant setae at apices of tibiae and bases of metatarsi dense (>20) (Fig. 46B) *Paramigas pectinatus*, new species
- 18(16) Labium with fewer than 10 cuspules; dense network of reticulate striae on lateral margins of caput (Fig. 28A) and longitudinal banding patterns on legs (Fig. 28B) *Paramigas alluaudi* (Simon)
 – Labium with more than 15 cuspules (Fig. 49B); lateral margins of caput without striae and legs not longitudinally banded (Fig. 48) *Paramigas rothorum*, new species
- 19(1) Fang with basal tooth (Fig. 53B) 20
 – Fang lacking basal tooth (Figs. 30A, 37B) 24
- 20(19) Tibia I unmodified, cylindrical; sternal sigilla flat (Fig. 30A); pedipalpal tarsus with apical spinules (Figs. 20A–B, 37E–G) 21

- Tibia I swollen prolaterally (Figs. 52, 55A); sternal sigilla deeply incised (Fig. 53B); pedipalpal tarsus lacking apical spinules (Figs. 53E–G, 54B–C). *Thyropoeus malagasus* (Strand)
- 21(20) OAW $<0.41 \times$ carapace width; embolus longer than bulb (Fig. 20A) 22
 – OAW $>0.44 \times$ carapace width; embolus length equal to bulb (Legendre & Calderon Gonzalez 1984, fig. X, 8). *Goloboffia vellardi* (Zapfe)
- 22(21) Scopulae present beneath tarsi III and IV (Fig. 60A); femora with dorsal spines short or absent (Griswold 1987b, fig. 70) 23
 – Scopulae absent from tarsi III and IV (Fig. 60B); femora with dorsal spines long (Griswold 1987b, fig. 69). *Migas*
- 23(22) Dark dorsal and lateral maculations or annuli on tibiae and metatarsi; embolus straight (Figs. 20A–B). *Poecilomigas*
 – Tibiae and metatarsi lacking such dorsal and lateral maculations or annuli; embolus reflexed (Raven 1984 fig. 6). *Migas variapalpus* Raven
- 24(19) Femur I venter rounded (Figs. 7D, 30B); apical lobes of pedipalpal tibia subequal (Figs. 7B, 11C, 32C) 25
 – Femur I venter carinate (Fig. 60C); ectal apical lobe of pedipalpal tibia longer than mesal (Figs. 16A, 32D) *Moggridgea* (Africa)
- 25(24) Caput low, not highly arched, height less than $2.0 \times$ height at thoracic fovea; retroapex of tibia I with megaspine (Figs. 7D, 30B) 26
 – Caput highly arched, height greater than $2.3 \times$ height at thoracic fovea; retroapex of tibia I lacking megaspine (Fig. 11D). *Heteromigas*
- 26(25) Metatarsus I straight, cylindrical or slightly swollen retroapically (Figs. 29, 36) 27
 – Metatarsus I swollen for apical half (Figs. 6, 7D) *Calathotarsus*
- 27(26) Metatarsus I cylindrical, unmodified (Figs. 37C, 38C) 28
 – Metatarsus I pale and swollen retrolaterally (Figs. 29, 30B, 31D–E). *Paramigas andasibe* Raven, new species
- 28(27) Pedipalpal tarsus with apical spinules (Figs. 37E–G); embolus length less than or equal to bulb length (Figs. 38E–G) 29
 – Apex of pedipalpal tarsus lacking spinules; embolus length much longer than bulb (Fig. 16A) *Moggridgea* (Australia)
- 29(28) Tarsi III and IV cylindrical, with weak ventral scopulae (Fig. 36); tibia I with 3–4 retroventral spines (Fig. 37C) *Paramigas macrops*, new species
 – Tarsi III and IV swollen, curved, sausage shaped, with dense ventral scopulae (Fig. 38D); tibia I with only retroapical megaspine (Fig. 38C) *Paramigas manakambus*, new species

MIGID GENERA NOT FROM MADAGASCAR

Calathotarsus Simon, 1903

(Figs. 4, 5A–E, 6, 7A–F, 62A–B, 63A, 65, 66)

Calathotarsus (type species *C. coronatus* Simon, 1903) comprises three species from Argentina and Chile. The genus was described by Simon (1903), the Argentinean fauna was reviewed by Schiapelli and Gerschman (1973), the Chilean fauna was reviewed by Legendre and Calderón Gonzalez (1984), Goloboff and Platnick (1987) and Goloboff (1994), and new species were described by Schiapelli and Gerschman (1975) and Goloboff (1991). Possible synapomorphies for the genus are the modified female pedipalpal tarsus bearing a ventral expansion and dorsal group of cuspules (Figs. 5C) and bent male metatarsus I (Figs. 6, 7D) that is swollen for the apical half. The very wide ocular area (Fig. 4), mentioned as a synapomorphy by Goloboff (1991) may relate '*Migas vellardi* to *Calathotarsus*. *Calathotarsus* are medium sized (12–20 mm) with an arched caput (Fig. 5A) in the female, wide ocular area (except in *C. pihuychen* Goloboff) and with rows of setae on the caput. The thoracic fovea is simple or may have a weak posterior extension (Fig. 4). The cheliceral fang furrow has denticles between the tooth rows (Figs. 5D, 7E) and intercheliceral tumescence in the male, the cuspules of the pedipalpal coxae are clustered near the base (Fig. 5B), the sternal sigilla are flat, and there are no thorns on the leg coxae. Female tarsi I and II have spines, patellae III and IV and tibiae and metatarsi III are densely spinulose, tibiae III are cylindrical, metatarsi III and IV have broad retrolateral preening combs of long and short setae (Figs. 62A–B), and the ITC have one to a few teeth (Fig. 5E). The spermathecae are short, cylindrical and without easily distinguished head and stalk (Fig. 63A). Males have a megaspine on metatarsus I, the pedipalpal tibia lacks spinules, and there are scopulae beneath at least tibiae

III and IV. Biology has been reported by Schiapelli and Gerschman (1973, 1975) and Goloboff (1991). All *Calathotarsus* appear to be burrowers rather than nest builders. Goloboff reports that *Calathotarsus coronatus* and *C. pihuychen* make burrows closed with a thick and rigid trapdoor (Goloboff 1991 figs. 9–11) that has several small pits on the inner surface that presumably mark where the spider inserts its fangs to hold the door shut.

***Heteromigas* Hogg, 1902**

(Figs. 8, 9A–D, 10, 11A–F, 63B, 65, 66)

Heteromigas (type species *Heteromigas dovei* Hogg, 1902) comprises two species from eastern Australia. Hogg described *H. dovei* from Tasmania (Hogg 1902), Raven (1984) described *H. terraereginae* from Queensland and Raven and Churchill (1989) added notes on the morphology and biology of *H. dovei*. Possible synapomorphies for the genus are long pedipalpal tarsi of males (Fig. 10) and loss of the male retrolateral tibia I megaspine (Fig. 11D). *Heteromigas* are small to medium sized (8–18 mm) with an arched caput (Fig. 9A) in the female, moderately broad ocular area (ocular area width 0.38–0.44 × carapace width) (Fig. 8) and with rows of setae on the caput. The thoracic fovea has a posterior extension in most specimens. The cheliceral fang furrow has denticles between the tooth rows and the male lacks intercheliceral tumescence (Figs. 9C, 11E). The cuspules of the pedipalpal coxae extend to the apex, the sternal sigilla are flat, and thorns are absent from the leg coxae (Fig. 9B). Female tarsi I and II have spines, patellae III and IV and tibiae and metatarsi III are densely spinulose, tibiae III are cylindrical and preening combs are absent. Tarsal claws of the female have simple or divided teeth (Fig. 9D) and those of the male have multiple teeth (Fig. 11F). The spermathecae of *H. dovei* are long and have the head narrower than the stalk (Fig. 63B) whereas those of *H. terraereginae* are short and cylindrical. Male metatarsus I lacks a megaspine and the pedipalpal tibia lacks spinules, and there are scopulae beneath at least metatarsi III and IV. Biology has been reported by Raven (1984) and Raven and Churchill (1989). *Heteromigas terraereginae* lives in the ground in burrows that are fitted with circular trapdoors impregnated with soil. *Heteromigas dovei* also makes burrows in the soil that are up to 10 cm deep with a soil-impregnated lid.

***Mallecomigas* Goloboff & Platnick, 1987**

(Figs. 12A–F, 63C–D, 65, 66)

This monotypic genus (type species *Mallecomigas schlingeri* Goloboff & Platnick, 1987), known only

from Chile, was proposed by Goloboff and Platnick (1987) for a unique female specimen. A possible synapomorphy for *Mallecomigas* is spermathecae that are long and have the head narrower than the stalk (Figs. 63 C–D). *Mallecomigas* are large (22 mm) with an arched caput, narrow ocular area (width 0.43 × carapace width) (Fig. 12A) and with rows of setae on the caput. The thoracic fovea is simple with a faint, shallow posterior extension. The cheliceral fang furrow lacks denticles between the tooth rows (Fig. 12E), the cuspules of the pedipalpal coxae are clustered near the base, the sternal sigilla are flat, and thorns are absent from the leg coxae (Fig. 12B). Female tarsi I and II have spines (Fig. 12C), patellae III and IV and tibiae and metatarsi III are densely spinulose, tibiae III are cylindrical (Fig. 12D) and metatarsi III and IV have preening combs of setae that are uniformly long and separated at the base by distances greater than their diameter (Goloboff & Platnick 1987:9). The comb on metatarsus IV is inconspicuous, being formed of very thin setae. The spermathecae are characteristic: they are long and have the head narrower than the stalk (Figs. 63C–D). Tarsal claws have few teeth (Fig. 12F). The male is unknown and nothing has been published on the biology. The collector indicated that the specimen had been dug from a deep hole in the ground without a door (E. Schlinger, pers. commun.).

***Migas* L. Koch, 1873**

(Figs. 13A–E, 14A–F, 19C, 59A–C, 60B, 63E–F, 65, 66)

With 34 described species from Australia, New Caledonia, and New Zealand, *Migas* (type species *Migas paradoxus* L. Koch, 1873 from New Zealand) is the largest migid genus. It comprises a disparate assemblage of species united by the presence of a tooth near the base of the fang, preening combs in most species, and lacking the synapomorphy (tibial banding) of *Poecilomigas*. We do not know the genus in detail but our species examined do include the type species and comprise species from the full geographic range of the genus: *Migas affinis* Berland from New Caledonia, *M. distinctus* O. P. Cambridge, *M. gatenbyi* Wilton, *M. giveni* Wilton, *M. paradoxus* L. Koch, and *M. taierii* Todd from New Zealand, and *M. nitens* Hickman and *M. variapalpus* Raven from Australia. Most of our other data come from the literature. Our analysis suggests that the Chilean species *Migas vellardi* is misplaced in *Migas* and is more closely related to the other South American genera *Calathotarsus* and *Mallecomigas* (see *Goloboffia*). The composition and affinities of *Migas* constitute the greatest remaining problem in migid taxonomy. The species from Australia, New

Caledonia and New Zealand are similar in being small to medium sized (6–17mm) with a nearly flat caput no higher than the thoracic region (Fig. 13A), ocular area moderately wide (OAW 0.37–0.49 × carapace width) (Fig. 13B) and with well developed rows of setae on the caput leading to a pair of enlarged prefoveal setae. The thoracic fovea is simple. The cheliceral fang furrow lacks denticles between the tooth rows (Fig. 13D) and intercheliceral tumescence in the male may be present (some CASC and AMNH specimens determined as *M. variapalpis*, although these may be a distinct species [Goloboff 1991:71]) or absent (holotype of *M. variapalpis* [Raven in Goloboff 1991:71]), the cuspules of the pedipalpal coxae extend to the apex, the sternal sigilla are flat, and thorns are absent from the leg coxae. Female tarsi I and II lack spines (Fig. 13C), patellae III and IV and tibiae and metatarsi III are sparsely spinulose and tibia III is cylindrical (Fig. 59A). A dense vestiture of long, curled hairs beneath legs I and II may be present (e.g., *M. gatenbyi*) or absent (e.g., *M. giveni*), leg I and II dorsal procumbant setae are absent (*M. affinis* has retrodorsal patches of thorns at the bases of metatarsi I and II that resemble those of the Malagasy *Paramigas goodmani* but it lacks procumbant setae on the tibiae) and preening combs of widely spaced or mixed long and short setae are present in most species (Fig. 59C), though absent at least from *M. affinis* and *M. distinctus*. Tarsal claws of the female are simple or have a few teeth (Fig. 13E). Males typically lack scopulae from tarsi III and IV (Fig. 60B) but have a metatarsus I megaspine and spinules on the pedipalpal tarsus. The spermathecae of at least some New Zealand species are folded so that they appear mushroom-like (Fig. 19C): this morphology may prove to be a synapomorphy uniting at least some *Migas* species. Males have spinules at the apex of the pedipalpal tarsus.

The biology of several species of *Migas* has been reported. Species from New Zealand and Australia appear to make nests or burrows, and some species (e.g., *M. distinctus*) are reputed to make both (Wilton 1968:77). The biology of New Zealand species was summarized by Wilton (1968). He reports that *Migas* construct unbranched trap-door nests that comprise a “flattened silk tube with a hinged lid with exposed surfaces camouflaged and strengthened with material gathered from the surrounding terrain. Nests may be on the trunks of trees, in moss on banks, under stones, in crevices . . . or in burrows in sand or clay banks” (Wilton 1968:77, figs. 221, 412). Nests have one or in rare cases two doors. Todd (1945) studied the biology of *Migas*. Raven and Churchill (1989) report that

Migas nitens makes burrows directly in the soil with a thin door whereas *M. plomleyi* makes a camouflaged silken, sac-like nest.

***Moggridgea* O. P. Cambridge, 1875**

(Figs. 15A–F, 16A–B, 17A–C, 32D, 60C,
61A–D, 62C–D, 65, 66)

Moggridgea (type species *Moggridgea dyeri* O. P. Cambridge, 1875) comprises 33 species from Africa and some surrounding islands and from Australia. This genus was described in 1875 by Cambridge for *Moggridgea dyeri* from South Africa, placed in the Migeae by Simon (1892) and transferred from the Miginae to Paramiginae by Raven (1985). *Moggridgea* are recorded from mainland Africa by Benoit (1962), Cambridge (1875), Griswold (1987a), Hewitt (1913a, 1913b, 1913c, 1914, 1915a, 1916, 1919), Lawrence (1928), Purcell (1903), and Simon (1903), from the surrounding islands of Bioko (Griswold & Ubick 1999), the Comoros (Griswold 1987a), Príncipe (Simon 1907), and Socotra (Griswold 1987a). Griswold (1987a) monographed the African species and Main (1991) described two new species from Australia. Our analysis suggests that *Moggridgea* should be returned to the Miginae (sensu Simon 1903) (placement supported by a low caput and loss of spines from female leg tarsi) and that the dorsobasal depression on female tibia III, considered by Raven (1985) to be a synapomorphy of the Paramiginae, has arisen in parallel in *Moggridgea*. Possible synapomorphies for the genus are the lamellate setae beneath at least patellae I, II and IV (with homoplasy in *Goloboffia vellardi*), a dorsobasal depression on female tibia III (with homoplasy in the Malagasy migids), and a median sclerotized band across the spermathecae. Thorns on the leg coxae were postulated to be a synapomorphy uniting *Moggridgea* and *Micromesomma* (Griswold 1987a:109); our new analysis suggests that these have evolved in parallel. *Moggridgea* are small to large (5–25mm) with a low caput (Fig. 15A), moderately broad ocular area (OAW 0.42–0.86 × caput width) (Fig. 15B) and with at least a few setae on the caput. Prefoveal setae may be absent, small, or enlarged. The thoracic fovea is simple or may have a weak posterior extension. The cheliceral fang furrow lacks denticles between the tooth rows (Fig. 15E) and intercheliceral tumescence in the male may be present (*M. tingle*) or absent (most African species). The cuspules of the pedipalpal coxae extend to the apex, the sternal sigilla are flat, and thorns on the leg coxae may be present or absent. Female tarsi I and II lack spines (Fig. 15C), patellae III and IV and tibiae

and metatarsi III are densely spinulose, tibiae III have a weak (most species) to moderate (*M. breyeri* Hewitt) dorsobasal depression (Figs. 15 D, 61 A–B) and metatarsus IV has a preening comb (Figs. 62C–D) of a few, closely spaced setae, in most species on a common base (some lack this comb, e.g., *M. anactenidia* Griswold). Peculiar, lamellate setae are present beneath at least patellae I, II and IV, occurring in both sexes of most species (Figs. 16B, 61D). Tarsal claws may have simple (Fig. 15F) or multidentate (Griswold 1987a fig. 37) teeth. The spermathecae are short to long, cylindrical to sinuate, with the head slightly wider than the stalk (*M. ampullata* has the head narrower than the stalk: Griswold 1987a fig. 80) and have a median transverse sclerotized band (Figs. 17A–C). Males lack tibia I megaspines (Fig. 16B) and spinules on the pedipalpal tarsus (Fig. 16A), most species have scopulae beneath metatarsi III and IV and at least most of the African species have male femur I carinate ventrally (Fig. 60C) and the apical lobes of the pedipalpal tarsus unequal (Figs. 16A, 32D). The biology of African species was summarized by Griswold (1987a) and that of Australian species by Main (1991). The majority of African species for which biology is known make a bag or sac-like nest, oval to pear shaped, constructed of silk mixed with bits of the surrounding substrate, provided with a single wafer or cork trap door, and placed in a niche or crevice in the substrate (Griswold 1987a, figs. 2–3). Most nest building species have been taken from the trunks of trees though some build their nests on rock faces or stone walls. The Australian *M. tingle* constructs similar nests (Main 1991, fig. 1). Some species make a true silk-lined tubular burrow, excavated in the substrate and usually terrestrial. At least the African *M. mordax*, *M. peringueyi*, *M. terrestris* and *M. terricola* and the Australian *M. australis* are burrowing species.

***Poecilomigas* Simon, 1903**

(Figs. 18, 19A–B, 20A–C, 59D, 60A, 65, 66)

This genus (types species *Poecilomigas pulchripes* Simon 1903) comprises three species from southern and eastern Africa. The genus was proposed by Simon (1903), revised by Griswold (1987b), and Griswold (1998b) provided additional data on behavior and taxonomy. Possible synapomorphies for the genus are annulate tibiae (Fig. 18) and, implied by our analysis, the loss of preening combs from metatarsus IV. *Poecilomigas* are small to large sized (females 6.0–26.0 mm) with a low, nearly flat caput, moderately wide ocular area (OAW 0.5–0.65 width caput) and

with rows of setae on the caput and enlarged prefoveal setae (Fig. 18). The thoracic fovea is simple. The cheliceral fang furrow lacks denticles between the tooth rows (Fig. 20C) and intercheliceral tumescence occurs in the male, the cuspules of the pedipalpal coxae extend to or near to the apex, the sternal sigilla are flat, and thorns are absent from the leg coxae. Females are with or without dense, long silky hairs beneath legs I and II, tarsi I and II lack spines (Fig. 18), patellae III and IV and tibiae and metatarsi III are weakly spinulose, and preening combs are absent. The spermathecae are short to long, cylindrical, uniformly sclerotized and have a well-defined head and stalk (Figs. 19A–B). Males are with or without a retroapical megaspine on tibia I, have spinules at the apex of the pedipalpal tarsus (Figs. 20A, B), and have scopulae beneath tarsi III and IV (Fig. 60A). Biology has been reported by Cambridge (1889), Pocock (1895), Hewitt (1915b), Griswold (1987b) and Griswold (1998b). Both *P. abrahami* and *P. basilleupi* appear to build nests, usually on the trunks of trees. Although Cambridge, Pocock, and Hewitt report *P. abrahami* making nests with one or two doors, Griswold found only 2-door nests for this species and it is likely that the 1-door nests were made by other sympatric migids. The nests of *P. abrahami* are vertical, situated in a crevice and woven of silk and bits of the substrate, and are provided with a wafer type door at the upper and lower end (Griswold 1987b, figs. 16, 17). *Poecilomigas basilleupi* makes a similar nest with a single door at the upper end (Griswold 1998b, figs. 2–3).

***Goloboffia*, new genus**

(Figs. 14A–F, 63E–F)

Type species.—*Migas vellardi* Zapfe 1961, male holotype from La Herradura, Coquimbo Province, Chile, deposited in Museo Nacional de Historia Natural, Universidad de Chile, Santiago, examined.

Etymology.—Named in honor of Pablo Goloboff, student of phylogenetic systematics and collector of many new and interesting South American mygalomorphs. Gender feminine.

Diagnosis.—Distinguished from migids other than *Calathotarsus* by having a very wide ocular area (OAW >0.6 × carapace width) and from migids other than *Moggridgea* by having ventral lamellate setae on the patellae. *Goloboffia* is distinguished from *Calathotarsus* by lacking a ventral expansion and dorsal group of cuspules on the female pedipalpal tarsus and bent male metatarsus I and from *Moggridgea* by lacking a dorsal excavation on female tibia III and having tarsal spines and spinules on the tibia of the male pedipalpus.

Note.—We transfer *Migas vellardi* because it does not belong in *Migas*. It shares with the other South American genera *Calathotarsus* and *Mallecomigas* the synapomorphies of pedipalpal coxa cuspule distribution that is concentrated at the proximal edge near the labium, slender spinules densely situated on patella-tibia III of females, and preening combs that consist of many setae that extend part way around the ventral apex of the segment and that occur on both metatarsi III and IV. We place *Migas vellardi* in the new genus *Goloboffia* because it differs from both *Calathotarsus* and *Mallecomigas* in several features both diagnostic and synapomorphic for these genera. Synapomorphies for *Goloboffia* are the low caput, basal tooth on the fang, ventral lamellate setae on the patellae, apical spinules on the male pedipalpal tibia and loss of the male metatarsus I megaspine.

Description.—The male was described by Zapfe (1961: 153) and redescribed by Calderon and Calderon Gonzalez (1983) and Legendre and Calderon Gonzalez (1984) and the female was described by Goloboff and Platnick (1987). Small (6–8mm); caput raised above thoracic region (though not highly arched), the ocular area very wide (OAW >0.6 × carapace width); with few setae on the caput and small prefoveal setae (Fig. 14A); thoracic fovea simple, nearly straight; chelicerae with anteromedian brush of stout setae (like *Calathotarsus*), fang with basal tooth and fang furrow with few (female) or many (male) denticles between tooth rows (Fig. 14E); male with intercheliceral tumescence; cuspules of pedipalpal coxae restricted to base (Fig. 14B); sternal sigilla flat; female tarsi I and II with spines (Fig. 14C), patellae I, II and IV with ventral lamellate setae (Fig. 14C), patellae III and IV and tibiae and metatarsi III densely spinulose (Fig. 14D); metatarsi III and IV with broad preening combs; female tarsal claws slender with short teeth (Fig. 14F); spermathecae short and cylindrical (Figs. 63E–F); male lacks tibia I megaspine; pedipalpal tarsus with apical spinules; scopulae beneath male metatarsi III and IV.

Natural History.—Goloboff (1991) reports that *Migas vellardi* is terrestrial and makes burrows closed with a thin and rigid trapdoor lacking beveled edges (Goloboff 1991, figs. 12–13). The door fits over the burrow entrance and has two mesal holding marks on the inner surface that presumably mark where the spider inserts its fangs to hold the door shut.

Composition.—One species.

Distribution.—Northern Chile (Fig. 66).

MIGIDAE OF MADAGASCAR

Paramiginae Petrunkevitch 1939

Myrtaleae Simon 1892: 84 (unavailable through homonymy of type genus)

Paramiginae Petrunkevitch 1939: 154 (nomen novum).
Roewer 1942: 192. Bonnet 1958: 3329. Raven 1985: 144.

Diagnosis.—Migids with reduced caput setation, with prefoveal setae only or lacking setae altogether posteriad of ocular area (Figs. 1, 2A, 33, 50), femur III with a ventral membrane that extends at least 4/5 the length of the femur (Fig. 42C), and tibia III with a deep dorsobasal excavation (Figs. 25A, C, 42A–B) and anterior diagonal ridge (Fig. 25A, 42A), and most species with an angular and strongly tripartite thoracic fovea (Figs. 2A, 22, 46A).

Genus *Micromesomma* Pocock 1895

Micromesomma Pocock 1895:190 (type species, by monotypy, *Micromesomma cowani* Pocock 1895). Roewer 1942: 192. Bonnet 1957:2886. Dresco & Canard 1975:783–788. Raven 1985:145. Griswold 1987a:109–117. Platnick 1989: 71. Dippenaar-Schoeman & Jocqué 1997:77. Platnick 2001.

Diagnosis.—Distinguished from all other migid genera, except some *Moggridgea*, by having thorns on the ventral surfaces of coxae II and III (Figs. 23B, 25D), and from *Moggridgea* by having tarsal spines in the female (Fig. 22), a group of dorsal thorns at the apices of tibiae I and II (Figs. 24A–B), and lacking lamellate setae beneath the patellae.

Note.—A possible synapomorphy for the genus is the thorns on leg coxae.

Description.—Small to large, 6.0–22.0 in length. Sparsely setose. Carapace smooth, length 1.14–1.21 × width, posteriorly narrowed (Fig. 22); caput with median ocular seta, prefoveal setae present. Ocular area 0.43–0.52 × width caput; AER straight to slightly recurved, ALE equal to or smaller than AME; PER slightly recurved, PLE equal to or smaller than PME; ocular quadrangle narrowed anteriorly. Thoracic fovea tripartite, recurved, width 0.19–0.30 × width carapace. Sternum length 1.30–1.53 × width, margin sinuate; setose along margin, sparsely setose on surface; sigilla oval to irregular, shallowly excavated, length 2.25–3.0 × sternum width (Fig. 23B). Thorns present at least on coxae II and III. Leg formula 4123; tibiae, metatarsi, and tarsi I and II ventrally with sparse distribution of short setae; femur III with ventral membrane extending to base, tibia III with deep dorsobasal excavation and anterior ridge (Figs. 25A–B). Spermathecae with broad head and narrow stalk (Figs. 23D–E, 26A–C). Male unknown.

Natural History.—Unknown.

Composition.—One species.

Distribution.—Central Madagascar.

***Micromesomma cowani* Pocock 1895**

(Figs. 22, 23A–E, 24A–E, 25A–B, D, 26A–C, 65, 68)

Micromesomma cowani Pocock, 1895:190–191 (two specimens from Central Madagascar, purchased of Rev. Deans Cowans, lectotype female, here designated in order to ensure the name's proper and consistent application, and paralectotype female, BMNH 82.26, in BMNH, examined). Roewer 1942:192. Bonnet 1957:2886. Dresco & Canard 1975: 783–788. Raven 1985:145. Griswold 1987a:109–117. Platnick 1989:71. Platnick 2001.

Note.—The types are from “Central Madagascar” (Pocock 1895: 191). There are no precise locality data with any specimen, so the distribution within Madagascar remains a mystery.

Diagnosis.—Same as for genus.

Description.—Female (lectotype): Total length 19.1. Carapace dark yellow-brown; caput and ocular area light yellow-brown with dark striae extending along lateral margins and from PME to thoracic fovea, black surrounding each AME and extending between each ALE and posterior eyes; chelicerae dark yellow-brown, coxae and trochanters yellow-brown, sternum light yellow-brown except darker at margin, pedipalpal coxae yellow-brown shading to pale yellow along anterior margin; legs and pedipalpi dorsally dark yellow-brown, light yellow-brown ventrally on patellae and tibiae; abdomen faded to yellow-white. Carapace 6.0 long, 5.1 wide, height at thoracic fovea $0.29 \times$ carapace width; smooth. Caput inclined (Fig. 23A); height $1.33 \times$ that at thoracic fovea, $0.74 \times$ carapace width; median ocular setae situated behind and between AME, two pairs of setae positioned anterior to this; clypeus $0.55 \times$ length OAL, margin procurved. Thoracic fovea recurved and tripartite, width $0.19 \times$ that of carapace, $1.33 \times$ wider than long, with pair of prefoveal setae. Ocular area width $0.52 \times$ caput, $2.22 \times$ wider than long; AER 2.0 wide, $1.14 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.0: 2.13: 1.4: 1.2, diameter AME 0.27; AME separated by $0.45 \times$ their diameter, PME by $5 \times$ their diameter. Ocular quadrangle $1.43 \times$ wider than long, posterior width $1.64 \times$ anterior. Sternum 4.1 long, 3.1 wide, widest behind coxa II and narrowed anteriorly, setose laterally and sparsely setose on surface; single thorn situated posterior to labial suture; coxae I with 3–5, II with 17–20, and III with 35–37 thorns; sigilla 2.2 long, 1.0 wide, shallow, irregularly shaped, adjacent to coxa II, width $0.31 \times$ width sternum, distance between $0.5 \times$ distance from margin. Labial sigilla distinct, swollen; labium with 27 and pedipalpal coxae

with 34–36 cuspules; labium 0.85 long, 1.15 wide, pedipalpal coxae 1.95 long, 1.1 wide, apex produced to a sharp point. Chelicerae 2.1 long, promargin of fang furrow with 3 teeth, retromargin with 1 large basal tooth, pro- and retromargin interspersed with 7 denticles, with pale swelling at base of tooth rows. Femur I 0.84, tibia I 0.49, femur IV 0.83, and tibia IV $0.52 \times$ carapace width. Spination: pedipalpus: tibia v1-0-0, tarsus p 1-1-1-1, r 0-1-1-0; leg I: tibia p 2-4-2-4, r 3-4-3-3-3, d 14 thorns at apex of tibia, metatarsus p 5-4-1a, r 4-4-3-1a, tarsus p 1-1-1, r 1-1-1; leg II: tibia p 2-1-3-1-3, r 1-2-2-1-2, d 27 thorns at apex of tibia, metatarsus p 3-3-2-1a, r 0-2-2-2, tarsus p 1-1-1-1, r 1-0-0; leg III: patella with approximately 60, tibia with approximately 110, metatarsus with approximately 130, and tarsus with approximately 70 spinules; leg IV: patella with approximately 70 spinules and tibia with approximately 80 stout setae, metatarsus p 0-0-1-1a. Femur II with proximal ventral rows of 10–15 stout setae. STC teeth (pro-retro): I, II, III (2-2), IV (1-1); ITC simple, pedipalp claw with 1 tooth (Fig. 23F). Leg measurements (Femur + Patella + Tibia + Metatarsus + Tarsus = [Total]): I: $4.3 + 2.3 + 2.5 + 2.1 + 1.1 = [12.25]$; II: $3.75 + 2.25 + 2.2 + 1.8 + 1.5 = [11.25]$; III: $3.05 + 1.9 + 2.15 + 1.9 + 1.5 = [10.5]$; IV: $4.25 + 2.45 + 2.7 + 2.15 + 2.15 = [13.7]$; pedipalpus: $2.9 + 1.25 + 1.4 + (\text{absent}) + 1.25 = [6.25]$. Abdomen 11.0 long, 7.0 wide, sparsely covered with short setae. Spermathecae not removed from type specimens, but glandular covering visible through cuticle suggests they are like those described from other specimens below (Figs. 23D–E, 26A–C).

Variation (N = 4).—Total length 16.5–19.4; height at fovea $0.2–0.29 \times$ carapace width. Caput width $0.73–0.78 \times$ carapace width, height $1.33–2.08 \times$ height at thoracic fovea; width ocular area $0.43–0.52 \times$ caput width, PLE $0.4–0.75 \times$ PME; clypeus length $0.33–0.55 \times$ OAL; thoracic fovea width $1.33–2.12 \times$ length. Cheliceral fang furrow interspersed with 4–8 denticles (Figs. 23C, 24E). Sternum with or without cuspules, sigilla oval to irregularly shaped; labium with 19–39, pedipalpal coxae with 40–45 cuspules; coxa I with 0–6, coxa II with 24–37, and coxa III with 35–45 thorns. Tibia I (Fig. 24A) with 11–19, metatarsus I with 7–14 retroventral, tibia II with 6–15 proventral spines. STC with 1–2 teeth. Spermathecae (N=6 specimens) length $0.55–0.84 \times$ distance between them and $1.12–1.35 \times$ head diameter, diameter head $3.12–4.0 \times$ diameter stalk, head length $2.14–4.0 \times$ length stalk (Figs. 23D–E, 26A–C).

Material Examined.—MADAGASCAR: (no other locality) 1954 A. Verdier (3 females, MRAC 147.158); Le Barbier No. 29–1920, “Fage det. Revu par Dresco

en 1974" (19 females, MNHN AR4136, 1 female, CASC); Central Madagascar, Rev. Deans Cowans (lectotype and paralectotype females, BMNH).

Genus *Paramigas* Pocock 1895

Paramigas Pocock 1895:188 (type species, by monotypy, *Paramigas subrufus* Pocock 1895 [= *Myrtale perroti* Simon 1895]). Simon 1892:32. Roewer 1942:193. Dresco & Canard 1975:783–788. Raven 1985:144. Platnick 1989:73. Dippenaar-Schoeman & Jocqué 1997:77. Platnick 2001. *Legendrella* Dresco & Canard 1975:786 (type species, by monotypy, *Legendrella pauliani* Dresco & Canard, 1975). Brignoli 1983:119. First synonymized by Raven 1985:144.

Diagnosis.—Distinguished from all other migid genera by the presence of retrodorsal procumbant setae or thorns at the apices of tibiae and bases of metatarsi I and II (Figs. 27A–C, 46B), from *Moggridgea* also by having spines on female tarsi I and II (Figs. 1, 28B), and from all other genera except some *Moggridgea* and the Malagasy *Micromesomma* and *Thyropoeus* by having tibia III with a deep dorsal basal concavity (Figs. 36, 42A–B). Males have spinules at the apex of the pedipalpal tarsus (Figs. 30E, 32C, 37F), a retroapical megaspine on tibia I (Figs. 30B, 37C), and a tripartite thoracic fovea (Figs. 29, 36, 38A).

Note.—Possible synapomorphies for the genus are procumbant and stout dorsal setae at the base of metatarsi I and II and apical spinules on the male pedipalpal tarsus.

Description.—Small to large sized mygalomorphs, 6–22 mm in length. Carapace smooth in female, rugose in male, length 1–1.3 × width in female, 0.98–1.02 × width in male, posteriorly narrowed in female, rounded in male; caput with median ocular seta, prefoveal setae present (Fig. 1) or absent (Fig. 48). Ocular area 0.41–0.55 × width caput; AER straight to slightly recurved, ALE equal to or smaller than AME; PER straight to slightly recurved, PLE equal to or smaller than PME; ocular quadrangle narrowed anteriorly. Thoracic fovea recurved, tripartite, 0.11–0.25 × width carapace. Fang furrow of females with pale swelling at base of tooth rows (Fig. 43B). Sternum length 1.10–1.53 × width, margin sinuate; setose along margin, sparsely setose on surface; sigilla oval to irregularly shaped, shallow, length 0.21–0.42 × sternum width. Labial suture distinct; cuspules present on labium and pedipalpal coxae of female, absent from male (Fig. 30A); thorns absent from coxae. Leg formula 4123 (female) or 1423 (male); coxae, legs and pedipalpi setose; legs I and II with strong series of spines on pro- and retrolateral margins (Figs. 1, 27A); retrodorsal procumbant setae or thorns at the apices of

tibiae and bases of metatarsi I and II (Figs. 27A–C); tibiae, metatarsi, and tarsi I and II ventrally with sparse (Figs. 44C, 48) or dense (Figs. 27A, 33, 47C) distribution of long filiform setae; legs III and IV with dense patterns of spinules and stout setae pro- and retrodorsally gradually changing to slender setae distally in female, spination weak in male; femur III with ventral membrane extending to base (Fig. 42C), tibia III with deep dorsobasal excavation and anterior ridge; scopulae absent from female, present in male. Male with retrolateral tibia I megaspine, spinules at apex of pedipalpal tarsus, bulb uniform, embolus simple and slender, embolus short, 0.25–0.55 × bulb length. Spermathecae (Figs. 35A–E, 40A–D, 45A–C) paired, simple, unbranched, straight to distally curved, length 0.67–1.2 × distance between bases, with pores throughout, unsclerotized, with distinct head and stalk, head 1.8–7.5 × stalk width.

Natural History.—The biology of only a few species is known. All *Paramigas* adults for which collection data are available have been arboreal but some adult females have been taken from pitfall traps and some juveniles have also been sifted from leaf litter. Pocock (1895:190, figs. 1a, 1b) described two trap door nests received with the specimens of *Paramigas subrufus*. These are oval with a single wafer type door, woven of silk, and covered on three sides and the door with moss, lichen and pieces of bark (Figs. 21A–B). Several nests of *P. oracle* were collected from depressions on tree trunks and vines at Ranomafana. These nests are oval with length 2 × the spider's total length, with a single wafer type door at the upper end. The exposed surfaces are covered with moss, lichen and pieces of bark, effecting a superb camouflage. All nests are made of fragments of bark and lichen woven together with silk (Figs. 21C–D; Pocock 1895, figs. 1a, 1b).

Composition.—Eleven species.

Distribution.—Probably all of Madagascar (Fig. 68).

Paramigas alluaudi (Simon)

(Figs. 28A–E, 45C, 65, 68)

Myrtale alluaudi Simon 1903: 133 (type female, Madagascar, Fort Dauphin, MNHN, examined).

Paramigas alluaudi, Roewer 1942: 193. Bonnet 1958: 3329. Platnick 2001.

Diagnosis.—Females are distinguished from other *Paramigas* that lack a dense vestiture of long silky hairs beneath legs I and II by the dense lateral network of striae on the caput (Fig. 28A), longitudinal banding pattern on legs (Fig. 28B), and the thinly distributed

cuspsules on the pedipalpal coxae (<20) and labium (<8); male unknown.

Description.—Female (holotype): Total length 12.7. Carapace, chelicerae, and legs light brown, venter, coxae, and trochanters yellow-brown, lateral margins of caput yellow-brown with light brown band extending from PME to thoracic fovea; dense lateral network of light brown striae on caput and extending from behind ocular area to thoracic fovea, also radiating from thoracic fovea to carapace margin (Fig. 28A); carapace with dark rebordered margin; ocular area light brown, black surrounding AME, behind ALE and between PLE and PME; clypeus dark; femora, patellae and tibiae with narrow dorsal and broad pro-and retrolateral maculate bands, these united at base of patellae and bases and apices of femora and tibia, area between bands may have reticulate markings, tarsi yellow-white, unmarked; abdomen dark purple-brown including basal segment of spinnerets, distally segments yellow-brown.

Carapace 2.9 long, 2.55 wide, height at thoracic fovea $0.39 \times$ carapace width; smooth. Caput inclined, height $1.4 \times$ that at thoracic fovea, width $0.76 \times$ carapace width; median ocular seta present with a pair of setae anterior to this, prefoveal setae minute, visible at greater than 80x magnification; clypeus height 0.4 times length OAL, margin straight. Thoracic fovea recurved, tripartite with weak posterior depression, width $0.23 \times$ that of carapace, $6.0 \times$ wider than long.

Ocular area width $0.41 \times$ caput, $2.13 \times$ wider than long; AER 0.8 wide, $1.0 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 0.53: 1.0: 0.60: 0.80, diameter AME 0.1; AME separated by $1.25 \times$ their diameter, PME by $3.25 \times$ their diameter. Ocular quadrangle $0.40 \times$ wider than long, posterior width $1.53 \times$ anterior.

Sternum 2.35 long, 1.67 wide, widest behind coxa II and narrowed anteriorly, sparsely setose; sigilla irregularly oval, adjacent to coxae II and III, width $0.25 \times$ width sternum, distance between $0.71 \times$ distance from margin. Labium with 6 and pedipalpal coxae with 16–18 cuspsules; labium 0.5 long, 0.6 wide, pedipalpal coxae 0.72 long, 0.55 wide, apex produced to a blunt point. Chelicerae 0.45 long, fangs broad, flaring pro-laterally before apex, promargin of fang furrow with 3 teeth, retromargin with 4 teeth (Fig. 28D).

Femur I (Fig. 28B) 0.80, tibia I 0.44, femur IV 0.76, and tibia IV $0.41 \times$ width carapace. Spination: pedipalpus: tibia p1-0-0, tarsus p 1-1-1, r 1-0-0; leg I: tibia p 1-1-1-1-1, r 1-1-1-0, metatarsus p 1-3-2, r 1-3-2; tarsus p 1-1, r 1-1; leg II: tibia p 1-0-2, r 0-1-1-1, metatarsus p 3-1-1, r 1-0-2, tarsus p 0-2, r 1-0; leg III: patella with approximately 16, tibia with approximate-

ly 20 spinules, metatarsus: v0-0-1a, tarsus with 4–5 proapical spinules; leg IV: patella with approximately 50 slender spinules, metatarsus v 0-0-1a. Femur II with proximal ventral row of 5–6 stout setae, retrodorsum of tibiae I and II with 7–8 apical, metatarsi I and II with 3–6 basal stout procumbant setae. STC teeth (pro-retro): I, II (2-2), III, IV (1-1); ITC simple, pedipalpal claw with 1 tooth (Fig. 28E). Leg measurements (Femur + Patella + Tibia + Metatarsus + Tarsus = [Total]): I: $2.05 + 1.17 + 1.12 + 0.87 + 0.70 = [5.91]$; II: $1.82 + 1.05 + 0.87 + 0.75 + 0.72 = [5.21]$; III: $1.5 + 0.9 + 0.8 + 0.77 + 0.75 = [4.72]$; IV: $1.95 + 1.12 + 1.05 + 0.87 + 0.87 = [5.86]$; pedipalpus: $1.25 + 0.67 + 0.72 + (\text{absent}) + 0.47 = [3.11]$.

Abdomen 3.0 long, 2.25 wide, sparsely covered with short setae. Spermathecae with broad head and short, narrow stalk, length spermathecae equal to distance between and to their head diameter, diameter head $3.7 \times$ diameter stalk, head length $3.6 \times$ length stalk (Figs. 28C, 45C).

Material Examined.—MADAGASCAR: Toliara: Fort Dauphin, 8 November 1901, Ch. Alluaud (*Myrtale alluaudi* female, type, MNHN 26248, AR4123).

Distribution.—Known only from the type locality at the southern tip of Madagascar (Fig. 68).

Paramigas andasibe Raven, new species
(Figs. 29, 30A–G, 31A–H, 32A–C, 65, 68)

Types.—Holotype male from An' Ala, 9 km E Andasibe, 840 m, 15 February 1995, primary rainforest, F. Glaw, deposited in ZFMK.

Note.—Robert Raven provided us with the specimen and descriptive notes. We attribute authorship of the new species to him.

Etymology.—The specific name is a noun in apposition from the type locality.

Diagnosis.—Distinguished from other *Paramigas* males by having pallid, swollen, weakly sclerotized areas on the retrolateral surface of metatarsus I (Figs. 30B, 31D–E) and AME smaller than ALE (Fig. 29).

Description.—Male (holotype): Total length 17.1. Carapace dark red-brown with a dark brown band marginal surrounding; caput with light red-brown areas along lateral margin; ocular area dark red-brown, black behind ALE and between PME and PLE; chelicerae dark red-brown; sternum, coxae, and trochanters orange-brown except sterno-labial junction red-brown; dorsal surface of legs I–IV red-brown gradually fading to yellow-brown on tips of tarsi and on ventral surfaces, femora with dorsal and retrodorsal longitudinal dusky bands; pro-lateral surface of metatarsus I fading from red-brown to yellow-brown, retrolateral surface

yellow-white, bulging, tarsi I and II yellow-brown; pedipalpi yellow-brown; abdomen dark purple-brown; spinnerets and book lung covers yellow-brown.

Carapace 8.0 long, 7.9 wide, height at thoracic fovea $0.24 \times$ carapace width; strongly rugose. Caput low, height $1.15 \times$ that at thoracic fovea, width $0.51 \times$ carapace width; with minute pair of prefoveal setae; median ocular seta present; pair of setae situated anteriorly of this; clypeus height $0.34 \times$ length OAL, transversely striate, margin straight. Thoracic fovea tripartite (Fig. 29), weakly recurved, width $0.15 \times$ that of carapace, $1.71 \times$ wider than long.

Ocular area width $0.59 \times$ caput, $2.13 \times$ wider than long; AER 2.45 wide, $1.08 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.0: 1.3: 0.6: 0.5, diameter AME 0.5; AME separated by $0.2 \times$ their diameter, PME by $3.33 \times$ their diameter. Ocular quadrangle $1.39 \times$ wider than long, posterior width $1.6 \times$ anterior.

Sternum 6.4 long, 4.2 wide, widest behind coxa II and narrowed anteriorly, sparsely setose laterally and on surface; sigilla irregularly shaped, adjacent to coxae II, $0.33 \times$ width sternum, distance between $0.1 \times$ distance from margin. Labium and pedipalpal coxae lacking cuspules; labium 1.5 long, 1.4 wide, pedipalpal coxae 3.3 long, 1.6 wide, apex produced to a blunt point. Chelicerae 1.6 long, promargin of fang furrow with 4–5 teeth and retromargin with 1 basal tooth and 4–5 distal denticles (Fig. 31G).

Femur I 1.15, tibia I 0.83, femur IV 1.08, and tibia IV $0.89 \times$ width carapace. Scopulae beneath distal $\frac{1}{2}$ of tarsus I and beneath entire tarsi II–IV (Figs. 31E, F). Spination: leg I: patella p 0-2-2, v 0-0-4, tibia p 1-0-0-0, r 2-3-1-1a, metatarsus p 2-2-0-1, r 1-0-1-1, tarsus p 1-1-1, r 1-1-1; leg II: patella r 0-0-1, tibia p 0-0-1-1, r 2-3-0-2, tibia p 2-2-2-1, r 2-0-0-2, tarsus p 1-1-1-1, r 1-1-0-0; leg III: patellae with approximately 41 prodorsal and 18 retrodorsal spinules, tibia with approximately 50 apical spinules, metatarsus v 0-0-0-4; leg IV: patella with approximately 150 prodorsal spinules, metatarsus v 0-0-2-3. STC teeth (pro, retro): I, II (1-2), III, IV (1-1) (Fig. 31H). Leg measurements (Femur + Patella + Tibia + Metatarsus + Tarsus = [Total]): I: $9.1 + 4.5 + 6.6 + 6.1 + 2.0 = [28.3]$; II: $8.0 + 4.0 + 5.6 + 5.3 + 2.2 = [25.1]$; III: $6.1 + 3.2 + 4.2 + 4.1 + 2.7 = [20.3]$; IV: $8.6 + 3.9 + 7.1 + 5.8 + 3.5 = [28.9]$; pedipalpus: $4.9 + 2.2 + 3.7 + (\text{absent}) + 1.5 = [12.3]$.

Pedipalpus (Figs. 31A–C) with femur 0.62, tibia $0.46 \times$ carapace width; femur 3.26, tibia $2.46 \times$ length tarsus; tibia widest basally, height $0.48 \times$ length; tarsus with approximately 10 slender apical spinules; bulb width $1.06 \times$ tarsus length; embolus length $0.34 \times$ bulb width. Abdomen 7.5 long, 5.3 wide, sparsely covered

with short setae.

Variation (N=4).—Total length 8.15–17.1. The size difference between the largest and smallest specimens is dramatic but specimens of intermediate size exhibit intermediate development of most distinctive characters. Prosoma yellow-brown to dark red-brown, legs orange-brown to dark red-brown. Caput 0.52 – $0.6 \times$ carapace width, height 1.28 – $1.6 \times$ that at fovea; thoracic fovea width 0.28 – $0.29 \times$ caput width, straight to slightly recurved; fang furrow with or without denticles (Figs. 30C, 31G). Spines of leg I small and inconspicuous in smallest individual (Fig. 30B) to stout in largest (Figs. 31D0150E). STC II with 2–3 teeth (Fig. 30G). Femur I 0.48 – $1.15 \times$ carapace width; pedipalpal femur 0.55 – $0.62 \times$, tibia 0.35 – $0.47 \times$ carapace width; embolus length 0.25 – $0.37 \times$ bulb (Figs. 30D–F, 31A–C, 32A–C).

Natural History.—The Ambohitantely specimen was collected in pitfall traps at 1450m in disturbed transitional montane mossy forest; other specimens are recorded from forest.

Additional Material Examined.—MADAGASCAR: Toamasina: Manakambahiny near Vavatenne, forêt, February 1995, A. Pauly (2 males, MRAC). Antananarivo: 1450m in R.S. d'Ambohitantely, 24 km NE Ankazobe ($18^{\circ}10.1'S$, $47^{\circ}16.6'E$), in pitfall traps, 7–12 December 1997, S. Goodman (1 female, FMNH).

Distribution.—East central Madagascar in Antananarivo and Toamasina provinces (Fig. 68).

Paramigas goodmani, new species

(Figs. 33, 34A–E, 35D, 65, 68)

Type.—Holotype female collected at 80m elevation in Forêt de Vohibasia, 59 km NE Sakaraha ($22^{\circ}27.5'N$, $44^{\circ}50.5'E$), Toliara Province, Madagascar, 10–16 January 1996 by S. Goodman, deposited in FMNH.

Etymology.—The specific name honors Steve Goodman, whose extraordinary collecting efforts in Madagascar discovered the type and numerous other new species.

Diagnosis.—Distinguished from all other *Paramigas* that have a dense vestiture of long, silky hairs beneath patellae-metatarsi I and II by having dorsal thorns at the apices of metatarsi I and II (Fig. 33).

Description.—Female (holotype): Total length 20.5. Carapace (Fig. 33) dark red-brown with a dark brown band surrounding its margin; caput light red-brown along lateral margin; ocular area dark red-brown, dusky between AME and black mesad of ALE and PLE; chelicerae dark red-brown; sternum, coxae, and trochanters orange-brown (Fig. 34B); legs and

pedipalpi dark red-brown, except orange-brown tarsi, with orange-brown setal bases giving a mottled pattern; abdomen dark purple-brown including book lungs and epigastric furrow; spinnerets dark red-brown (Fig. 34B).

Carapace 8.9 long, 8.2 wide, height at thoracic fovea $0.31 \times$ carapace width; smooth. Caput inclined (Fig. 34A), height $1.30 \times$ that at thoracic fovea, width $0.73 \times$ carapace width; median ocular seta situated anteriorly of AME and twelve setae positioned anteriorly to this; clypeus $0.30 \times$ length OAL, margin straight. Thoracic fovea recurved and tripartite, width $0.21 \times$ that of carapace, $1.8 \times$ wider than long; with pair of prefoveal setae (Fig. 33).

Ocular area width $0.50 \times$ caput, $2.30 \times$ wider than long; AER 3.0 wide, $1.09 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.0: 0.66: 0.66: 0.5, diameter AME 0.6; AME separated by $0.33 \times$ their diameter, PME by $2.25 \times$ their diameter. Ocular quadrangle $1.48 \times$ wider than long, posterior width $1.68 \times$ anterior.

Sternum 8.0 long, 5.3 wide, widest behind coxa II and narrowed anteriorly, setose along lateral margin and sparsely setose on surface; sigilla indistinct, shallow, irregularly oval, adjacent to coxa II, $0.13 \times$ width sternum, distance between $0.57 \times$ distance from margin (Fig. 34B). Labium with 41, pedipalpal coxae with 46–48 cuspules; labium 1.3 long, 1.65 wide, pedipalpal coxae 3.0 long, 1.65 wide, apex produced to a blunt point. Chelicerae 2.0 long, promargin of fang furrow with 4 teeth, retromargin with 6 teeth, pro- and retromargin interspersed with 1–3 denticles (Fig. 34D).

Femur I 0.84, tibia I 0.53, femur IV 0.85, and tibia IV $0.54 \times$ carapace width. Ventral surfaces of patellae, tibiae, metatarsi, and tarsi of legs I and II densely covered by long filiform setae (Fig. 33). Spination: pedipalpus: tibia p 1-0-0, tarsus p 1-1-1, r 1-0-1; leg I: tibia p 1-2-3-3, r 2-3-3-6, d 12 thorns, metatarsus p 2-6-2, r 3-3-3-3, d 26 thorns, tarsus p 1-1-1, r 1-1-0; leg II: tibia p 2-3-3, r 1-3-4-2-3, d 15 thorns, metatarsus p 3-3-3-2-1a, r 3-3-1a, d 28 thorns, tarsus p 2-1-1-1, r 1-1-0; leg III: patella with approximately 69, tibia with approximately 75, metatarsus with approximately 40, and tarsus with approximately 12 spinules; leg IV: patella with approximately 80 slender spinules. STC teeth (pro-retro): I (3-2), II (3-3), III, IV (1-1); ITC simple, pedipalpal claw with 1 tooth (Fig. 34E). Leg measurements (Femur + Patella + Tibia + Metatarsus + Tarsus = [Total]): I: $6.9 + 4.0 + 4.4 + 3.0 + 2.0 = [20.3]$; II: $6.2 + 3.8 + 4.0 + 2.9 + 1.9 = [18.8]$; III: $5.0 + 3.1 + 3.2 + 2.6 + 2.1 = [16.0]$; IV: $7.0 + 4.0 + 4.5 + 3.9 + 2.5 = [21.9]$; pedipalpus: $4.0 + 2.1 + 2.6 + (\text{absent}) + 2.2 = [10.9]$.

Abdomen 11.6 long, 8.7 wide, sparsely covered with short setae. Spermathecae with narrow head and long stalk, length spermathecae $0.78 \times$ distance between them and $1.85 \times$ head diameter, diameter head $1.81 \times$ diameter stalk, head length $0.90 \times$ length stalk (Figs. 34C, 35D).

Material Examined.—Only the type.

Distribution.—Known only from the type locality, an isolated montane forest in south-western Madagascar (Fig. 68).

Paramigas macrops, new species

(Figs. 36, 37A–H, 65, 68)

Type.—Holotype male collected at elev. 440 m in Reserve Naturelle Integrale d' Andohahela, parcel 1, 12.5 km NW Eminiminy ($24^{\circ}37.6'S$, $46^{\circ}45.9'E$), Toiliara Province, Madagascar, 19–28 October 1995 by S. Goodman, deposited in FMNH.

Etymology.—The specific name refers to the large anterior median eyes.

Diagnosis.—Distinguished from other *Paramigas* males except *P. manakambus* by having AME larger than ALE (Fig. 36), the thoracic fovea recurved and metatarsus I cylindrical, and from *P. manakambus* by having a retroventral row of 4 spines on tibia I (Fig. 37C) and tarsi III and IV cylindrical (Fig. 36).

Description.—Male (holotype): Total length 6.15. Prosoma (Figs. 36, 37A) light yellow-brown with dark yellow-brown areas extending along lateral margins of caput and ocular area darkening to black at edge of clypeus; chelicerae dark yellow-brown; ocular area dark except between PME; sternum, coxae, and trochanters light yellow-brown (Fig. 37B); dorsal surface of legs I–IV dark yellow-brown fading to light yellow-brown on tips of tarsi and on ventral surfaces; pedipalpi light yellow-brown; abdomen pale purple-brown; spinnerets and book lung covers light yellow-brown.

Carapace 2.6 long and wide, height at thoracic fovea $0.19 \times$ carapace width; weakly rugose. Caput inclined (Fig. 37A), height $1.5 \times$ that at thoracic fovea, width $0.55 \times$ carapace width; ocular area with single setae situated anteriorly of AME and a pair of setae situated anteriorly of this; clypeus height $0.35 \times$ length OAL, margin recurved. Thoracic fovea tripartite and recurved, width $0.17 \times$ that of carapace, $1.8 \times$ wider than long, prefoveal setae minute, nearly invisible except at high (80x) power.

Ocular area width $0.70 \times$ caput, $1.78 \times$ wider than long; AER 1.02 wide, $1.0 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.0: 0.63: 0.33: 0.67, diameter AME 0.27; AME separated by $0.55 \times$ their diame-

ter, PME by $2.6 \times$ their diameter. Ocular quadrangle $1.0 \times$ wider than long, posterior width $1.21 \times$ anterior.

Sternum 1.82 long, 1.4 wide, widest behind coxa II and narrowed anteriorly, sparsely setose laterally and on surface; sigilla $0.10 \times$ width sternum, oval, adjacent to coxa II, distance between $3.82 \times$ distance from margin. Labium 0.35 long, 0.47 wide, pedipalpal coxae 0.75 long, 0.45 wide, apex rounded (Fig. 37B). Chelicerae 0.6 long, promargin of fang furrow with 3 teeth, retromargin with 1 large basal and 3 distal teeth (Fig. 37D).

Femur I 1.0, tibia I 0.73, femur IV 0.96, and tibia IV $0.71 \times$ width carapace. With sparse patches of scopular hairs beneath apices of tarsi. Tibia III with weak dorsobasal excavation before protuberance at mid-segment (Fig. 36). Tarsi III and IV elongate and nearly straight dorsally. Spination: leg I: tibia r 0-1-1-1-1, metatarsus r 0-0-0-1; leg III: patella with approximately 15 and tibia with approximately 9 minute lateroapical spinules. STC teeth (pro, retro): I, II (3-3), III (3-2), IV (2-2) (Fig. 37H). Leg measurements (Femur + Patella + Tibia + Metatarsus + Tarsus = [Total]): I: $2.6 + 1.3 + 1.9 + 1.75 + 0.65 = [8.2]$; II: $2.5 + 1.1 + 1.65 + 1.5 + 0.6 = [7.35]$; III: $2.0 + 0.9 + 1.25 + 1.15 + 0.65 = [5.95]$; IV: $2.5 + 1.25 + 1.85 + 1.6 + 0.8 = [8.0]$; pedipalpus: $1.15 + 0.6 + 0.95 + (\text{absent}) + 0.45 = [3.15]$.

Pedipalpus (Figs. 37E-G) with femur 0.44, tibia $0.36 \times$ carapace width; femur 2.5, tibia $2.11 \times$ length tarsus; tibia broad proximally and narrowed distally, height $0.57 \times$ length; tarsus with 2-3 apical spinules; bulb width $0.93 \times$ tarsus length; embolus length $0.52 \times$ bulb width. Abdomen 2.95 long, 2.2 wide, sparsely covered with short setae.

Natural History.—The specimen was collected in a pitfall trap.

Material Examined.—Only the type.

Distribution.—Known only from the type locality in far southern Madagascar (Fig. 68).

Paramigas manakambus, new species

(Figs. 38A-H, 65, 68)

Type.—Holotype male collected at Forêt bac jaune, Manakambahing Atn., Madagascar, 1-17 January 1991 by A. Pauly, deposited in MRAC (#174.501).

Etymology.—The specific name is an arbitrary combination of letters.

Diagnosis.—Distinguished from other *Paramigas* males except *P. macrops* by having AME larger than ALE (Fig. 38A), the thoracic fovea recurved and metatarsus I not swollen retrolaterally (Fig. 38C), and from *P. macrops* by having only an apical megaspine on tibia I, metatarsus I flattened dorsally (Fig. 38C)

and tarsi III and IV curved and swollen (Fig. 38D).

Description.—Male (holotype): Total length 7.9. Carapace (Fig. 38A) dark red-brown with a dark band around margin, dusky on clypeus and along anterior margins of caput; ocular area black except between PME; sternum, coxae, and trochanters yellow-brown; dorsal surfaces of legs I through IV dark red-brown gradually fading to yellow-brown on ventral surfaces and on tarsi; pedipalpi dark yellow-brown; abdomen dark purple-brown except spinnerets and anterior of epigastric furrow yellow-brown.

Carapace 3.35 long, 3.4 wide, height at thoracic fovea $0.26 \times$ carapace width, rugose. Caput low, height $1.38 \times$ that at thoracic fovea, width $0.57 \times$ carapace width; ocular area with single seta situated between AME and a pair of setae positioned anterior to this; clypeus length $0.34 \times$ length OAL, slightly procurved. Thoracic fovea tripartite, recurved, width $0.16 \times$ that of carapace, $2.3 \times$ wider than long, with minute pair of prefoveal setae.

Ocular area width $0.55 \times$ caput, $1.86 \times$ wider than long; AER 1.05 wide, $1.07 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.0: 0.6: 0.4: 0.5, diameter AME 0.25; AME separated by $0.4 \times$ their diameter, PME by $3.6 \times$ their diameter. Ocular quadrangle $1.22 \times$ wider than long, posterior width $1.03 \times$ anterior.

Sternum 1.9 long, 1.75 wide, widest behind coxa II and narrowed anteriorly; sigilla $0.2 \times$ width sternum, irregular, adjacent to coxa II, distance between $1.25 \times$ distance from margin. Labium and pedipalpal coxae lacking cuspules; labium 0.6 long, 0.65 wide, pedipalpal coxae 1.1 long, 0.6 wide, apex produced to a blunt point. Chelicerae 0.9 long, promargin of fang furrow with 3 teeth, retromargin with single basal tooth and 6-7 distal denticles (Fig. 38B).

Femur I 0.94, tibia I 0.63, femur IV 0.92, and tibia IV $0.69 \times$ width carapace. Scopulae restricted to tarsi I-IV, I very weak. Metatarsus I (Fig. 38C) slightly flattened dorsally, tibia III with weakly defined dorsobasal excavation and tarsi III and IV elongate, dorsally concave and swollen ventrally (Fig. 38D). Spination: leg I: tibia r 0-0-0-1a, d 5 minute apical spinules, metatarsus d 17 minute spinules at tibia-metatarsus joint; leg II: tibia d 8 minute apical spinules, metatarsus d 13 minute spinules at tibia-metatarsus joint; leg III: patella with approximately 31 spinules, tibia with approximately 14 minute dorsoapical spinules; leg IV: patella with approximately 50 spinules. STC teeth (pro, retro): I-IV (1-1). Leg measurements (Femur + Patella + Tibia + Metatarsus + Tarsus = [Total]): I: $3.2 + 1.5 + 2.15 + 2.15 + 0.9 = [9.9]$; II: $2.95 + 1.45 + 1.85 + 1.9 + 1.05 = [9.2]$; III: $2.1 + 1.0 + 1.4 + 1.5 + 1.2 = [7.2]$; IV: 3.15

+ 1.5 + 2.35 + 2.05 + 1.55 = [10.6]; pedipalpus: 1.4 + 0.75 + 0.95 + (absent) + 0.6 = [3.7].

Pedipalpus (Figs. 38E–G) with femur 0.72, tibia 0.49 × carapace width; femur 2.33, tibia 1.58 × length tarsus; tibia ventrally concave (Fig. 38G) with approximately 10 elongate setae on ventral surface, height 0.52 × length; approximately 4 spines at apex of tarsus; bulb width 1.16 × tarsus length; embolus length 0.53 × bulb width. Abdomen 3.65 long, 2.7 wide, sparsely covered with short setae.

Material Examined.—Only the type.

Distribution.—Known only from the type locality in eastern Madagascar (Fig. 68).

Paramigas milloti, new species

(Figs. 1, 35E, 39A–E, 65, 68)

Type.—Holotype female collected at 600 m elevation at “1 Av. Antongoniviksika” in November 1947 by J. Millot, deposited in MNHN.

Etymology.—The specific name honors Jacques Millot, collector of the type and many other interesting Malagasy arthropods.

Note.—The hand-copied label may have a transcription error. The type locality is probably Antongoniviksika, which is a mountain north of the col d’Ambatondradama. This latter mountain is 35–40 km NE of Maroantsetra on the path between Maroantsetra and Antalaha (Viette 1991).

Diagnosis.—Distinguished from other *Paramigas* that lack a dense vestiture of long silky hairs beneath legs I and II by having these legs densely spinose, tibia I with more than 40 ventrolateral spines (Fig. 1), prefoveal setae large, and the spermathecae long and narrow, length greater than 1.63 × maximum diameter, head diameter less than 1.81 × diameter stalk (Figs. 35E, 39C).

Description.—Female (holotype): Total length 20.1. Carapace and ocular area orange-red (Figs. 1, 39A) with faint longitudinal striations extending from PME to thoracic fovea and radiating from thoracic fovea to carapace margin, black surrounding AME and mesad of ALE and PLE; sternum, coxae, and trochanters light yellow-brown (Fig. 39B); legs and pedipalpi orange-brown gradually fading to light yellow-brown on tarsi, with dark lateral longitudinal maculations; abdomen dark purple-brown; spinnerets and book lung covers yellow-white.

Carapace 8.5 long, 8.2 wide, height at thoracic fovea 0.26 × carapace width; smooth. Caput width 5.5 × carapace width, inclined (Fig. 39A), height 1.4 × that at thoracic fovea, with weak lateral dimples; ocular area with single seta situated between AME and a pair

of setae situated anterior to this; clypeus length 0.4 × length OAL, margin straight, with 5–6 setae along margin in center. Thoracic fovea recurved and tripartite, width 0.21 × that of carapace, 1.8 × wider than long, with pair of long prefoveal setae (Fig. 1).

Ocular area width 0.5 × caput, 2.2 × wider than long; AER 2.75 wide, 1.12 × width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.0: 1.45: 1.09: 0.72, diameter AME 0.275; AME separated by 1.27 × their diameter, PME by 4.16 × their diameter. Ocular quadrangle 1.48 × wider than long, posterior width 2.05 × anterior.

Sternum 6.3 long, 5.2 wide, widest behind coxa II and narrowed anteriorly (Fig. 39B), setose along margin and on surface; sigilla shallow, irregularly oval, adjacent to coxa II, width 0.28 × width sternum, distance between 0.086 × distance from margin. Labium with 24 and pedipalpal coxae with 25–42 cuspules; labium 1.75 long, 1.7 wide, pedipalpal coxae 3.5 long, 1.8 wide, apex produced to a sharp point. Chelicerae 2.0 long, promargin of fang furrow with 5 teeth, retromargin with large basal tooth, distad of this 5 teeth and 4 denticles (Fig. 39D).

Femur I 0.80, tibia I 0.51, femur IV 0.82, and tibia IV 0.54 × width carapace. Spination: pedipalpus: tibia p 1-0-0, tarsus p1-1-1, r1-1-1; leg I: tibia promargin with 24, retromargin with 28 spines, metatarsus promargin with 20, retromargin with 23 spines, tarsus p 1-1-1-1, r 3-2; leg II: tibia promargin with 16, retromargin with 19 spines, metatarsus promargin with 15, retromargin with 9 spines, tarsus p 3-1-1-1, r 1-1-1; leg III: patella with prodorsal and dorsal bands totaling 70 spinules, tibia with prodorsal and dorsal bands totaling 55 spinules, v 0-0-1a, metatarsus with prodorsal and dorsal bands totaling 60 spinules, v 0-0-2a, tarsus with more than 20 dorsal and more than 15 proapical spinules; leg IV: patella with prodorsal and dorsal bands of more than 120 spinules, tibia with prodorsal and dorsal bands of 55 spinules, metatarsus v 0-1-2a. Femur II with rows of 20–25 stout proximal ventral setae, retrodorsum of legs I and II with sparse patches of stout, procumbant setae: 20–25 apical on tibiae and 20–25 basal on metatarsi. STC teeth (pro-retro): I (2-2), II (2-1), III, IV (1-1); ITC simple, pedipalp claw with 1 tooth (Fig. 39E). Leg measurements (Femur + Patella + Tibia + Metatarsus + Tarsus = [Total]): I: 6.6 + 4.1 + 4.2 + 3.2 + 1.8 = [19.9]; II: 6.0 + 3.9 + 3.7 + 3.0 + 1.9 = [18.5]; III: 4.6 + 2.9 + 3.0 + 2.7 + 2.2 = [15.4]; IV: 6.8 + 4.0 + 4.5 + 3.6 + 2.7 = [21.6]; pedipalpus: 3.6 + 1.9 + 2.2 + (absent) + 2.0 = [9.7].

Abdomen 9.6 long, 7.6 wide, sparsely covered with short setae. Spermathecae with broad head and narrow stalk, length spermathecae 0.77 × distance be-

tween them and $1.63 \times$ head diameter, diameter head $2.44 \times$ diameter stalk, head length $2.30 \times$ length stalk (Figs. 35E, 39C).

Material Examined.—Only the type.

Distribution.—Known only from the type locality in northern Madagascar (Fig. 68).

***Paramigas oracle*, new species**

(Figs. 3C–D, 21C–D, 25C, 27A–D, 40A–B, 41A–G, 42A–D, 43A–D, 65, 68)

Type.—Holotype female collected in primary forest at ca. 1200 m at Vatoharanana ($21^{\circ}16.7'S$, $47^{\circ}26.1'E$), Parc Nationale Ranomafana, Fianarantsoa Province, Madagascar, on 29 April 1998 by C. E. Griswold, deposited in CASC. Paratype female, also from P. N. R. at Talatakely ($21^{\circ}14.9'S$, $47^{\circ}25.6'E$) ca. 900 m elev., collected on 27 April 1998 by D. Ubick, deposited in CASC.

Etymology.—The specific name thanks the Oracle Foundation, whose support made possible the 1998 California Academy of Sciences' expeditions to Madagascar.

Diagnosis.—Distinguished from all other *Paramigas* that have a dense vestiture of long, silky hairs beneath patellae-metatarsi I and II (Fig. 41B) by (contra *P. goodmani*) having slender setae rather than thorns at the apices of metatarsi I and II (Figs. 27A–C, 41B) and (contra *P. perroti*) by having the spermathecae short with large heads, length less than $1.67 \times$ head diameter and head diameter greater than $2.14 \times$ diameter stalk (Figs. 40A–B, 41C–D).

Description.—Female (holotype): Total length 11.0. Carapace dark yellow-brown with yellow-brown striae extending along lateral margins of caput and a dark band rebordering carapace (Fig. 41A); ocular area and clypeus dark, black surrounding AME and extending between these and ALE, PLE and PME; sternum, coxae, and trochanters light yellow-brown gradually darkening to orange-brown on pedipalpal coxae and labium; legs and pedipalpi dark yellow-brown fading to orange-brown on tarsi; patella IV yellow-white dorsally; abdomen dark purple-brown, venter and spinnerets paler.

Carapace 4.5 long, 4.1 wide, height at thoracic fovea $0.29 \times$ carapace width; smooth. Caput inclined, height $1.6 \times$ that at thoracic fovea, width $0.70 \times$ carapace width; anteromedian ocular seta present with a pair of setae situated anteriorly to this; clypeus length $0.38 \times$ length OAL, margin straight. Thoracic fovea recurved and tripartite, width $0.18 \times$ that of carapace, $1.6 \times$ wider than long, prefoveal setae absent (Fig. 41A).

Ocular area width $0.52 \times$ caput, $1.96 \times$ wider than

long; AER 1.5 wide, $1.07 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.0: 0.76: 0.84: 0.53, diameter AME 0.32; AME separated by $0.38 \times$ their diameter, PME by $1.81 \times$ their diameter. Ocular quadrangle $1.96 \times$ wider than long, posterior width $1.17 \times$ anterior.

Sternum 3.0 long, 1.32 wide, widest behind coxa II and narrowed anteriorly, setose along margin and sparsely setose on surface; sigilla shallow, oval, adjacent to coxa II, width $0.15 \times$ width sternum, distance between $0.61 \times$ distance from margin. Labium 0.42 long and wide; labium with 25 and pedipalpal coxae with 36–37 cuspules; pedipalpal coxae 0.8 long, 0.5 wide, apex produced to a blunt point. Chelicerae 1.2 long, fang with prolateral flange, promargin of fang furrow with 3 teeth, retromargin with 4 teeth interspersed with a denticle (Fig. 41F).

Femur I 0.82, tibia I 0.47, femur IV 0.81, and tibia IV $0.48 \times$ width carapace. Ventral surfaces of patellae, tibiae, metatarsi, and tarsi of legs I and II densely covered by long filiform setae (Fig. 41B). Spination: pedipalpus: tibia p 1-0-0, tarsus p 1-1-1, r 0-1-1; leg I: tibia p 1-1-1-1a, r 3-2-3a; metatarsus p 1-1-2-1-1-3a, r 2-2-2-1a; tarsus p 2-1-1, r 2-0-0; leg II: tibia p 2-2-1-2a, r 3-2-3a, metatarsus p 2-2-2-1a, r 2-2-2-1a, tarsus p 1-1-1-1, r 1-1-0; leg III: patella with approximately 45, tibia with approximately 59, metatarsus with approximately 20, and tarsus with 5 spinules; leg IV patella with approximately 70 slender spinules. Femur II with row of 5–6 stout proximal ventral setae, retrodorsum of legs I and II with dense patches of stout, smooth, procumbant setae: 13–18 apical on tibiae, 20–24 basal on metatarsi. STC teeth (pro-retro): I, II (2-2), III, IV (1-1); ITC simple, pedipalp claw with 1 multidentate tooth (Figs. 3C–D, 41G). Leg measurements (Femur + Patella + Tibia + Metatarsus + Tarsus = [Total]): I: $3.4 + 1.9 + 1.95 + 1.5 + 0.95 = [9.7]$; II: $3.0 + 1.85 + 1.55 + 1.4 + 1.1 = [8.9]$; III: $2.55 + 1.5 + 1.55 + 1.25 + 1.15 = [8.0]$; IV: $3.35 + 1.95 + 2.0 + 1.7 + 1.35 = [10.35]$; pedipalpus: $1.95 + 1.10 + 1.15 + (\text{absent}) + 1.15 = [5.95]$.

Abdomen 5.3 long, 4.3 wide, sparsely covered with short setae. Spermathecae with broad head and short stalk, length spermathecae $0.67 \times$ distance between them and $1.37 \times$ head diameter, diameter head $3.0 \times$ diameter stalk, head length $1.28 \times$ length stalk (Figs. 40B, 41C).

Variation (N=3).—Total length 8.8–11.0; height at fovea 0.29 – $0.34 \times$ carapace width. Caput 0.70 – $0.77 \times$ carapace width, height 1.2 – $1.6 \times$ that at fovea; diameter ALE 0.61 – $1.0 \times$ AME, PLE 0.72 – $1.0 \times$ PME; clypeus length 0.33 – $0.44 \times$ OAL; thoracic fovea width 1.25 – $1.6 \times$ length, pre-foveal setae absent or reduced

to a single seta. Sternal sigilla width $0.071\text{--}0.15 \times$ sternum width; labium with 20–42 and pedipalpal coxae with 16–40 cuspules (Figs. 43C–D); retromargin of fang furrow with 4–5 teeth (Figs. 41E–F). Metatarsus I with 5–7 retrolateral spines; tibia II with 5–7 and metatarsus II with 5–7 prolateral spines, pedipalp claw with 1–3 teeth. Spermathecae length $0.67\text{--}1.05 \times$ distance between them and $1.33\text{--}1.67 \times$ head diameter, diameter head $2.14\text{--}3.0 \times$ diameter stalk, head length $1.0\text{--}1.28 \times$ length stalk.

Natural History.—Specimens from Vatoharanana and Talataky were taken from nests on the trunks of small trees or large vines in forest understory. Three nests observed have the same form: they are oval, oriented vertically on the substrate, and with a single wafer type door at the upper end. The nest of the holotype is 29 mm long, 13 mm wide, and 9 mm deep; the door is 10 mm long and 12 mm wide (Figs. 21C–D). All nests are made of fragments of bark and lichen woven together with silk.

Distribution.—Central to south-central Madagascar (Fig. 68).

Additional Material Examined.—MADAGASCAR: Fianarantsoa: Parc Nationale Ranomafana: Talataky, $21^{\circ}14.9'S$, $47^{\circ}25.6'E$, 5–18 April 1998, C. E. Griswold & D. H. Kavanaugh (1 fragmentary female, CASC), 30 October–21 November 1998, V. Lee & K. Ribardo (1 female, CASC). Antananarivo: 3 km 41° NE Andranomay, 11.5 km 147° SSE Anjozorobe, $18^{\circ}28.4'S$, $47^{\circ}56.6'E$, elev. 1300 m, montane rainforest, 5–13 December 2000, CAS/PBZT Spider-Ant Class (1 female, CASC).

***Paramigas pauliani* (Dresco & Canard)**

(Figs. 40C–D, 44A–I, 65, 68)

Legendrella pauliani Dresco & Canard, 1975:783–788 (female holotype, 2 female paratypes, and 3 additional specimens [Dresco & Canard reported that all 3 are juveniles but 2 are adult females], Fort Dauphin, Madagascar, collected by Paulian, 1961, in MNHN, examined). Brignoli 1983: 119.

Paramigas pauliani, Raven, 1985:155. Platnick 1989:73. Platnick 2001.

Diagnosis.—Females are distinguished from other *Paramigas* that lack long silky hairs beneath legs I and II (Fig. 44C) by having tarsus III with more than 15 prolateral spinules (Figs. 44D, I) and by the form of the spermathecae with the head diameter greater than $7 \times$ that of the very narrow stalk (Figs. 40C–D, 44G–H), and from *P. rothorum* by having a pair of long prefoveal setae (Fig. 44A); male unknown.

Description.—Female (holotype): Total length

19.0. Carapace orange-brown with faint brown striae posteriad of PME and extending to thoracic fovea (Fig. 44A); ocular area and clypeus orange-brown, black surrounding AME and mesad of ALE and PLE; chelicerae orange-brown, sternum, coxae, and trochanters light orange-brown (Fig. 44B); legs and pedipalpi orange-brown; patellae, especially IV, orange-brown dorsally; abdomen dark brown; spinnerets and book lung covers pale yellow-white.

Carapace 7.7 long, 7.0 wide, height at thoracic fovea $0.25 \times$ carapace width; smooth. Caput inclined, height $1.4 \times$ that at thoracic fovea, width $0.71 \times$ carapace width, with shallow dimples just anterior of thoracic fovea; median ocular seta present with two pairs of setae situated anterior to this; clypeus length $0.63 \times$ length OAL, margin weakly procurved, with one setae near margin. Thoracic fovea recurved and tripartite, width $0.18 \times$ that of carapace, $1.6 \times$ wider than long, with long prefoveal setae (Fig. 44A).

Ocular area width $0.51 \times$ caput, $1.62 \times$ wider than long; AER 2.55 wide, $1.15 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.0: 2.1: 1.3: 1.1, diameter AME 0.25; AME separated by $1.4 \times$ their diameter, PME by $2.71 \times$ their diameter. Ocular quadrangle $1.42 \times$ wider than long, posterior width $1.87 \times$ anterior.

Sternum 6.4 long, 4.3 wide, widest behind coxa II and narrowed anteriorly, setose along margin and sparsely setose on surface; sigilla shallow, oval, adjacent to coxa II, width $0.162 \times$ width sternum, distance between $0.4 \times$ distance from margin (Fig. 44B). Labium with 24 and pedipalpal coxae with 41–43 cuspules; labium 1.2 long, 1.5 wide, pedipalpal coxae 2.9 long, 1.4 wide, apex produced to a sharp point. Chelicerae 1.8 long, promargin of fang furrow with 4 teeth, retromargin with 1 large basal tooth, distad of this row of 7 small teeth (Fig. 44E).

Femur I 5.0, tibia I 3.2, femur IV 5.5, and tibia IV $3.6 \times$ width carapace. Spination: pedipalpus: tibia p 1-0-0, tarsus p 1-1-1-1, r 1-1-1; leg I (Fig. 44C): tibia p 1-3-5-3, r 3-3-3-8; metatarsus p 4-4-3, r 8-4-4; tarsus p 1-1-1, r 1-1-1-1; leg II: tibia p 4-2-3, r 4-2-3-1, metatarsus p 3-2-3-4, r 4-2-4-1, tarsus p 1-1-1, r 1-1-1; leg III (Fig. 44D): patella with approximately 46, tibia with approximately 52, metatarsus with approximately 56, and tarsus with 15 proapical spinules; leg IV patella with approximately 90 slender spinules. Femur II with row of 5–6 stout proximal ventral setae, retrodorsum of legs I and II with sparse groups of stout, serrate, procumbant setae: 4–6 apical on tibiae, 4–6 basal on metatarsi. STC teeth (pro-retro): I, III, IV (1-1), II (2-2); ITC simple, pedipalp claw with 1 simple tooth (Fig. 44I). Leg measurements (Femur + Patella + Tibia +

Metatarsus + Tarsus = [Total]): I: $5.0 + 3.0 + 3.2 + 2.5 + 1.4 = [15.1]$; II: $4.4 + 2.9 + 2.7 + 2.3 + 1.5 = [13.8]$; III: $3.7 + 2.4 + 2.1 + 2.0 + 1.8 = [12.0]$; IV: $5.5 + 3.1 + 3.6 + 2.8 + 2.5 = [17.5]$; pedipalpus: $3.0 + 1.7 + 1.9 + (\text{absent}) + 1.8 = [8.4]$.

Abdomen 9.5 long, 6.7 wide, sparsely covered with short setae. Spermathecae (of paratype) with broad head and short, very narrow stalk; although the heads are nearly contiguous the length of the spermathecae is $0.86 \times$ distance between them and $1.05 \times$ head diameter, diameter head $7.33 \times$ diameter stalk, head length $5.47 \times$ length stalk.

Variation (N=5).—Total length 16.8–19.9; height at fovea $0.21\text{--}0.25 \times$ carapace width. Caput height $1.3\text{--}1.6 \times$ that at fovea; diameter ALE $1.8\text{--}2.1 \times$ AME; clypeus length $0.6\text{--}0.7 \times$ OAL, margin straight to weakly procurved; thoracic fovea width $1.6\text{--}2.0 \times$ length. Sternal sigilla width $0.16\text{--}0.20 \times$ sternum width; labium with 19–26 and pedipalpal coxae with 32–45 cuspules; retromargin of fang furrow with large basal tooth and 3–7 small teeth (Figs. 44E–F). Metatarsus I with 13–18 retrolateral spines; tibia II with 9–13 and metatarsus II with 11–12 prolateral spines. STC with 2–3 teeth. Spermathecae (N=2) length $0.78\text{--}0.86 \times$ distance between them and $0.89\text{--}1.05 \times$ head diameter, diameter head $7.33\text{--}7.40 \times$ diameter stalk, head length $5.00\text{--}5.47 \times$ length stalk (Figs. 40C–D, 44G–H).

Material Examined.—MADAGASCAR: Toliara: Fort Dauphin, 1961, R. Paulian (*Legendrella pauliani* holotype female, 2 paratype females, 2 females, 1 juvenile, MNHN)

Distribution.—Known only from the type locality at the southern tip of Madagascar (Fig. 68).

Paramigas pectinatus, new species

(Figs. 45A, 46A–E, 65, 68)

Type.—Holotype female collected 20 March 1994 by Alaine Pauly at the Piscine Naturelle at Isalo, Fianarantsoa Province, Madagascar, deposited in MRAC (#201.283).

Etymology.—The specific name refers to the comb or rake of procumbant setae on the anterior legs.

Diagnosis.—Females are distinguished from other *Paramigas* that lack a dense vestiture of long silky hairs beneath legs I and II by the presence of dense patches of conspicuously serrate, procumbant setae at apices of tibiae and bases of metatarsi I and II (Fig. 46B), carapace with small prefoveal setae and dimples (Fig. 46A); spermathecae short, with base narrow, head diameter greater than $3.7 \times$ stalk diameter (Figs. 45A, 46C); male unknown.

Description.—Female (holotype): Total length

10.3. Carapace yellow-brown with faint longitudinal striae extending from AME and PLE on caput to thoracic fovea (Fig. 46A) and faint dark striae along lateral margins of caput; ocular area dark, black surrounding AME and extending between all eyes; sternum, coxae, and trochanters light yellow-brown; legs and pedipalpi yellow-brown gradually fading to light yellow-brown on tarsi; abdomen dark purple-brown, paler ventrally; spinnerets light yellow-brown.

Carapace 4.4 long, 3.75 wide, height at thoracic fovea $0.26 \times$ carapace width; smooth. Caput inclined, height $1.8 \times$ that at thoracic fovea, width $0.76 \times$ carapace width, with weak lateral dimples; ocular area with a single seta positioned between AME, 2 behind AME, and a pair of setae anterior to median ocular seta; clypeus length $0.59 \times$ length OAL, procurved, with several setae. Thoracic fovea recurved and tripartite, width $0.16 \times$ that of carapace, $1.3 \times$ wider than long, with a pair of short prefoveal setae (Fig. 46A).

Ocular area width $0.44 \times$ caput, $1.8 \times$ wider than long; AER 1.27 wide, $1.06 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.0: 1.17: 0.70: 0.88, diameter AME 0.17; AME separated by $1.0 \times$ their diameter, PME by $3.8 \times$ their diameter. Ocular quadrangle $1.5 \times$ wider than long, posterior width $1.25 \times$ anterior.

Sternum 2.85 long, 2.15 wide, widest behind coxa II and narrowed anteriorly, setose along margin and sparsely setose on surface; sigilla shallow, irregularly oval, adjacent to coxa II, contiguous medially, width $0.30 \times$ width sternum, distance from sternal margin $0.77 \times$ diameter. Labium with 24, pedipalpal coxae with 15–21 cuspules; labium 0.32 long and wide, pedipalpal coxae 1.2 long, 0.85 wide, apex produced to a blunt point. Chelicerae 1.0 long, fang with prolateral flange, promargin and retromargins of fang furrow with 3 teeth (Fig. 46D).

Femur I 0.86, tibia I 0.46, femur IV 0.74, and tibia IV $0.4 \times$ width carapace. Spination: pedipalpus: tarsus p 1–1–1, r 1–1–1; leg I: tibia p 2–2–2, r 2–2–4, metatarsus p 1–2–2–1a, r 2–2–2, tarsus p 0–1, r 1–1–0; leg II: tibia p 2–2–1, r 2–2–2, metatarsus p 2–2–1a, r 1–1–1–1, tarsus p 1–1–0, r 1–0–0; leg III: patella with approximately 38, tibia with approximately 56, and metatarsus with approximately 17 spinules, tarsus with 4–5 proapical spinules; leg IV patella with approximately 80 slender spinules, metatarsus v 0–0–2a. Femur II with row of 5–6 stout proximal ventral setae, retrodorsum of legs I (Fig. 46B) and II with dense patches of stout, serrate procumbant setae: 20–25 apical on tibiae, 25–27 basal on metatarsi. STC teeth (pro-retro): I, II (2–2), III, IV (1–1), ITC simple, pedipalp claw with 1 simple tooth (Fig. 46E). Leg measurements (Femur + Patella +

Tibia + Metatarsus + Tarsus = [Total]: I: $3.25 + 1.8 + 1.75 + 1.5 + 0.85 = [9.15]$; II: $2.75 + 1.6 + 1.35 + 1.25 + 0.75 = [7.7]$; III: $2.1 + 1.3 + 1.25 + 1.05 + 1.05 = [6.75]$; IV: $2.8 + 1.6 + 1.5 + 1.15 + 1.05 = [8.1]$; pedipalpus: $1.5 + 0.95 + 1.0 + (\text{absent}) + 0.95 = [4.4]$.

Abdomen 4.9 long, 3.65 wide, sparsely covered by short setae. Spermathecae with broad head and short stalk, length spermathecae $1.125 \times$ distance between them and $0.90 \times$ head diameter, diameter head $3.75 \times$ diameter stalk, head length $3.25 \times$ length stalk (Figs. 45A, 46C).

Natural History.—The label with the type states "Piscine naturelle, massif rocheux." This is an area of large rocks within Isalo National Park, which is surrounded by arid grassland.

Material Examined.—Only the type.

Distribution.—Known only from the type locality in south-central Madagascar (Fig. 68).

Paramigas perroti (Simon)

(Figs. 21A–B, 35A–C, 47A–I, 65, 68)

Myrtale perroti Simon, 1891:300 (lectotype female from Tamatave, Madagascar, in MNHN, examined). Simon 1892:84, 1903:883.

Kolosvarya perroti, Strand 1934:272.

Paramigas perroti, Roewer 1942:193. Bonnet 1958:3329. Dresco & Canard 1975:785. Platnick 2001.

Paramigas subrufus Pocock, 1895:189 (lectotype female, here designated in order to ensure the name's proper and consistent application, and paralectotype female, from Senbrendrana, Madagascar, in BMNH, examined). Simon 1895:1066. Roewer 1942:193. Bonnet 1958:3329. Platnick 2001. NEW SYNONYMY

Myrtale subrufus, Simon 1903:883.

Synonymy.—In 1895, Pocock described a new migid, *Paramigas subrufus*, with some reservation as his specimens shared many characteristics with *Myrtale perroti* Simon (Pocock, 1895). However, using the illustration provided in Simon (1892), Pocock believed that his specimens were sufficiently different to warrant new status. Indeed, Simon's illustration of the cephalothorax of *Myrtale* reflects a very distinct looking spider (Simon 1892, fig. 84). However, upon examination of the holotypes, we have found Simon's illustration to be an inaccurate representation of *Myrtale perroti* specimens that differ from *Paramigas subrufus* only by color.

Diagnosis.—Distinguished from other *Paramigas* that have a dense vestiture of long, silky hairs beneath patellae–metatarsi I and II (Fig. 47C) by (contra *P. goodmani*) lacking thorns at the apices of metatarsi I and II and (contra *P. oracle*) having the spermathecae long with narrow heads, length greater than $1.67 \times$ head diameter and head diameter greater than $2.0 \times$ di-

ameter stalk (Figs. 35A–C, 47G–H).

Description.—Female (lectotype): Total length 20.7. Carapace orange-brown, caput with faint longitudinal striations behind ocular area (Fig. 47A); ocular area and clypeus orange-brown, black surrounding AME and mesad of ALE and PLE; chelicerae, sternum, coxae, and trochanters light orange-brown (Fig. 47B); legs and pedipalpi orange-brown; abdomen light brown; spinnerets and book lung covers pale yellow-brown.

Carapace 8.6 long, 6.7 wide, height at thoracic fovea $0.28 \times$ carapace width; smooth. Caput inclined, height $1.47 \times$ that at thoracic fovea, width $0.71 \times$ carapace width; median ocular seta present with two pairs of setae situated anterior to this; clypeus length $0.7 \times$ length OAL, margin weakly procurved. Thoracic fovea recurved and tripartite, width $0.5 \times$ that of carapace, $1.57 \times$ wider than long, with pair of small prefoveal setae.

Ocular area width $0.5 \times$ caput, $2.4 \times$ wider than long; AER 2.35 wide, $1.02 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.14: 1.0: 1.0: 0.71, diameter AME 0.4; AME separated by $0.5 \times$ their diameter, PME by $2.71 \times$ their diameter. Ocular quadrangle $1.5 \times$ wider than long, posterior width $1.36 \times$ anterior.

Sternum 6.4 long, 4.2 wide, widest behind coxa II and narrowed anteriorly, setose along margin and sparsely setose on surface; sigilla shallow, oval, adjacent to coxa II, width $0.11 \times$ width sternum, distance between $0.45 \times$ distance from margin (Fig. 47B). Labium with 36 and pedipalpal coxae with 39–47 cuspules; labium 1.3 long, 1.4 wide, pedipalpal coxae 2.8 long, 1.5 wide, apex produced to a sharp point. Chelicerae 2.3 long, promargin of fang furrow with 5 teeth, retro-marginal with 1 large basal tooth and distal row of 4–6 small teeth.

Femur I 0.86, tibia I 0.52, femur IV 0.82, and tibia IV $0.50 \times$ width carapace. Spination: pedipalpus: tibia p 1-0-0, tarsus p 1-1-1, r 1-1-1-1; leg I: tibia p 2-1-4, r 3-3-3-3; metatarsus p 2-2-3-2, r 2-2-3-3; tarsus p 1-1-1, r 1-2; leg II: tibia p 3-2-3, r 2-4-2-2, metatarsus p 2-3-2-2, r 2-1-1-1-1, tarsus p 1-1-1, r 1-0-0; leg III: metatarsus v0-0-0-2, patella with approximately 50 prolateral and retroapical, tibia with approximately 47 pro- and retrolateral, metatarsus with approximately 21, and tarsus with 13 prolateral spinules (Figs. 47D, I); leg IV patella with approximately 90 slender prolateral spinules. Femur II with proximal ventral row of 5–6 stout setae, retrodorsum of legs I (Fig. 47C) and II with dense patches of stout, smooth procumbant setae: 13–20 apical on tibiae, 30–35 basal on metatarsi; with a dense vestiture of long, silky hairs beneath patellae-

metatarsi I and II. STC teeth (pro-retro): I (2-3), II (2-2), III (1-2), IV (1-1); ITC simple, pedipalp claw with 1 tooth having small denticle (Fig. 47I). Leg measurements (Femur + Patella + Tibia + Metatarsus + Tarsus = [Total]): I: $5.8 + 3.2 + 3.5 + 2.4 + 1.5 = [16.4]$; II: $5.0 + 2.8 + 3.1 + 2.3 + 1.5 = [14.7]$; III: $4.1 + 2.3 + 2.5 + 2.1 + 1.7 = [12.7]$; IV: $5.5 + 3.2 + 3.4 + 2.7 + 1.8 = [16.6]$; pedipalpus: $3.0 + 1.5 + 1.7 + (\text{absent}) + 2.0 = [8.2]$.

Abdomen 9.8 long, 7.8 wide, sparsely covered with short setae. Spermathecae of lectotype not dissected: for description see variation below.

Variation (N=5).—Prosoma orange-brown to dark red-brown with light red-brown areas along lateral margins of ocular area and extending to edge of clypeus; chelicerae yellow-brown to dark red-brown; sternum, coxae, and trochanters yellow-brown to light red-brown; legs and pedipalpi unicolorous or with dorsal surface red-brown gradually fading to light red-orange on apices of metatarsi and tarsi; abdomen brown to purple-gray. Total length 14.0–20.7; height at fovea $0.23\text{--}0.33 \times$ carapace width. Caput $0.66\text{--}0.75 \times$ carapace width, height $1.38\text{--}1.55 \times$ that at fovea; diameter ALE $0.57\text{--}0.87 \times$ AME, PLE $0.66\text{--}0.71 \times$ PME; clypeus length $0.41\text{--}0.8 \times$ OAL, margin straight to weakly procurved; thoracic fovea width $1.22\text{--}2.0 \times$ length. Sternal sigilla width $0.11\text{--}0.16 \times$ sternum width; labium with 23–45 and pedipalpal coxae with 45–107 cusps; retromargin of fang furrow with basal tooth and 3–5 small teeth, with or without 1–3 denticles between tooth rows (Figs. 47E–F). Tibia I with 10–14 and metatarsus I with 8–12 retrolateral spines; tibia II and metatarsus II each with 8–12 prolateral spines. STC with 2–3 teeth. Spermathecal length $0.78\text{--}0.90 \times$ distance between, $1.67\text{--}2.05 \times$ head diameter, head diameter $2.00\text{--}2.33 \times$ stalk diameter, head length $0.89\text{--}1.0 \times$ stalk length (Figs. 35A–C, 47G–H).

Natural History.—The nest of the large *Paramigas subrufus* syntype is oval, 37 mm long, 20 mm wide, and 18 mm deep with a single wafer type door at one end that is 13 mm long and 17 mm wide (Figs. 21A–B; Pocock 1895, figs. 1a, 1b). The nest is made of fragments of bark and lichen woven together with silk. Pocock (1895) reports that he received two nests with the syntypes and that they appear to have been taken from the trunk of a tree.

Material Examined.—MADAGASCAR: no locality, label states ‘comp with type’ (2 females, MRAC 122.888). Toamasina: Tamatave, Perrot “revu par Dresco 1974,” (*Myrtale perroti* Simon, lectotype female, designated by PLG Benoit, ES #9915, AR 4134,

and syntype female, MHNH); Senbrendrana, 1891, “purchase of Gerrard, Mons. Magestre, BMNH 1891.7.1.4-5” (2 female syntypes of *Paramigas subrufus* Pocock, BMNH).

Distribution.—East central Madagascar in Toamasina province (Fig. 68).

Paramigas rothorum, new species

(Figs. 45B, 48, 49A–E, 65, 68)

Type.—Holotype female collected at Montagne d’Ambre ($12^{\circ}30'57''\text{S}$, $49^{\circ}11'04''\text{E}$) in Antsiranana Province, Madagascar, on 12 August 1992 by V. and B. Roth, deposited in CASC.

Etymology.—The specific name honors Barbara and the late Vincent Roth, collectors of the type and many other new and interesting spiders from Madagascar.

Diagnosis.—Females are distinguished from other *Paramigas* that lack a dense vestiture of long silky hairs beneath legs I and II by the pattern of longitudinal striae extending from the PER to the thoracic fovea (Fig. 48), by having legs I and II with sparse dorsal patches of procumbant setae (<15) at apices of tibiae and bases of metatarsi, the spermathecal base narrow, having head maximum diameter greater than $4.0 \times$ stalk diameter (Figs. 45B, 49C), and from *P. pauliani* by lacking prefoveal setae (Figs. 48, 49A); male unknown.

Description.—Female (holotype): Total length 10.65. Carapace yellow-brown with dark longitudinal striae extending from AME and PME to thoracic fovea (Fig. 48) and with faint dark striae along lateral margins of caput; ocular area dark, black surrounding AME, behind ALE, and extending between PME and PLE; sternum, coxae, and trochanters light yellow-brown (Fig. 49B); legs and pedipalpi yellow-brown gradually fading to light yellow-brown on tarsi; abdomen dark purple-brown; spinnerets and book lung covers light yellow-brown.

Carapace 3.85 long, 3.2 wide, height at thoracic fovea $0.39 \times$ carapace width; smooth. Caput inclined (Fig. 49A), height $1.2 \times$ that at thoracic fovea, width $0.75 \times$ carapace width; ocular area with a single seta positioned between AME and a pair of setae anterior to this; clypeus length $0.47 \times$ length OAL, procurved, with 2 setae. Thoracic fovea tripartite, recurved, width $0.19 \times$ that of carapace, $2.48 \times$ wider than long, prefoveal setae absent (Fig. 48).

Ocular area width $0.5 \times$ caput, $2.28 \times$ wider than long; AER 1.17 wide, $1.04 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.0: 1.13: 0.54: 0.56, diameter AME 0.22; AME separated by $0.77 \times$ their diame-

ter, PME by $4.0 \times$ their diameter. Ocular quadrangle $1.5 \times$ wider than long, posterior width $1.3 \times$ anterior.

Sternum 2.3 long, 2.05 wide, widest behind coxa II and narrowed anteriorly, setose along margin and sparsely setose on surface (Fig. 49B); sigilla shallow, oval, adjacent to coxa II–III, width $0.21 \times$ width sternum, distance between $0.55 \times$ width, distance from sternal margin $0.89 \times$ width. Labium with 19, pedipalpal coxae with 22–24 cuspules; labium 0.6 long, 0.7 wide, pedipalpal coxae 1.25 long, 0.8 wide, apex produced to a blunt point. Chelicerae 1.2 long, pro- and retromargins of fang furrow with 4 teeth (Fig. 49D).

Femur I 0.81, tibia I 0.46, femur IV 0.82, and tibia IV $0.5 \times$ width carapace. Spination: pedipalpus: metatarsus p 1-0-0, tarsus p 1-1-1, r 0-1-1; leg I: tibia p 1-1-2-2, r 1-1-2-1-2, metatarsus p 1-1-2-1-1-1, r 2-2-3, tarsus p 1-1-1, r 1-1-0; leg II: tibia p 2-2-2, r 0-2-2-2, metatarsus p 2-2-2, r 0-2-1, tarsus p 1-1-1, r 1-1-0; leg III: patella with approximately 18, tibia with approximately 37, and metatarsus with approximately 31 spinules, tarsus with 8–9 proapical spinules; leg IV: patella with approximately 34 spinules. Femur II with row of 5–6 stout proximal ventral setae, retrodorsum of legs I and II with sparse groups of stout, procumbant setae: 4–6 apical on tibiae, 5–7 basal on metatarsi. STC teeth (pro-retro): I, II, III (2-1), IV (1-1); ITC simple, pedipalpal claw with 1 tooth (Fig. 49E). Leg measurements (Femur + Patella + Tibia + Metatarsus + Tarsus = [Total]): I: $2.6 + 1.5 + 1.5 + 1.15 + 0.85 = [7.6]$; II: $2.3 + 1.45 + 1.35 + 1.0 + 0.85 = [6.95]$; III: $1.95 + 1.15 + 1.05 + 1.0 + 0.85 = [6.0]$; IV: $2.65 + 1.4 + 1.6 + 1.35 + 1.15 = [5.5]$; pedipalpus: $1.6 + 0.85 + 1.05 + (\text{absent}) + 0.9 = [4.4]$.

Abdomen 5.9 long, 4.2 wide, sparsely covered by short setae. Spermathecae close together with broad head and short, narrow stalk, length spermathecae $0.74 \times$ distance between them and $1.33 \times$ head diameter, diameter head $4.20 \times$ diameter stalk, head length $3.67 \times$ length stalk (Figs. 45B, 49C).

Material Examined.—Only the type.

Distribution.—Known only from the type locality in an isolated montane forest in far northern Madagascar (Fig. 68).

Genus *Thyropoeus* Pocock 1895

Thyropoeus Pocock 1895:191–192 (type species, by monotypy, *Thyropoeus mirandus* Pocock 1895). Simon 1903:883. Roewer 1942:193. Bonnet 1959:4607. Dresco & Canard 1975:784. Raven 1985:144. Platnick 1989:71. Dipenaar-Schoeman & Jocqué 1997:77. Platnick 2001.

Heteromigella Strand 1908:454 (type species, by monotypy, *Heteromigella malagasa* Strand 1908). Roewer 1942:193. Bonnet 1957:2184. First synonymized by Raven 1985:144.

Diagnosis.—Distinguished from all other migid genera by having deep, lunate shaped sternal sigilla (Figs. 51B, 53B, 58B), clavate spermathecae that gradually taper from narrow base to broad apex (Figs. 56A–D), prolaterally expanded male tibia I (Figs. 52, 55A) and a large tooth on STC III (Figs. 51E, 58G).

Note.—The diagnostic characters (above) are possible synapomorphies for the genus.

Description.—Medium to large sized, 13.0–44.1 in length. Carapace smooth in female, rugose in male, length $1.00\text{--}1.08 \times$ width, posteriorly narrowed in female, rounded in male; caput raised (Figs. 51A, 58A), with median ocular seta, prefoveal setae present (*T. mirandus*) or absent (*T. malagasus*). Ocular area $0.41\text{--}0.65 \times$ width caput; AER straight to slightly recurved, ALE diameter equal to or less than AME; PER straight to slightly recurved, PLE diameter equal to or less than PME; ocular quadrangle narrowed anteriorly. Thoracic fovea tripartite, straight or weakly recurved, $0.21\text{--}0.26 \times$ width carapace. Sternum length $1.09\text{--}1.69 \times$ width, margin sinuate; setose along margin, sparsely setose on surface; sigilla lunate, deep, length $0.02\text{--}0.11 \times$ sternum width. Thorns absent from coxae. Leg formula 4123 (female) or 1423 (male); femur III with ventral membrane extending to base, tibia III with deep dorsobasal excavation (Figs. 50, 57), anterior ridge present or absent. Male with tibia I expanded prolaterally (Figs. 52, 55A), with retrolateral tibia I megaspine (Figs. 53C, 55B), bulb uniform (Figs. 53E–G, 54A–C), embolus simple and slender, length $0.55\text{--}0.61 \times$ bulb length. Spermathecae gradually tapering from narrow base to broad apex, straight to distally curved, with pores throughout, unsclerotized (Figs. 51C, 56A–D, 58C, D).

Natural History.—Collection data with *Thyropoeus malagasus* suggest that they may be terrestrial.

Composition.—Two species.

Distribution.—Southern and western Madagascar (Fig. 68).

Thyropoeus malagasus (Strand) 1908

(Figs. 50, 51A–E, 52, 53A–H, 54A–C, 55A–D, 56D, 65, 68)

Heteromigella malagasa Strand 1908:454 (holotype female from St. Marie de Marovoay, Madagascar, in NHR Stockholm, examined).

Heteromigella malagassa, Petrunkevitch 1928:69 (unjustified emendation). Roewer 1942:193. Bonnet 1957:2184.

Thyropoeus malagassa, Raven 1985:145. Platnick 1989:71.

Thyropoeus malagasus, Platnick 2001.

Synonymy.—Raven (1985) first proposed the synonymy of *Heteromigella* Strand under *Thyropoeus* Pocock. He noted the similarity in the deep, lunate

shaped sternal sigilla and the dorsobasal excavation on tibia III shared by *Heteromigella malagasa* Strand and *Thyropoeus mirandus* Pocock. Although the dorsobasal excavation on tibia III is shared by other Malagasy Migidae, the lunate sternal sigilla are unique to *Thyropoeus* and *Heteromigella*. The types of *Heteromigella malagasa* and *Thyropoeus mirandus* have been examined and found to share these features, confirming Raven's decision.

Notes.—Petrunkevitch (1928:69), without comment, used *malagassa* instead of Strand's name *malagasa*. This change was followed as an emendation by Roewer (1954) and Bonnet (1957), the latter stating "Il vaut mieux écrire malagassa" (Bonnet 1957:2184). This emendation is unjustified under the rule of nomenclature (ICZN 1999, Article 33.2.3).

The male is described here for the first time. Although the type locality of *H. malagasa* in Mahajanga Province is far from Vohimena in Toliara Province, the great similarity of females from each locality indicate that they are conspecific.

Diagnosis.—Distinguished from *Thyropoeus mirandus* by its smaller size (length 12.9–14.8), thoracic fovea that is straight to weakly procurved medially (Fig. 50) in females, and the basal tooth on the fang (Figs. 51B, 53B).

Female.—(Holotype): Total length 14.8. Specimen faded. Carapace pale yellow-brown with faint dark areas along lateral margins of caput; ocular area, chelicerae, sternum, labium, coxae, pedipalpi and legs pale yellow-brown; abdomen yellow-white including spinnerets.

Carapace 5.8 long, 5.4 wide, height at thoracic fovea $0.22 \times$ carapace width; smooth. Caput highly arched, height $2.5 \times$ that at thoracic fovea, width $0.79 \times$ carapace width; median ocular seta present with a pair and single seta anterior to this, one pair of setae on clypeus; clypeus $0.42 \times$ length OAL, margin straight. Thoracic fovea weakly procurved medially and recurved at sides, width $0.25 \times$ that of carapace, $7.0 \times$ wider than long; prefoveal setae absent.

Ocular area width $0.46 \times$ caput, $2.85 \times$ wider than long; AER 2.0 wide, $1.08 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.0: 1.6: 1.6: 1.0, diameter AME 0.13; AME separated by $1.3 \times$ their diameter, PME by $3.0 \times$ their diameter. Ocular quadrangle $0.92 \times$ wider than long, posterior width $2.08 \times$ anterior.

Sternum 3.6 long, 3.2 wide, widest behind coxa II and narrowed anteriorly, sparsely setose along margin and on surface; sigilla adjacent to coxa II, $0.03 \times$ width sternum, distance between $0.77 \times$ distance from margin. Labium with 17 and pedipalpal coxae with 32–33

cuspules; labium 1.0 long, 1.3 wide, pedipalpal coxae 2.0 long, 1.4 wide, apex produced to a blunt point. Chelicerae 2.5 long, promargin of fang furrow with 3 teeth, retromargin with 6 teeth, pro-and retromargins interspersed with 8 denticles.

Femur I 0.59, tibia I 0.37, femur IV 0.68, and tibia IV $0.39 \times$ width of carapace. Spination: pedipalpus: tibia p 1-2, r 0 or 0-0-1, tarsus p 2-2-1-1, r 1-1-1-1; leg I: tibia p 3-2-2, r 2-4-2, metatarsus p 2-4-4, r 3-3-3, tarsus r 2; leg II: tibia p 3-3-2, r 0-2-2, metatarsus p 2-3-3, r 3-2-2, tarsus r 2-0; leg III: patella with approximately 55, tibia with approximately 75, metatarsus with approximately 54, and tarsus with approximately 20 spinules; leg IV: patella with approximately 70 and tibia with approximately 30 spinules, metatarsus v0-0-2a. STC (pro-retro) I, II, and IV (1-1), III (1-2), ITC simple, pedipalpal claw with 1 simple tooth (Fig. 51E). Leg measurements (Femur + Patella + Tibia + Metatarsus + Tarsus = [Total]): I: $3.2 + 2.2 + 2.0 + 1.55 + 1.0 = [9.95]$; II: $2.95 + 2.2 + 1.9 + 1.65 + 1.2 = [9.9]$; III: $2.65 + 2.05 + 1.5 + 1.65 + 1.4 = [9.25]$; IV: $3.7 + 2.35 + 2.15 + 2.05 + 1.7 = [11.95]$; pedipalpus: $2.4 + 1.35 + 1.5 + (\text{absent}) + 1.5 = [6.75]$.

Abdomen 6.5 long, 5.5 wide, sparsely covered with short setae. Spermathecae not dissected but through cuticle they appear to be like those of FMNH female (see below).

Variation (N=2).—Total length 13.0–14.8. Markings of a fresh female specimen from Vohimena are pale yellow-brown on prosoma except dusky on middle of and along margin of caput, with black surrounding each AME and mesad of each ALE, PME and PLE; abdomen yellow-white, unmarked (Figs. 50, 51A–B). Height at fovea $0.16\text{--}0.22 \times$ carapace width. Caput $0.79\text{--}0.84 \times$ carapace width, height $2.5\text{--}3.62 \times$ height at thoracic fovea; width ocular area $0.41\text{--}0.46 \times$ caput width, diameter ALE $1.6\text{--}1.7 \times$ AME, PLE $1.4\text{--}1.6 \times$ PME; clypeus length $0.83\text{--}1.15 \times$ OAL, 3–4 setae anterior of ocular area; thoracic fovea width $6.2\text{--}7.0 \times$ length. Teeth of fang furrow interspersed with 6–9 denticles (Fig. 51D). Sternal sigilla width $0.03\text{--}0.11 \times$ sternum width; labium with 16–17, pedipalpal coxae with 33–40 cuspules. Tibia I with 8, metatarsus I with 9–10 retroventral spines, tibia II with 6–8 proventral spines. STC may have small denticle distad to tooth. Spermatheca (of FMNH specimen from Vohimena) length $3.0 \times$ maximum diameter, length $0.88 \times$ base width, maximum diameter $1.45 \times$ minimum, head and stalk not distinguishable (Figs. 51C, 56D).

Male.—(Vohimena): Total length 11.7. Carapace red-brown with faint dark areas along median and margins of caput and around thoracic fovea; ocular area

and chelicerae red-brown, black between AME and mesad of ALE, PME and PLE (Figs. 52, 53A); sternum, coxae, and trochanters pale yellow-brown (Fig. 53B); pedipalpi and legs II through IV pale yellow-brown with dorsal surface of femora distinctly darker than ventral surface; leg I red-brown fading to pale yellow-brown ventrally and on tarsus and apex of metatarsus (Figs. 52, 53C); abdomen yellow-white including spinnerets.

Carapace 5.0 long, 4.7 wide, height at thoracic fovea $0.25 \times$ carapace width; rugose, margin rebordered. Caput inclined (Fig. 53A), height $1.5 \times$ that at thoracic fovea, width $0.65 \times$ carapace width; median ocular seta present with a pair of setae anterior to this; clypeus $0.66 \times$ length OAL, rugose, margin straight. Thoracic fovea T-shaped, tripartite, with deep posterior part, width $0.21 \times$ that of carapace, $1.6 \times$ wider than long, prefoveal setae absent (Fig. 52).

Ocular area width $0.41 \times$ caput, $2.16 \times$ wider than long; AER 1.35 wide, $1.02 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.0: 0.63: 1.57: 0.36, diameter AME 0.27; AME separated by $0.45 \times$ their diameter, PME by $3.14 \times$ their diameter. Ocular quadrangle $1.5 \times$ wider than long, posterior width $1.5 \times$ anterior.

Sternum 2.95 long, 2.45 wide, widest behind coxa II and narrowed anteriorly; sigilla adjacent to coxa II, $0.06 \times$ width sternum, distance between $1.18 \times$ distance from margin (Fig. 53B). Labium and pedipalpal coxae lacking cuspules; labium 1.0 long, 0.95 wide, pedipalpal coxae 2.0 long, 1.05 wide, apex produced to a blunt point. Chelicerae 1.7 long, fang long and slender, with longitudinal basal tooth, promargin of fang furrow with 4 teeth, retromargin with 8 teeth, pro- and retromargins interspersed with 8 denticles (Fig. 53D).

Tibia I prolaterally swollen and with retrolateral megaspine (Figs. 52, 53C, 55A–B). Femur I 1.0, tibia I 0.78, femur IV 0.89, and tibia IV $0.63 \times$ width carapace. Scopulae weak beneath tarsi I and II, dense and entire beneath tarsi III and IV and apically on 1/3 of metatarsus IV. Spination: leg I: patella p 0-0-1-1, v 0-0-0-3, r 0-0-1-0, tibia p 0-2-2-2-2a, v 0-1-1-0, metatarsus p 0-1-1-1-1a, r 0-1-1-1-1a, tarsus r 2-1-0; leg II: patella p 0-0-1, v 0-0-1, tibia p 1-1-1-1, v 1-2-1-2-1a, metatarsus p 0-1-1-1-1a, r 1-2-1-1-1a, tarsus r 1-1-0; leg III: patella with approximately 45, tibia with approximately 50, and metatarsus with approximately 30 spinules; leg IV: patella with approximately 50 and tibia with approximately 25 spinules. STC (pro, retro) I (1-1), II (1-2), III, IV (1-1), ITC simple (Fig. 53H). Leg measurements (Femur + Patella + Tibia + Metatarsus + Tarsus = [Total]): I: $4.7 + 2.5 + 3.7 + 2.8 + 1.2 = [14.9]$; II: $4.0 + 2.0 + 2.7 + 2.6 + 1.4 = [12.7]$; III: 3.4

$+ 2.0 + 2.0 + 2.1 + 1.9 = [11.4]$; IV: $4.2 + 2.2 + 3.0 + 2.6 + 2.3 = [14.3]$; pedipalpus: $3.5 + 1.5 + 2.9 + (\text{absent}) + 0.8 = [8.7]$.

Pedipalpus with femur 0.74, tibia $0.62 \times$ carapace width; femur 4.37, tibia $3.62 \times$ length tarsus; tibia stout, prolaterally swollen (Figs. 53E–G, 54A), height $0.34 \times$ length; tarsus without apical spinules; bulb width $1.75 \times$ tarsus length; embolus length $1.25 \times$ bulb width (Fig. 53F). Abdomen 5.0 long, 3.8 wide, sparsely covered with spiniform setae (Fig. 52).

Variation (N=5).—Total length 8.8–12.9; height at fovea $0.14\text{--}0.25 \times$ carapace width. Caput inclined, caput height $1.33\text{--}2.5 \times$ that at thoracic fovea, width $0.31\text{--}0.38 \times$ carapace width; width ocular area $0.41\text{--}0.53 \times$ caput width, diameter AME $0.20\text{--}0.32$, PME $0.10\text{--}0.20$, PME interdistances $3.14\text{--}6.0 \times$ their diameter; clypeus length $0.57\text{--}0.88 \times$ OAL; thoracic fovea width $1.6\text{--}4.0 \times$ length. Sternal sigilla width $0.06\text{--}0.115 \times$ width sternum; retromargin of fang furrow with 4–6 teeth and 2–4 denticles. Metatarsus II with 4–5 proventral spines. STC with 1–3 teeth. Bulb length $2.13\text{--}2.93 \times$ width.

Natural History.—A female and many male specimens were collected in pitfall traps during January 1996. Whereas males were probably wandering, the presence of a female in these terrestrial traps suggests that this species may be terrestrial.

Distribution.—Western Madagascar (Fig. 68).

Material examined.—MADAGASCAR: Mahajanga: St. Marie de Marovoay, 22 November 1906 (holotype female of *Heteromigella malagasa* Strand 1908, NHR). Toliara: Forêt de Vohimena, 35 km SE Sakaraha, $22^{\circ}41.0'S$, $44^{\circ}49.8'E$, elev. 780m, 17–24 January 1996, S. Goodman, (2 males CAS; 1 female, 23 males, FMNH).

Thyropoeus mirandus Pocock (Figs. 56A–C, 57, 58A–G, 65, 68)

Thyropoeus mirandus Pocock 1895:192 (holotype female from S. Central Madagascar, in BMNH, examined). Simon 1903:84. Roewer 1942:192. Bonnet 1959:4607. Dresco & Canard 1975:784. Raven 1985:145. Platnick 2001.

Diagnosis.—Distinguished from *Thyropoeus malagasus* by its exceptionally large size (>30 mm body length), the absence of a basal tooth on the fang (Fig. 58B), and the broad and short ocular area that is more than $3 \times$ wider than long (Fig. 57).

Description.—Female (holotype): Total length 44.1. Carapace dark yellow-brown with faint dark longitudinal reticulate markings extending along margins of caput and medially from PME to thoracic fovea (Figs. 57, 58A). Chelicerae, pedipalpi, and legs dark

yellow-brown, femora with dorsal longitudinal bands, integument darker beneath dorsal and lateral setal bands on patellae-tibiae. Sternum, labium, and coxae dark orange-brown except yellow-brown transverse band at sterno-labial junction (Fig. 58B). Abdomen dark brown including spinnerets. Abdomen split open and stuffed with cotton, connected to prosoma by a pin.

Carapace 18.5 long, 17.0 wide, height at thoracic fovea $0.26 \times$ carapace width; smooth. Caput highly arched (Fig. 58A), height $2.1 \times$ that at thoracic fovea, length $0.52 \times$ carapace width; median ocular seta present with 13 setae positioned anteriorly; clypeus length $0.03 \times$ length OAL, margin straight. Thoracic fovea deep, T-shaped, width $0.25 \times$ that of carapace, $8.6 \times$ wider than long (Fig. 57). Prefoveal setae present.

Ocular area width $0.65 \times$ caput, $3.5 \times$ wider than long; AER 8.8 wide, $1.1 \times$ width PER. Ratio of eyes: AME: ALE: PME: PLE: 1.0: 0.3: 0.6: 0.5, diameter AME 0.6; AME separated by their diameter, PME by $6.27 \times$ their diameter. Ocular quadrangle $2.25 \times$ wider than long, posterior width $2.51 \times$ anterior.

Sternum 16.1 long, 9.5 wide, widest behind coxae II and narrowed anteriorly; sigilla adjacent to coxa II, $0.06 \times$ width sternum, distance between $1.16 \times$ distance from margin (Fig. 58B). Labium with 28 and pedipalpal coxae with 39–43 cuspules; labium 3.7 long, 4.7 wide, pedipalpal coxae 7.2 long, 4.3 wide, apex produced to a blunt point. Chelicerae 5.0 long, promargin of fang furrow with 4 teeth, retromargin with 3 teeth, pro and retromargin interspersed with 16 denticles (Fig. 58E).

Legs I and II with dense ventral distribution of long, slender setae. Femur I 0.64, tibia I 0.44, femur IV 0.61, and tibia IV $0.41 \times$ width carapace. Spination: pedipalpus: tibia p 1-1, r 0-2, tarsus p 0-3, r 2-2; leg I: tibia p 2-3-3-4, r with 29 spines in two longitudinal rows, metatarsus p 2-4-3-3-2-2-4-3, r 3-4-3-2-3-3-4-8, tarsus p 1-1, r 3-0; leg II: tibia p 0-1-1-2-2-2-2-1, r 2-3-5-5-3-3-2, metatarsus p 3-3-5-8-2, r 4-2-2-2-5-4, tarsus p 1-1, r 2-0; leg III: patella with approximately 90, tibia with approximately 140, and metatarsus with approximately 90 spinules; metatarsus with approximately 180 and tarsus with approximately 80 slender spinules; leg IV: patella with 60 spinules, metatarsus v 0-0-0-3a. STC (pro, retro) I (2-1), II (2-2), III, IV (1-2), ITC simple, pedipalp claw with a single large tooth. Leg measurements (Femur + Patella + Tibia + Metatarsus + Tarsus = [Total]): I: $10.9 + 6.0 + 7.6 + 5.6 + 1.6 = [31.7]$; II: $9.6 + 6.0 + 6.5 + 5.5 + 1.9 = [29.5]$; III: $8.7 + 5.0 + 5.1 + 5.2 + 3.2 = [27.7]$; IV: $10.5 + 8.0 + 7.0 + 7.1 + 3.6 = [36.2]$; pedipalpus: $7.7 + 3.2 + 5.1 + (\text{absent}) + 4.1 = [20.1]$.

Abdomen 23.0 long, 21.1 wide, sparsely covered with short setae. One spermathecae dissected out, with very narrow base and broad apex, length $1.79 \times$ maximum diameter, maximum diameter $4.75 \times$ minimum (Figs. 56B, 58C).

Variation (N=3).—Total length 32.0–44.1; height at fovea $0.21\text{--}0.26 \times$ carapace width. Caput $0.76\text{--}0.84 \times$ carapace width, $2.0\text{--}3.0 \times$ height at thoracic fovea; width ocular area $0.56\text{--}0.69 \times$ caput width, OAW $3.5\text{--}4.0 \times$ OAL, diameter ALE $1.14\text{--}1.28 \times$ AME, PLE = PME; clypeus length $1.12\text{--}1.54 \times$ OAL, margin weakly procurved to straight; thoracic fovea width $1.92\text{--}3.53 \times$ length. Fang furrow interspersed with 14–16 denticles (Figs. 58E–F). Sternal sigilla width $0.03\text{--}0.07 \times$ sternum width, distance between $0.6\text{--}2.0 \times$ distance from sternal margin; labium with 25–40, pedipalpal coxae with 35–50 cuspules. Tibia I with 12–29, metatarsus I with 30–32 retroventral spines, tibia II with 11–18, metatarsus II with 20–22 proventral spines. Legs I and II may have sparse to dense vestiture of fine ventral setae. STC I and II have 1–3 teeth (Fig. 58G). Spermathecal length $1.61\text{--}1.79 \times$ maximum diameter, maximum diameter $4.75\text{--}5.14 \times$ minimum (Figs. 56A–C, 58C–D).

Distribution.—Probably southern Madagascar: the type locality is vague but the Paris specimens are recorded from Ft. Dauphin at the southern tip of the island (Fig. 68).

Material Examined.—MADAGASCAR: "S. Central Madagascar," 1894, J. Last, BM1894.2.27.2 (holotype female of *Thyropoeus mirandus* Pocock, BMNH). To-liara: Fort Dauphin (3 females, MNHN AR4135).

PHYLOGENETICS

Data

A data matrix was assembled (Appendix) comprising 45 characters scored for all 14 Malagasy species, three exemplars of the outgroup families Idiopidae, Ctenizidae and Actinopodidae, and 11 exemplars of the 6 non-Malagasy migid genera *Calathotarsus*, *Heteromigas*, *Mallecomigas*, *Migas*, *Moggridgea* and *Poecilomigas*. This matrix was analyzed under a variety of parameters to obtain trees of minimum length and of maximum fit (*sensu* Goloboff 1993c).

Exemplars for the non-Malagasy migids and outgroups are listed in Table 2. When possible the type species of each genus was chosen, i.e., *Calathotarsus coronatus*, *Heteromigas dovei*, *Mallecomigas schlingeri*, and *Poecilomigas abrahami*. *Poecilomigas basilleupi* was also included because it differed from *P. abrahami* in several characters of potential phyloge-

netic importance (e.g., male tibia I megaspine, dense setal vestiture beneath legs I and II of female). The type species of *Moggridgea* (*M. dyeri*) was inappropriate because it is known only from females. Instead, *Moggridgea* species were chosen to reflect the phylogenetic diversity of the genus as proposed in Griswold (1987a): *M. peringueyi* from the *peringueyi* group, *M. intermedia* from the *quercina* group, and *M. rupicola* from the *crudeni* group. The Australian *Moggridgea tingle* was also included to test the monophyly of the genus. Exemplar selection for *Migas* was perhaps the most difficult problem. The species that we examined include the type species and comprise species from the full geographic range of the genus: *Migas affinis* from New Caledonia, *M. distinctus*, *M. gatenbyi*, *M. giveni*, *M. paradoxus*, *M. taierii* and a male of an undescribed species from New Zealand, and *M. nitens* and *M. variapalpus* from Australia. In our dataset the exemplar *Migas* comprises data from female *M. gatenbyi* and male *M. taierii*; *M. vellardi* from Chile is included as a separate taxon to test its placement within the Migidae. All Malagasy taxa are coded from the specimens listed in the monograph.

Outgroups

The Migoidea, comprising Migidae and Actinopodidae, has been well supported in the studies of Platnick and Shadab (1976), Raven (1985) and Goloboff (1993a). In order to polarize characters within the Migoidea additional outgroups are necessary. Raven proposed Ctenizidae and Idiopidae as successive outgroups to the Migoidea and Goloboff depicted the same families as forming a trichotomy with the Migoidea. Accordingly, we selected representatives of the Actinopodidae (*Actinopus*), Idiopidae (*Idiops*) and Ctenizidae (*Bothriocyrtum*) as outgroups to the Migidae. Exemplars were chosen on the basis of available material of both sexes at CASC; in addition, the exemplars of the Actinopodidae and Idiopidae are the type genera of their families.

Analysis

We analyzed our data with Hennig86 (Farris 1988) and NONA 1.8 (Goloboff 1993b) to find minimum length trees and Pee-Wee 2.6 (Goloboff 1997) to obtain trees that maximize implied weights across all characters ("fittest" *sensu* Goloboff 1993c), with all characters equally weighted (wt = 1) and unordered. We discuss the results with reference to our preferred cladogram (Fig. 65). Hennig86 analysis using the options **t**; **bb***; gave 42 trees of 96 steps with c.i. (consistency index) = 0.52 and r.i. (retention index) = 0.76. The

strict consensus of these trees is like Figure 65 except for lacking clades G through K. The results of these analyses were subjected to several rounds of successive weighting using the routine **xs**; **w**; and the trees obtained were compared with the weights reset to 1. Successive weighting gave 36 trees of 97 steps (1 step longer than the minimum). The consensus of these trees is like our preferred tree (Fig. 65) except for no resolution among the *Paramigas* species (i.e., nodes G—K were absent) and in lacking clade C, i.e. the placement of *Heteromigas* is ambiguous. We implemented Nona shuffling the input order of taxa 50 times (command **mult*50**). Trees were calculated accepting (**amb =**) and rejecting (**amb -**) ambiguous branch support. Accepting ambiguous branch support gave 45 trees, rejecting ambiguous branch support gave only four trees: all were of 96 steps. In each case the consensus gave no resolution among the *Paramigas* species (i.e., nodes G—K were absent). We implemented Pee-Wee shuffling the input order of taxa 50 times (command **mult*50**), rejecting ambiguous support (default) and using the concavity values 1 to 6. Concavity 1 gave 16 trees of fit 309.1. The strict consensus of these trees groups *Heteromigas* with clade S (*Calathotarsus*, *Goloboffia vellardi*, and *Mallecomigas*) and provides no resolution within *Paramigas*. The other concavity values each gave the same four trees: concavity 2 fit = 340.2, concavity 3 fit = 359.9, concavity 4 fit = 372.4, concavity 5 fit = 380.7 and concavity 6 fit = 387.2. In each case the strict consensus was like our preferred tree except for no resolution within *Paramigas*.

The least restrictive assumption (accepting ambiguous branch support) allows numerous trees that suggest no resolution with *Paramigas*. More restrictive assumptions (i. e., rejecting ambiguously supported branches or preferring fittest trees derived with most concavity values) gave a smaller set of possibilities: 4 trees. Although the consensus of these also suggests no resolution within *Paramigas*, examination the 4 trees reveals a simple problem: resolution is lost in the consensus because *P. manakambus* and *P. macrops* may trade positions. Each in turn may be the sister group of *P. oracle* or belong to clade H. In one tree *P. macrops* is the sister group of *P. oracle* and *P. manakambus* belongs to clade H, and in three others *P. manakambus* is the sister group of *P. oracle* and *P. macrops* belongs to clade H. The first tree is also most fully resolved.

Preferred tree

We believe that the most efficient character optimization and most realistic discussion of evolution

should be done on the shortest, best resolved tree possible. A tree is a hypothesis, and maximum resolution and minimum length make the maximum number of predictions that can be tested. We prefer the tree that is of minimum length and most completely resolved given only unambiguous node support (Fig. 65). This tree requires 96 steps and has a consistency index of 0.52 and a retention index of 0.76. Readers should keep in mind that equally short but less resolved solutions for *Paramigas* occur, and that their consensus offers no resolution within *Paramigas*.

Character optimization and branch support

We used MacClade 3.0 (Maddison and Maddison 1992) and Clados 1.2 (Nixon 1992) to optimize characters on the tree. If optimizations were ambiguous, we usually resolved them using the ACCTRAN option (Farris optimization), which favors secondary loss over convergence to explain homoplasy and therefore maximizes homology. Character optimizations and evolution are discussed below. Branch support indices (Bremer 1994) were calculated with Nona for the cladogram depicted in Figure 65 using the options **hold25000 bsupport5**. The "Bremer Support" ("Decay Index") for a given node in the shortest unconstrained tree is the number of additional steps required in the shortest trees for which that node collapses. Due to lengthy calculation times the search for branch support was truncated at values of 5, therefore the Bremer support values reported range between 0 and 5 or greater. Bremer support (decay indices) for the nodes in Figure 65 are A (2), B (3), C (1), D (4), E (5), F (1), G—K (0), L (4), M (2), N (>5), O (4), P (4), Q (3), R (1), S (2) and T (1).

CHARACTER DESCRIPTIONS AND INTERPRETATIONS

We describe the characters and their states and also discuss their evolution as implied by our analyses. Character evolution is referred to our preferred cladogram (Fig. 65).

1. OAW/ Caput width: (0) less than 0.41, (1) greater than 0.45.

A traditional character used to support the monophyly of the Migoidea has been the broad distribution of eyes on the caput (Platnick & Shadab 1976; Raven 1985; Goloboff 1991). This feature optimizes at node A as a synapomorphy for the Migoidea.

2. Ocular area width: (0) normal for Migoidea, (1) extra wide.

The ocular areas of *Calathotarsus coronatus* (Fig. 4), *C. simoni* (but not *C. pihuychen*) and *Goloboffia vellardi* are especially wide, greater than $0.60 \times$ carapace width (Fig. 14A). Most migids and their outgroups have the ocular area with less than $0.40 \times$ carapace width, and even the wide ocular areas of *Actinopus* and *Thyropoeus mirandus* (Fig. 57) are less than $0.55 \times$ carapace width. The extra wide ocular area optimizes as a synapomorphy at node T for *Calathotarsus* plus *Goloboffia vellardi* with presumed reversal in *C. pihuychen*.

3. Prefoveal setae: (0) absent, (1) present, small, length $<1 \times$ interdistances, (2) present, enlarged, length $>1 \times$ interdistances.

A pair of setae is usually present on the caput near the anterolateral margins of the thoracic fovea (Figs. 1, 18). These setae may be small in or absent from males. *Bothriocyrtum* and *Idiops* have at least three bands of setae extending from the PME to the thoracic fovea. In *Idiops* an enlarged pair of setae, which we code as prefoveals, is closer to the ocular area than to the thoracic fovea. In *Actinopus* females there are setae near the anterior margin of the thoracic fovea, which the highly-arched caput renders nearly invisible when viewed from above. In some Migidae the pre-foveal setae are absent, in others conspicuously enlarged. Our cladogram implies a complex evolutionary history for these setae. Small prefoveals (state 1) is the most likely plesiomorphic state (Fig. 46A). Also coded as state 1 are the infinitesimal prefoveals of *Paramigas alluaudi* (Fig. 28A) and some *Paramigas* males. Enlarged prefoveals (state 2) have evolved in parallel five times: at node Q as a synapomorphy for *Poecilomigas* plus *Migas* (Figs. 13A–B, 18), and in *Idiops*, *Moggridgea tingle*, *Paramigas pauliani* (Fig. 44A), and *P. milloti* (Fig. 1). Prefoveals have been lost in parallel (state 0) four times: in *Moggridgea intermedia* (Figs. 15A–B), *Thyropoeus malagasus* (Figs. 50, 51A), and in *Paramigas oracle* (Fig. 41A) and *P. rothorum* (Fig. 48).

4. Caput setation: (0). Extensive, with four to many setae posteriad of ocular area. (1) reduced, with prefoveal setae only or lacking setae altogether posteriad of ocular area.

Idiopids, ctenizids and actinopodids have the caput with two to several rows of setae extending back from the ocular area. Most Migidae also have setae on the caput. *Migas* (Figs. 13A–B), *Heteromigas* (Fig. 8), *Mallecomigas* (Fig. 12A) and *Poecilomigas* (Fig. 18) may have three strong longitudinal rows of setae; most

Moggridgea (Figs. 15A, B), *Calathotarsus*, and *Goloboffia vellardi* have two to three weak rows; *Moggridgea tingle*, other *Moggridgea* and *Migas affinis* have at least a row of 2–3 setae as well as prefoveal setae. The Malagasy Migidae lack setae on the caput posteriad of the ocular area with the exception of prefoveal setae (Figs. 2A, 23A, 50). This loss is a synapomorphy at node D.

5. Female caput height/ caput length: (0) highly arched (height > 0.72 × length), (1) low (height < 0.7 × length).

When viewed from a lateral perspective, the female carapace of Actinopodidae, Idiopidae, Ctenizidae, and some Migidae (i.e., *Calathotarsus* [Fig. 5A], *Thyropoeus* [Figs. 51A, 58A], *Heteromigas* [Fig. 9A]) is strongly arched. This character is most dramatic in the Actinopodidae. The arch may be absent or reduced in males. Most migids have the caput only slightly higher than or equal to the height at the thoracic fovea (Figs. 13A, 15A, 23A, 34A). A ratio comparing the height of the caput to its length (from thoracic fovea to clypeus) quantifies this character. The arched caput is plesiomorphic with a low caput derived in parallel three times: as synapomorphies at nodes E and N, and in *Goloboffia vellardi*.

6. Fovea: (0) procurved, (1) recurved.

The thoracic foveae of the outgroups Actinopodidae, Idiopidae, Ctenizidae are strongly procurved. All Migidae have the fovea recurved: even *Thyropoeus malagasus*, which has the median part of the fovea slightly procurved, has the corners recurved (Fig. 50). The recurved fovea (Fig. 2A) is a synapomorphy at node B for the Migidae.

7. Fovea shape: (0) simple, (1) tripartite.

Some migids have a longitudinal, posterior groove connecting with the transverse foveal groove (Figs. 2A, 22, 41A). Pocock (1895) was the first to recognize this tripartite fovea in *Paramigas subrufus* and used it to diagnose the genus *Paramigas*. Both males and females of *Heteromigas* and all Malagasy migids except *Thyropoeus malagasus* have a conspicuous posterior groove, though the groove in *Heteromigas* is shallow (Figs. 8, 10) whereas that of the Malagasy migids is deep. As noted by Griswold (1987a, figs. 106–116, 149–150) the character may be variable at least within some *Moggridgea*. Some *Calathotarsus* individuals may have this weakly developed and it is faintly visible in *Mallecomigas* (Fig. 12A). We consider the groove reduced in these taxa, and code their foveae as simple. Interestingly, all Malagasy *Paramigas* share this fovea shape including very small immature indi-

viduals (Fig. 2A). The tripartite condition optimizes as plesiomorphic for those taxa with recurved foveae with the simple fovea arising twice: as a synapomorphy at node M and in *Thyropoeus malagasus*.

8. Cheliceral tooth row number: (0) 2 rows only, (1) with denticles scattered between the rows of large teeth.

Some Migidae and all outgroup taxa except *Idiops* show complex dentition patterns on the chelicerae including large teeth and much smaller denticles, which are scattered on the fang furrow between the tooth rows and beneath the fang when it is closed. *Idiops* has a promarginal row of large teeth and a retrobasal row of small teeth, which we have not coded as denticles. Denticles occur in *Calathotarsus* (Fig. 5D), *Heteromigas* (Fig. 9C), *Thyropoeus* (Figs. 51D, 58E–F) and *Micromesomma* (Fig. 23C). *Goloboffia vellardi* has 2–3 denticles (Fig. 14E), as do some *Paramigas* (Fig. 39D). Other migids have only 2 rows of teeth without denticles (Figs. 13D, 15E, 41E–F). The plesiomorphic state is equivocal at the base of our cladogram, but denticles optimize unambiguously as plesiomorphic for the Migoidea. Loss of denticles occurs in *Idiops*, at nodes H and K within *Paramigas*, and possibly at node M with their reappearance at node T as a synapomorphy for *Calathotarsus* plus *Goloboffia vellardi*. Alternatively their presence in *Calathotarsus* and *Goloboffia vellardi* may be a plesiomorphic retention: this requires parallel loss at node N and in *Mallecomigas*.

9. Intercheliceral basal swellings: (0) absent; (1) present.

This is a small unsclerotized swelling located basally on the cheliceral promargin proximad of the teeth (Figs. 24E, 43B) in *Actinopus*, *Migas*, *Poecilomigas*, *Paramigas*, *Micromesomma* and some *Moggridgea*. This feature appears to have arisen three times: in *Actinopus* and as synapomorphies at nodes E and N (with loss of this feature in *Moggridgea peringueyi*).

10. Male intercheliceral tumescence: (0) absent; (1) present.

Intercheliceral tumescence refers to pale, unsclerotized areas presumed to be of glandular origin on the interior surfaces of the chelicerae in some male mygalomorphs. This feature has been recorded by Raven (1985) and scored and used cladistically by Goloboff (1993a). On our cladogram (Fig. 65) intercheliceral tumescence arises as a synapomorphy at node M with loss within *Moggridgea* at node P.

11. Rastellum: (0) absent, (1) present.

A traditional character used to unite the Migidae

has been the absence of a rastellum at the apex of the chelicerae (Raven 1985, Goloboff 1991). This character is corroborated by our analysis as a synapomorphy at node B for the Migidae.

12. Fang shape: (0) round, (1) quadrate and keeled.

A traditional character used to support the monophyly of the Migidae has been the presence of strong keels on the fang (Goloboff 1991, Raven 1985). The keeled fangs of Migidae are also quadrate in shape with minute serrations basally on the pro- and retrolateral margins (Figs. 2C, 43A). This character is corroborated by our analysis as a synapomorphy at node B for the Migidae.

13. Fang basal tooth: (0) absent, (1) present.

The monophyly of the Miginae (*Migas* and *Poecilomigas*) has been suggested by the presence of a small basal tooth on the fang (Fig. 59D) (Griswold 1987a, 1987b; Raven 1985). Goloboff and Platnick (1987) were first to recognize potential problems with this character as a similar tooth is also present in *Actinopus*. *Thyropoeus malagasus* has a basal tooth (Fig. 51B) although its sister species, *T. mirandus*, does not (Fig. 58B). Our analysis suggests that the basal tooth has arisen in parallel 4 times: as a synapomorphy at node Q for *Migas* plus *Poecilomigas*, and as autapomorphies in *Actinopus*, *Goloboffia vellardi*, and *Thyropoeus malagasus*.

14. Fang orientation: (0) vertical, (1) diagonal.

The diagonal fang orientation found in the Actinopodidae and Migidae (Figs. 2C, 12B) was used by Raven (1985) in support of the Migoidea. The character is further corroborated as support at node A for the Migoidea in our analysis.

15. Pedipalpal coxa cuspule distribution: (0) across coxa to apex, (1) proximally near labium.

Females of all Chilean Migidae (including *Goloboffia vellardi*) share a cuspule distribution that is concentrated at the proximal edge of the pedipalpal coxa near the labium (Figs. 5B, 12, 14B), which is a synapomorphy at node S. *Bothriocyrtum* also has this state, but this is most parsimoniously interpreted as a parallelism.

16. Pedipalpal coxa cuspule anterior distribution: (0) broadly across coxa to apex, (1) only proximally near labium.

Goloboff and Platnick (1987) noted that *Heteromigas* and *Mallecomigas* have the cuspules on the pedipalpal coxae extending to the anterior face of the segment (rather than confined to the ventral surface) and

suggested that this feature is primitive and might indicate that either of these genera, or both together, might represent the sister group of all remaining migids. In fact cuspules extend onto the anterior surface of the pedipalpal coxae in all taxa studied. In *Actinopus* and *Heteromigas* cuspules extend broadly onto the anterior surface, whereas in all others the cuspules extend only onto the anteromedian corner. We have optimized broad anterior extension as a synapomorphy for Migoidea at node A with reversal to anterior extension only at the corner as a synapomorphy at node C. Alternatively broad extension may have arisen in parallel in *Actinopus* and *Heteromigas*.

17. Thorns on coxae II–III: (0) absent, (1) present.

Thorns are stout, shortened setae that have a length $5 \times$ or less than their basal diameter (Figs. 23B, 25D). They differ from cuspules in gradually tapering to a point rather than first expanding from the base (Fig. 25D). Pocock (1895) used the distribution of thorns on the coxae as support for his new genus *Micromesomma*. Thorns occur in both females and males of some *Moggridgea*, though reduced in size and number in the latter (the male of *Micromesomma* is unknown). Griswold (1987a) also used the distribution of thorns on the coxae in his analysis of *Moggridgea* and suggested that these features indicate a sister-group relationship between *Micromesomma* and *Moggridgea*. Our cladogram refutes this, suggesting that thorns arose in parallel in *Micromesomma* and *Moggridgea*.

18. Anterior sternal sigilla: (0) present, (1) absent.

Migidae lack the anterior sternal sigilla, which are present in their outgroups. Goloboff (1993) used this character (his character 69: "posterior" is a typo [Goloboff pers. commun.]). Loss of anterior sternal sigilla is a synapomorphy at node B for the Migidae.

19. Deeply excavate, lunate shaped sternal sigilla: (0) absent, (1) present.

Pocock (1895) recognized the deeply excavated, lunate shaped sternal sigilla as diagnostic for *Thyropoeus* (Figs. 51B, 58B). Raven (1985) recognized the significance of similar sigilla in *Heteromigella malagasa* Strand and synonymized *Heteromigella* with *Thyropoeus*. Our analysis corroborates this morphology as a synapomorphy at node L for *Thyropoeus*.

20. Female tarsi I and II spines: (0) present; (1) absent.

Most migids and their outgroups have spines on female tarsi I and II (Figs. 1, 14C). *Migas* (Fig. 13C), *Poecilomigas* (Fig. 18), and *Moggridgea* (Figs. 15C, 16B) lack these spines, a synapomorphy at node N.

21. Female leg I and II shape: **(0)** rounded; **(1)** dorsoventrally flattened.

When viewed from a lateral perspective, the tibiae, metatarsi, and tarsi of legs I and II appear dorsoventrally flattened in all Migidae although they may be less flattened in males. We quantified this character by measuring the cross section of the tibia I apex at the tibia-metatarsus joint. *Idiops* and *Actinopus* have nearly round tibiae I and II, with the ratio of breadth to height less than 1.1, whereas *Bothriocyrtum* and all Migidae have the ratio of breadth to height greater than 1.2. Goloboff and Platnick (1987) suggested that *Mallecomigas* had these segments more rounded than other migids, but we find the cross section of *Mallecomigas* tibia I to be little different from that of *Migas*. This character cannot be polarized with our data set, but comparison to other mygalomorphs suggests that flattened legs (shared by *Bothriocyrtum* and the Migoidea) are derived. We optimize flattened legs as a synapomorphy at node B with parallelism in *Bothriocyrtum*.

22. Patellar ventral lamellate setae: **(0)** absent, **(1)** present.

Recognized by Cambridge (1875) and Hewitt (1913c), these erect, distally expanded setae (Fig. 61D) beneath at least patellae I, II and IV were postulated as a synapomorphy for *Moggridgea* by Griswold (1987a). Main (1991) discovered these setae in two new species from Australia, which she placed in *Moggridgea*. The setae occur in both males and females of the African species but only in females of the Australian *M. tingle*. We have found these setae beneath patellae I, II and IV in a female of the Chilean migid *Goloboffia vellardi* Zapfe (Fig. 14C). Although erect setae may occur in a similar position beneath the patellae of *Migas gatenbyi* these do not have the characteristic lamellate shape. Our analysis suggests that lamellate setae are a synapomorphy at node O for *Moggridgea* (Figs. 15C, 16B) with parallel evolution in *Goloboffia vellardi*.

23. Leg I and II long, fine, curved ventral setae: **(0)** absent to weak, **(1)** dense.

The densely distributed, long, fine, curved ventral setae that extend beyond the spine tips of legs I and II of females (Figs. 27A, 41B) were first recognized by Pocock (1895) in *Paramigas subrufus* and mentioned as a diagnostic character for *Paramigas* by Raven (1985). Griswold (1987b) recorded such setae in *Poecilomigas abrahami*. These setae are very densely distributed. In *Migas gatenbyi* more than 15 setae can be counted on a transverse line between the spine rows on tibia I (Fig. 13C); in *Poecilomigas abrahami*, and *Paramigas oracle* (Figs. 27A, 41B), *P. goodmani* (Fig.

33) and *P. perroti* (Fig. 47C) there are more than 20. Some specimens of *Thyropoeus mirandus* have long, curved setae beneath legs I and II: although these are in longitudinal rows rather than being evenly distributed we code this state as present. Coding *T. mirandus* either way makes no difference to the resulting trees. These setae do not occur in males. Our analysis suggests that the dense setal vestiture has arisen in parallel within *Paramigas* at node J, in *Thyropoeus mirandus*, in *Poecilomigas abrahami* and in *Migas*. It could be a synapomorphy at node Q for *Migas* plus *Poecilomigas*, but, given the variability in *Poecilomigas* and *Migas*, we prefer to minimize its importance until *Migas* is revised.

24. Dorsal setae at apex of tibia I and II: **(0)** erect, **(1)** procumbant and stout.

A conspicuous retrodorsal patch of thickened procumbant setae is present on the apices of tibiae I and II near the tibia-metatarsus joint of *Paramigas* (Figs. 27A–C). These setae may be dense (e.g., *Paramigas perroti*, *P. pectinatus*) or sparse (e.g., *P. pauliani*, *P. alluaudi*). *Micromesomma* has thorns in the same position (Figs. 22, 24A–B). In most other specimens examined the setae in this region are evenly distributed and erect (Figs. 13C, 14C). *Thyropoeus mirandus* has extensive longitudinal dorsal bands of procumbant setae on legs I and II (Fig. 57): whereas there are retrodorsal procumbant setae at the tibia-metatarsus joints such setae also occur dorsally and extend to mid-segment. We have not coded the condition in *T. mirandus* as homologous to that in *Micromesomma* and *Paramigas*. These setae do not occur in males. Our analysis suggests that these setae are a synapomorphy at node E for *Micromesomma* plus *Paramigas*.

25. Dorsal setae at base of metatarsus I and II: **(0)** erect, **(1)** procumbant and stout.

A conspicuous retrobasal patch of thickened procumbant setae is present on the bases of metatarsi I and II near the tibia-metatarsus joint of *Paramigas* (Figs. 27A–B). Like the previous character these setae may be dense or sparse. *Micromesomma* lack procumbant setae in this position (Figs. 24A, B). These setae do not occur in males. Our analysis suggests that these setae are synapomorphic at node F for *Paramigas*.

26. Femur III ventral membrane: **(0)** short, **(1)** elongate.

The length of the ventral membrane of the femur-patella joint on femur III may be restricted to 1/4 (Fig. 59B) to 1/3 (Figs. 15D, 61C) the length of the femur (most migids and their outgroups), or extend at least 4/5 the length of the femur (Malagasy migids including

Micromesomma, *Paramigas* and *Thyropoeus*) (Figs. 42C, 44D). This character appears to be independent of the tibia III dorsobasal excavation (see below) found in Malagasy migids: in other taxa with a tibia III dorsobasal excavation (e.g., *Moggridgea*; *Ctenizidae Um-midia*) the membrane is short (Figs. 15D, 61C). This feature does not occur in males. Our analysis suggests that this morphology is a synapomorphy at node D for the Malagasy Migidae.

27. Tibia III dorsobasal excavation: (0) absent, (1) present.

Most Migidae and their outgroups have tibiae III that are cylindrical (Figs. 4, 8, 14D, 59A). The presence of a dorsobasal excavation on tibia III was used by Raven (1985) to support inclusion of *Moggridgea* in the Paramiginae. The dorsobasal excavation is a depressed, glabrous, usually shiny dark area at the base of tibia III (Figs. 1, 25A–C). In most *Moggridgea* (including *M. tingle* from Australia) it is small and shallow (Fig. 15D, 61A–B), although in some species it may be absent (e.g., *M. crudeni*, Griswold 1987a fig. 18). In *Moggridgea breyeri* the dorsobasal excavation is deep and equals nearly one quarter the length of the segment (Griswold 1987a, fig. 86). In all Malagasy Migidae the dorsobasal excavation is deep and equals nearly one third of the segment length. All dorsobasal excavations, whether shallow or deep, are coded as homologues. A vestige of the dorsobasal excavation may or may not occur in males: it is visible, at least as a darkened area, in the males of Malagasy *Paramigas* (Figs. 29, 36). Our analysis suggests that the dorsobasal excavation has arisen in parallel in *Moggridgea* (node O) and the Malagasy Migidae (node D). When this character was weighted until forcing the monophyly of *Moggridgea* plus the Malagasy Migidae the resulting trees were 4 steps longer than minimum length trees.

28. Tibia III anterior surface: (0) convex, (1) with diagonal ridge.

The anterior surface of tibia III of most migids and their outgroups is convex (Figs. 14D, 59A, 61A). The Malagasy migids (except *Thyropoeus malagasus*) have a weak to strong diagonal ridge extending from the midpoint of the dorsobasal excavation to the middle or nearly to the apex of the segment (Figs. 25A, 42A, 47D). No vestige of this ridge is found in males. We optimize this as a synapomorphy at node D for the Malagasy Migidae with loss in *Thyropoeus malagasus*. Alternatives are parallel evolution in *Thyropoeus mirandus* and clade E.

29. Spines on female patella and tibia III: (0) stout, (1) slender.

The spines on the anterior surfaces of patella and tibia III of most taxa studied are short and stout, with a length that is less than 5 times base width (Figs. 1, 25). *Heteromigas* (Fig. 8), *Calathotarsus* (Fig. 4), *Mallecomigas* (Fig. 12D), and *Goloboffia vellardi* (Fig. 14D) resemble one another in having slender spinules with length greater than 10 times base width. This state optimizes as a synapomorphy at node S with parallel evolution in *Heteromigas*.

30. Dark dorsal and lateral maculations forming bands on leg tibia: (0) absent, (1) present.

Many migids have dorsal and lateral maculations on the leg tibiae and metatarsi (e.g., Fig. 28B). In *Poecilomigas* these marks are overlain by diffuse dark bands that completely surround the segment forming conspicuous basomedian leg bands most prominent on the tibiae (Fig. 18). This banding was commemorated by Simon's naming the genus *Poecilomigas* (Simon 1903) and was proposed as a synapomorphy for this genus by Griswold (1987b). Our analysis corroborates this character as a synapomorphy for *Poecilomigas* at node R.

31. Preening comb at apex of metatarsus IV: (0) absent, (1) mixed and/or separate at base (calathotarsine type), (2) identical and on common base (*Moggridgea* type).

We define preening combs as rows or clusters of apical setae that differ conspicuously from their surroundings and that may be regularly arranged (see also Raven 1984:381; Griswold 1987a; Goloboff & Platnick 1987). In most migids and their outgroups, setae at the metatarsal apex do not form combs. *Calathotarsus*, *Mallecomigas*, *Goloboffia vellardi*, most *Migas* (but not *M. affinis*) and most *Moggridgea* have unambiguous preening combs at the apex of metatarsus IV. The nature of these setae may differ among taxa. In most *Moggridgea* the comb setae are similar in length and thickness and arise juxtaposed from a common base (Figs. 62C–D). In *Calathotarsus* (Figs. 62A–B) and many *Migas* long setae are widely spaced and may alternate with short setae. In *Goloboffia vellardi* and *Mallecomigas* (Goloboff & Platnick 1987:3, 9) and other *Migas* (Fig. 59C) the setae are uniformly long and separated at the base by distances greater than their diameter. Vestiges of these combs occur in males, e.g., *Calathotarsus* males have well developed combs on metatarsi III and IV, and in *Moggridgea* males there is a comb on metatarsus IV. Most migids may be scored unambiguously as having or not having combs. *Het-*

eromigas dovei has 3–5 slender setae regularly arranged at the retroapex on metatarsus IV whereas other *Heteromigas* species have nothing resembling a comb (Raven 1984, pers. commun.). We score the comb as absent in *Heteromigas*. A comb of widely-spaced setae optimizes as a synapomorphy at node M with loss of the comb occurring at node R for *Poecilomigas*. The *Moggridgea* type of comb optimizes as a synapomorphy at node P for the African *Moggridgea*.

32. Preening comb at apex of metatarsus III: (0) absent, (1) present.

Calathotarsus (Fig. 4), *Mallecomigas*, and *Goloboffia vellardi* (Fig. 14D) have combs at the apex of metatarsus III that may be similar to those at the apex of metatarsus IV. The metatarsus III comb of *Goloboffia vellardi* alternates long and short setae, differing from the comb of uniform setae on metatarsus IV. This comb is a synapomorphy at node S uniting *Calathotarsus*, *Mallecomigas* and *Goloboffia vellardi*.

33. Preening comb extent: (0) narrow, (1) extending around more than one fifth of segment circumference.

Whereas the preening combs of *Moggridgea* and *Migas* consist of a few closely-spaced setae (Figs. 59C, 62C–D), the combs of *Calathotarsus*, *Mallecomigas*, and *Goloboffia vellardi* consist of many setae that extend part way around the ventral apex of the segment (Figs. 4, 62A–B). These broad combs are most conspicuous when the segment is viewed end-on. Optimization of this character is ambiguous. We prefer the broad comb as a synapomorphy at node S uniting *Calathotarsus*, *Mallecomigas* and *Goloboffia vellardi*. Alternatively the narrow comb could be a synapomorphy at node N uniting *Moggridgea*, *Migas*, and *Poecilomigas* (where it is lost).

34. STC III and IV: (0) claw larger than tooth, (1) tooth larger than claw.

The superior tarsal claws of legs III and IV may have one (e.g. *Paramigas pauliani*) to three teeth (e.g., *Paramigas macrops*) beneath the apex (Figs. 37H, 44I). In most taxa the teeth are shorter than the apex of the claw but in both *Thyropoeus malagasus* (Fig. 51E) and *T. mirandus* (Fig. 58G) the tooth is as long as or longer than the apex of the claw. This is particularly pronounced on STC III. In *Idiops* the tooth of STC III is also large, though not as large as in *Thyropoeus*. This enlarged tooth is a synapomorphy at node L uniting the two species of *Thyropoeus*.

35. ITC III size: (0) large, greater than 1/3 length of STC III, (1) small, less than 1/5 length of STC III.

Goloboff and Platnick (1987) noted that *Mallecomigas* resembles the Actinopodidae in having a normal (rather than reduced) ITC III, implying that the large inferior tarsal claw is a shared primitive feature. We quantified ITC III size by comparing its length to that of STC III. *Idiops*, *Actinopus*, *Heteromigas dovei*, *Mallecomigas schlingeri* and *Thyropoeus mirandus* have ITC III that are at least 1/3 the length of the STC and all other taxa studied have reduced ITC. Large ITC optimize as primitive with reduced ITC appearing in *Bothriocyrtum* and at node C within the Migidae. The large ITC of *Mallecomigas* and *Thyropoeus mirandus* are reversals.

36. Male femur I venter: (0) convex, (1) carinate.

Male femora are typically cylindrical or laterally flattened (Figs. 7D, 11D, 30B). The ventral surface of femur I (and femur II of many species) of African *Moggridgea* is so strongly laterally flattened that it forms a ventral carina or ridge (Fig. 60C; Griswold 1987a, fig. 13). The carinate femur I optimizes as a synapomorphy at node P for the African *Moggridgea*.

37. Male pedipalpal tibia apex form: (0) Ectal lobe blunt, not or only slightly longer than mesal, (1) ectal lobe pointed, much longer than mesal.

The apex of the male pedipalpal tarsus has two lobes that are of near equal length in most migids and their outgroups (Figs. 7A–C, 11A–C, 32C, 54B). The ectal lobe is much broader than the mesal, and in *Moggridgea intermedia*, *M. peringueyi* and *M. rupicola* (as well as most other African *Moggridgea*) this lobe is pointed and extends far beyond the apex of the mesal lobe (Figs. 16A, 32D). The morphology of unequal apical lobes of the pedipalpal tarsus optimizes as a synapomorphy at node P for the African *Moggridgea*.

38. Male pedipalp tarsus apical spinules: (0) absent, (1) present.

One or more elongate spines, conspicuously stouter than the surrounding setae, may be present at the apex of the male pedipalpal tarsus in some Migidae (*Poecilomigas* [Figs. 20A–B], *Paramigas* [Figs. 32C, 37E–G], and *Goloboffia vellardi*) and Idiopidae. Our analysis suggests that apical spinules evolved four times: as synapomorphies at node F for *Paramigas* (the male of *Micromesomma* is unknown) and node Q for *Migas* plus *Poecilomigas*, and in *Idiops* and *Goloboffia vellardi*.

39. Male retrolateral tibia I megaspine: (0) absent, (1) present.

We define a megaspine as a spine that is conspicuously larger than others near it (Figs. 7D, 55B).

African *Moggridgea* lack enlarged spines at the retroapex of femur I (Fig. 16B), as do *Heteromigas* (Fig. 11D) and *Goloboffia vellardi*. *Poecilomigas abrahami* lacks such a spine but *Poecilomigas basilleupi* has an enlarged retroapical spine (Griswold 1998a fig. 7). Similar enlarged spines occur in *Moggridgea tingle*, *Migas variapalpus*, and *Calathotarsus* (Fig. 7D). A single large apical spine is present on the retrolateral surface of tibia I on all Malagasy migids. This is at the apex in *Paramigas macrops* (Fig. 37C) and *P. manakambus* (Fig. 38C) and arises from a subapical spur in *Paramigas andasibe* (Figs. 30B, 31E). *Idiops* has two and *Bothriocyrtum* several enlarged retroapical spines: we have coded these as homologous to the migid megaspine. Coding these as non-homologous makes no difference to the resulting tree. If we consider the spines in *Idiops* and *Bothriocyrtum* as megaspines this feature optimizes as plesiomorphic with megaspines lost in parallel five times: in *Actinopus*, *Heteromigas dovei*, *Goloboffia vellardi*, *Poecilomigas abrahami*, and as a synapomorphy at node P for the African *Moggridgea*. Alternatively loss of the megaspine could be a synapomorphy at node A for the Migoidea with regain at node C within the Migidae.

40. Male metatarsus I shape: (0) cylindrical, (1) curved, with retrolateral pale swelling.

The males of *Paramigas andasibe* have metatarsi I that are curved, with a retrolateral pale swelling (Figs. 29, 30B, 31D–E). *Calathotarsus* (Figs. 6, 7D) and *Bothriocyrtum* have male metatarsi that are strongly bent retrolaterad at mid-segment; we do not consider this as homologous to the state discussed here. This feature is an autapomorphy for *Paramigas andasibe*.

41. Male tarsus III shape: (0) cylindrical, (1) curved, sausage shaped, strongly convex ventrally.

Most rastelloid males have tarsi III and IV cylindrical (Figs. 6, 10, 36). Males of the Malagasy migids *Paramigas andasibe* (Fig. 31F) and *P. manakambus* (Fig. 38D) have tarsi III and IV weakly curved, slightly swollen, and strongly convex ventrally. We optimize this as a synapomorphy at node G, predicting its presence in the undiscovered males of *P. alluaudi*, *P. pectinatus*, *P. pauliani*, and *P. rothorum*.

42. PLS apical segment: (0) triangular, (1) domed.

As noted by Raven (1985), the apical segment of some mygalomorph spiders is triangular in shape, most easily observed in the Ctenizidae. All Migidae and Actinopodidae (the Migoidea, clade A) share a domed apical segment of the PLS (Figs. 3A–B).

43. PLS spigot distribution: (0) all articles, (1) median and apical articles only.

Goloboff and Platnick (1987) first recognized the unique distribution of spigots on the PLS of Chilean Migidae and suggested it as a potential synapomorphy for the family. All migid taxa surveyed have their spigots limited to the median and apical segments of the PLS (Figs. 3A, B), corroborating this condition as a migid synapomorphy at node B.

44. Distribution of spermathecae sclerotization: (0) uniform, (1) a median band.

Most migids and their outgroups have the spermathecae evenly sclerotized (Figs. 35A–E, 64A–C). The degree of sclerotization may vary from light to heavy. Uniquely, *Moggridgea* (including *M. tingle* from Australia) have a narrow band of sclerotization across the middle of the spermatheca (Figs. 17A–C). This sclerotized band may even be visible through the cuticle. This is a synapomorphy at node O for *Moggridgea*.

45. Spermatheca shape: (0) short, cylindrical, HS equal to or slightly wider than stalk, (1) head narrower than long stalk, (2) long stalk with wider head, (3) head much wider than short, narrow stalk, (4) clavate.

The spermathecae of *Actinopus* (Fig. 64B) and *Bothriocyrtum* (Fig. 64C) are short, stout and have the head only slightly wider than the stalk. Similar spermathecae occur in *Goloboffia vellardi* (Figs. 63E–F) and *Calathotarsus* (Fig. 63A). *Heteromigas dovei* (Fig. 63B) and *Mallecomigas schlingeri* (Figs. 63C, D) have spermathecae that are long and have the head narrower than the stalk. A slender stalk and broad head is characteristic of most migids, i. e., *Migas* (Fig. 19C), *Moggridgea* (Figs. 17A–C), *Poecilomigas* (Figs. 19A–B) and several *Paramigas* (Figs 35A–E, 40A–B). *Idiops* (Fig. 64A) and the Malagasy migids *Paramigas rothorum* (Fig. 45B), *P. alluaudi* (Fig. 45C), *P. pectinatus* (Fig. 45A), *P. pauliani* (Figs. 40C–D), and *Micromesomma* (Figs. 26A–C) have the head much wider than short, narrow stalk. The stalk is especially narrow in *Paramigas rothorum*, *P. alluaudi*, *P. pectinatus*, and *P. pauliani*. *Thyropoeus mirandus* (Figs. 56A–C) and *T. malagasus* (Fig. 56D) have clavate spermathecae that taper gradually from the base to the head: that of *T. mirandus* arises from a very narrow base. State 0 (short, cylindrical) optimizes as plesiomorphic. State 1 (head narrower than long stalk) arises in parallel in *Heteromigas* and *Mallecomigas*. State 3 (head much wider than short, narrow stalk) arises in parallel in *Idiops* and as a synapomorphy at node E uniting *Paramigas* and *Micromesomma*, and state 2 (long stalk with wider head) is a synapomorphy for clade N (*Moggridgea* plus the Miginae) and at node I within

Paramigas. State 2 is predicted to occur in the undiscovered female of *Paramigas macrops*.

Characters not included in data matrix

Goloboff and Platnick (1987:7) state that unlike most migid genera, *Heteromigas* and *Mallecomigas* have short spines on tibiae and metatarsi I and II and imply that retention of this primitive feature might indicate that either of these genera, or both together, might represent the sister group of all remaining migids. In fact *Heteromigas* and *Mallecomigas* spines are not particularly short: the longest spines on tibiae and metatarsi I and II of these genera have a length/base width ratio equal to that of many species of *Migas*, *Moggridgea* and *Paramigas*.

PHYLOGENY OF MIGIDAE

Our preferred tree (Fig. 65) contains the maximum resolution supported by the data. We discuss clades on this tree with their synapomorphies listed in parenthesis (Character: State).

Clade A (Migoidea) — Synapomorphies are the wide ocular area, with OAW/Caput width greater than 0.45 (1:1), diagonal fang orientation (14:1), and domed PLS apical segment (42:1). A potential synapomorphy, ambiguously optimized, is the cuspules on the pedipalpal coxae that extend broadly onto the anterior surface (16:1).

Clade B (Migidae) — Synapomorphies are the recurved thoracic fovea (6:1), loss of the rastellum (11:1), quadrate and keeled fang (12:1), loss of anterior sternal sigilla (18:1), flattened female anterior legs (21:1, ambiguous) and PLS spigots limited to median and apical articles only (43:1).

Clade C (all migids other than *Heteromigas*) — The reduced ITC III is a synapomorphy (35:1). A potential synapomorphy, ambiguously optimized, is the cuspules on the pedipalpal coxae that are restricted to the anterior median corner (16:0).

Clade D (Malagasy migids, Paramiginae *sensu* Simon) — Synapomorphies are the reduced caput setation, with prefoveal setae only or lacking setae altogether posteriad of ocular area (4:1), femur III ventral membrane that extends at least 4/5 the length of the femur (26:1), and tibia III with a deep dorsobasal excavation (27:1). The diagonal ridge on tibia III (28:1) is an ambiguous synapomorphy.

Clade E (*Micromesomma* plus *Paramigas*) — Synapomorphies are the low female caput, with height $< 0.7 \times$ length (5:1), cheliceral basal swellings (9:1), procumbant and stout dorsal setae at the apices of tibi-

ae I and II (24:1), and spermathecae with the head much wider than the short, narrow stalk (45:3).

Clade F (*Paramigas*) — Synapomorphies are the procumbant and stout dorsal setae at bases of metatarsi I and II (25:1) and male pedipalp tarsus apical spinules (38:1). The latter feature could instead be a synapomorphy uniting *Micromesomma* and *Paramigas*, as the male of *Micromesomma* is unknown.

Clade G (six species of *Paramigas*) — The synapomorphy is male tarsi III and IV that are weakly curved, slightly swollen, and strongly convex ventrally (41:1). This has been observed only in *Paramigas andasibe* (Fig. 31F) and *P. manakambus* (Fig. 38D) and is predicted to occur in the species of clade G that are known only from females.

Clade H (five species of *Paramigas*) — Loss of denticles from between the cheliceral teeth is the synapomorphy (8:0).

Clade I (five species of *Paramigas*) — Spermathecae with a long stalk with wider head (45:2) is a synapomorphy uniting these species.

Clade J (four species of *Paramigas*) — The densely distributed, long, fine, curved ventral setae that extend beyond the spine tips of legs I and II of females are the synapomorphy (23:1).

Clade K (*Paramigas macrops* plus *P. oracle*) — Loss of denticles from between the cheliceral teeth is the synapomorphy (8:0).

Clade L (*Thyropoeus*) — Synapomorphies are the deeply excavate, lunate shaped sternal sigilla (19:1), ITC III and IV with the tooth longer than the claw (34:1) and clavate spermathecae that taper gradually from the base to the head (45:4).

Clade M (*Calathotarsus*, *Goloboffia*, *Mallecomigas*, *Migas*, *Moggridgea* and *Poecilomigas*) — Synapomorphies are the simple, recurved fovea lacking posterior extension (7:0), loss of denticles from between the cheliceral tooth rows (8:0, ambiguous), presence of male intercheliceral tumescence (10:1) and metatarsus IV preening comb (31:1).

Clade N (Miginae *sensu* Simon) — *Migas*, *Moggridgea* and *Poecilomigas* are united by the synapomorphies low female caput, with height $< 0.7 \times$ length (5:1), basal cheliceral swellings (9:1), loss of spines from female tarsi I and II (20:1) and by having the spermathecae with a long stalk with wider head (45:2).

Clade O (*Moggridgea*) — Synapomorphies are the patellar ventral lamellate setae (22:1), tibia III dorsobasal excavation (27:1), and narrow band of sclerotization across the middle of the spermatheca (44:1).

Clade P (African *Moggridgea*) — Synapomorphies are loss of male intercheliceral tumescence

(10:0), metatarsus IV preening comb setae that are similar in length and thickness and arise juxtaposed from a common base (31:2), carinate male femur I venter (36:1), male pedipalpal tibia apex with the ectal lobe pointed, much longer than mesal (37:1) and loss of the male retrolateral tibia I megaspine (39:0).

Clade Q (*Migas* plus *Poecilomigas*) — Synapomorphies are the enlarged prefoveal setae (3:2, ambiguous), basal tooth on the fang (13:1), and male pedipalpal tarsus apical spinules (38:1).

Clade R (*Poecilomigas*) — Synapomorphies are the dark dorsal and lateral maculations forming annuli on the leg tibiae (30:1) and loss of the metatarsus IV preening comb (31:0).

Clade S (South American Migidae) — This newly proposed clade comprising *Calathotarsus*, *Mallecomigas* and *Goloboffia vellardi* is united by the synapomorphies of pedipalpal coxa cuspule distribution that is concentrated at the proximal edge near the labium (15:1), slender spinules densely situated on patella-tibia III of females (29:1), a preening comb at the apex of metatarsus III (32:1) and preening combs that consist of many setae that extend part way around the ventral apex of the segment (33:1, ambiguous).

Clade T (*Calathotarsus* plus *Goloboffia vellardi*) — Synapomorphies are the extra wide ocular area, greater than 0.60 × carapace width (2:1) and denticles scattered between the cheliceral tooth rows (8:1, ambiguous).

CLASSIFICATION

This phylogenetic analysis corroborates the monophyly of Migoidea (Actinopodidae plus Migidae) (Platnick & Shadab 1976; Raven 1985; Goloboff 1993a) and Migidae. We reject the Calathotarsinae (*sensu* Simon 1903) and note that it is paraphyletic with respect to the Miginae and Paramiginae. On the other hand, our results corroborate both the Miginae (*sensu* Simon 1903) and Paramiginae (Petrunkevitch 1939, *sensu* Simon 1892, but not *sensu* Raven 1985). Simon (1892, 1903) believed that the migids fell into three groups. His Migeae (Miginae), comprising *Migas*, *Moggridgea* and *Poecilomigas*, included taxa that have simple thoracic foveae and third tibiae and low caputs. His Calathotarsae (Calathotarsinae), comprising *Calathotarsus* and *Heteromigas*, included taxa that have caputs raised as in *Actinopus*. His Myrtaleae (Paramiginae Petrunkevitch 1939), comprising *Micromesomma*, *Paramigas*, and *Thyropoeus*, included taxa that have tripartite foveae and dorsobasal excavations on tibiae III. Raven (1985) reexamined migid classification and modified the limits of Miginae and

Paramiginae by transferring *Moggridgea* from the Miginae to Paramiginae. He noted that many *Moggridgea* species have a dorsal excavation on tibia III. He retained the Calathotarsinae although noting (Raven 1985:57) that they appear to lack a synapomorphy. Griswold accepted Raven's relimited Paramiginae (Griswold 1987a) and Miginae (Griswold 1987b). Goloboff and Platnick (1987) described *Mallecomigas* and the female of *Migas vellardi*. *Migas vellardi* was tentatively placed in the Miginae based on the basal tooth on the fang and low caput. Goloboff and Platnick (1987) noted that *Mallecomigas* retained presumably plesiomorphic features, e.g., rounded tibiae and metatarsi I and II (shared with *Heteromigas*) and a normal (rather than reduced) ITC III, and suggested that *Mallecomigas*, *Heteromigas*, or both together might represent the sister group of the remaining migids. Our conclusions differ from some of those of Raven (1985) and of Goloboff and Platnick (1987). Although the dorsally excavate tibia III is included in the dataset (character 27) for both *Moggridgea* and the Paramiginae it is most parsimonious to place *Moggridgea* in the Miginae with *Migas* and *Poecilomigas*. When character 27 was weighted to force the monophyly of the Paramiginae *sensu* Raven 1985 (including *Moggridgea*), resulting trees were 100 steps, 4 steps longer than the minimum for unweighted data. Our results suggest that the South American *Migas vellardi*, *Mallecomigas* and *Calathotarsus* form a clade. *Migas vellardi* does not belong in *Migas*, and we propose the new generic name *Goloboffia* for it. *Goloboffia* appears to be the sister genus of *Calathotarsus*, but to place *Migas vellardi* in *Calathotarsus* would render this genus heterogeneous in that *Migas vellardi* has ventral lamellate setae on the patellae but lacks the characteristic *Calathotarsus* synapomorphies of modified female pedipalpal tarsus bearing a ventral expansion and dorsal group of cuspules and bent and apically swollen male metatarsus I. *Mallecomigas* is not a relatively primitive migid. We include the shape of tibiae and metatarsi I and II in the dataset (character 21) but we find the cross section of *Mallecomigas* tibia I to be flattened and little different from that of *Migas*. The large ITC of *Mallecomigas* (character 35) appears to be an independent reversal to the plesiomorphic form. Our results do agree with those of Goloboff and Platnick (1987) in suggesting that *Heteromigas* is a primitive migid: it is probably the sister group to the rest of the family.

BIOGEOGRAPHY

Due to their strikingly disjunct southern distribution (Fig. 66) the migids have long drawn the attention

of biogeographers. Pocock (1903: 352) first offered an explanation for their distribution suggesting that they had arisen in the Afro-Mascarene area (i.e., Africa plus Madagascar) and subsequently migrated to Australia-New Zealand and later to South America. Legendre (1979) next commented on their distribution, writing after the widespread acceptance of continental drift as an influence on biogeography. Legendre accepted migid distribution as strong evidence for Gondwanaland, considering them "couvrent incontestablement l'ancienne Gondwanie et ont été souvent invoquées comme preuve de l'existence du continent de Gondwana" (Legendre 1979:45–46). Platnick was the first to examine the migids in the context of cladistics and vicariance biogeography (Platnick 1981; Nelson & Platnick 1984). Lacking a cladistic treatment of the family, Platnick accepted the then current classification as the best available phylogenetic hypothesis (Platnick 1981:90, fig. 7) and used the then conventional hypothesis of Gondwanaland breakup (i.e., [[Africa, Madagascar] [New Zealand [Australia, South America]]]). Recognizing that changes in migid classification and geological interpretation might alter the basic data, he nonetheless found that two components in migid classification were consistent with vicariance theory and explained by Gondwanaland breakup (Platnick 1981:89, fig. 6, components 4 [Australia plus South America] and 5 [New Zealand plus Australia plus South America]). Since Platnick's work our understanding of Gondwanaland breakup has changed somewhat (Smith et al. 1994) and with our new cladogram several components of migid classification have changed. Main (1991) described new *Moggridgea* from southern and western Australia, suggested that the genus may have originated in the Jurassic (140 ma), and compared the distribution of *Moggridgea* to pseudoscorpions, scarab beetles, and midge flies (see below). Griswold (1991a) examined migids as part of the Afromontane biota (Griswold 1991a; White 1978, 1983). Using a parsimony method to combine cladistic biogeographic information from the spider families Microstigmatidae (*Microstigmata*), Migidae (the *Moggridgea quercinca* group) and Phyxelididae (the Vidoleini and Phyxelidini, then considered Amaurobiidae), he proposed a cladogram for areas of temperate and montane forest in Africa and Madagascar (Griswold 1991a, fig. 5) that contained a sister-area relationship between Madagascar and the mountains of East Africa and predicted that members of the *Moggridgea quercinca* group should be discovered in Madagascar.

Dispersal cannot be ruled out a-priori in the case

of migid disjunctions although mygalomorphs like migids have long been considered poor in dispersal abilities and therefore excellent subjects for studies of historical biogeography. Most mygalomorphs are not thought to disperse by ballooning (becoming airborne and floating on silken threads) though spiderlings of some mygalomorphs exhibit stereotyped ballooning behavior and float for short distances on silken threads (Coyle 1983, 1985). Rafting on floating vegetation also cannot be ruled out for migids. Many migids are tree dwellers with tightly-sealed trap door nests. As Raven (1980) pointed out, a gravid female in a sealed trap door nest on a floating tree trunk might succeed in dispersing over water. At least the ancestors of *Moggridgea nesiota* may have arrived on the oceanic islands that make up the Comoros in this way. To favor a vicariance explanation for the disjunctions in migid distribution these patterns must correlate with some potential vicariance event in earth history and/or be general, that is, not characteristic of the migids alone. As shown below, migid disjunctions are both correlated with events in earth history and similar to distribution patterns found in other organisms.

Our new cladogram bears upon previous hypotheses and suggests several new insights. The Migidae can reasonably be considered a Gondwanan family, occurring in several parts of that former southern supercontinent (Africa, Australia, Madagascar, New Caledonia, New Zealand, and South America) and nowhere else (Fig. 66). An area cladogram (Fig. 67) derived from our taxon cladogram (Fig. 65) suggests several intercontinental relationships. Australia appears three times on the cladogram: related to Africa (*Moggridgea*), related to New Zealand and New Caledonia together and to eastern and southern Africa (clade Q: *Migas* plus *Poecilomigas*), and related to the areas Madagascar, South America, Africa and Australia, New Zealand and New Caledonia together (this relationship specified by *Heteromigas*). The complex area relationships shown by Australia suggest that this continent might be subdivided for biogeographic studies. For example, *Moggridgea* suggests a relationship of western and southern Australia to Africa, the Miginae suggest a relationship of eastern Australia to Africa, New Zealand and New Caledonia, and *Heteromigas* suggests a relationship of eastern Australia to all the other parts of Gondwanaland occupied by migids. Africa appears twice, once related to Australia (*Moggridgea*) and once to Australia, New Zealand and New Caledonia (clade Q: *Poecilomigas* plus *Migas*). South America (represented by clade S, comprising *Calathotarsus*, *Mallecomigas* and *Goloboffia vellardi*) is related to Africa,

Australia, New Zealand and New Caledonia together (represented by clade N, comprising *Moggridgea*, *Migas* and *Poecilomigas*). Madagascar arises near the base of the cladogram (clade D: Paramiginae) and is the sister area of all other Gondwanan components inhabited by Migidae, i.e. there is a fundamental split between Madagascar and the remainder of Gondwanaland. This is compatible with a recent, widely accepted hypothesis of Gondwanaland breakup. Smith, Smith and Funnell (1994) map a water gap between the east coast of Africa and west coast of Madagascar that may date back to the Sinemurian (200 ma); these areas remained in contact via Antarctica to the south. Madagascar (plus India) had separated from the remainder of Gondwanaland by the Aptian (120 ma). Other Gondwanan fragments remained in contact at this time. The fundamental division between the Malagasy Paramiginae and migids of the rest of Gondwanaland suggests that the family existed at least 120 million years ago and that the ancestors of Paramiginae may have been stranded on the Madagascar-India plate during the Aptian. The fact that *Heteromigas* (from eastern Australia) is plesiomorphic to even this potentially ancient split suggests that the Migidae may have geographically differentiated before the breakup of Gondwanaland.

The distribution of the remaining migids cannot be simply explained by continental drift and Gondwanaland breakup. The simplified hypothesis of Gondwanaland fragmentation suggested by modern works (e.g., Smith et al. 1994) is ((Madagascar, India) (Africa (New Zealand (South America, Australia))))). This is of course an oversimplification. Gondwanaland was not homogeneous, nor was or is any of its fragments. Numerous tropical west Africa-tropical South America disjunctions on the one hand and Australia-New Zealand-Chile disjunctions on the other suggest the fragmentation of tropical and temperate biotas that were already distinct before the breakup of Gondwanaland. Migidae exhibit at least two cases of trans-Indian Ocean disjunction: within *Moggridgea* (Africa-Australia) and clade Q (*Poecilomigas* [Africa] and *Migas* [Australia, New Caledonia and New Zealand]). Trans-Indian Ocean disjunctions occur in several other arthropod groups. The millipede families Harpagophoridae and Sphaerotheriidae occur in Africa, Madagascar, south Asia and Australia (Kraus 1978). The millipede distributions include taxa in Madagascar and south Asia, a situation not known in the trans-Indian Ocean Migidae. Trans-Indian Ocean disjunctions (for taxa that do not also occur in South America) have been called "East gondwanan" by Kraus (1978). This conception of "East Gondwana" differs from others

(e.g., Truswell 1977; Pielou 1979) in which East Gondwana included India, Antarctica, Australia, New Zealand and New Caledonia, but excluded Madagascar, which was considered part of "West Gondwanaland" along with Africa and South America. The spider family Cyatholipidae describes another trans-Indian Ocean disjunction, occurring in Africa, Madagascar, Australia and New Zealand but probably absent from South America (Griswold 2001). Harvey (1996a, 1996b) records several trans-Indian Ocean disjunctions in pseudoscorpions that he attributes to fragmentation of former ranges that encompassed parts of Gondwanaland. Cranston, Edward and Colless (1987) record an Africa-Australia disjunction in the chironomid midge fly genus *Archaeochlus*, and Mathews (1976) and Howden (1981) report Africa-Australia disjunctions in various groups of scarab beetles. These disjunct distributions may result from vicariance of a biota that was already differentiated in Gondwanaland. Given the Aptian age (120 ma) for Migidae implied by a basal split in the family it is likely that continental drift has influenced the distribution of the non-Paramiginae, probably acting on formerly restricted distributions and shaped by extinctions. The solution to migid biogeography requires a better understanding of the environmental history of Gondwanaland as well as a more complete picture of migid phylogeny and distribution.

Our study refutes the prediction of Griswold (1991a) that Madagascar should be home to close relatives of migids from the East African mountains. No members of *Moggridgea* have been found in Madagascar, although the species *Moggridgea nesioti* lives on the nearby Comoro islands (Griswold 1987a). The East Africa-Madagascar sister area relationship proposed by Griswold (1991a) does appear to be a general pattern for spiders, though. It has been replicated by new data for two groups of cyatholipid spiders (Griswold 2000, 2001) and a pair of zoroocratid spider genera (Griswold 1993, 2000), and parallels vicariance patterns suggested for lemurs (Yoder et al. 1996) and tenrecs (Asher 1997).

What can be said of the distribution of migids within Madagascar? Unfortunately the sampling is uneven and the cladogram is poorly resolved. Indeed, the consensus of equally short cladograms (but not necessarily equally preferable: see discussion above under "Preferred tree") offers no resolution among Madagascar migids. On the preferred cladogram (Fig. 65) some distributions of interest do emerge. With the exception of *Paramigas goodmani* from the southwestern part of the country, all clade J species (*Paramigas perroti*, *P.*

macrops and *P. oracle*) occur in the central-eastern part of the country. The sister group of clade G, *Paramigas milloti*, occurs in the north. Clade H comprises one species from the eastern escarpment (*Paramigas manakambus*), three species from the south or southwest of the country (*Paramigas alluaudi*, *P. pauliani*, and *P. pectinatus*) and one (*Paramigas rothorum*) from the far north. It is unfortunate that relationships cannot be further resolved among the members of this eastern, northern and western clade. A special relationship between northern and southwestern species has been suggested by Raxworthy and Nussbaum (1997, fig. 5.5), who performed a parsimony analysis of endemism (PAE) on the distributions of 200 Malagasy reptile species. Unfortunately, understanding the biogeography of migids within Madagascar will require far denser sampling than has been done to date.

CONCLUSIONS

Migid trap door spiders are an ancient group whose complex distribution has been influenced by continental drift but defies simple explanation. They may have been geographically differentiated even before the breakup of Gondwanaland. It appears that the Paramiginae evolved from ancestors stranded by continental drift on Madagascar, probably while this was still connected to India. This suggests that we need to look for Migidae in south Asia, particularly Sri Lanka and southern India. No migids have been found in these areas, but their highly cryptic habits may have led to them being overlooked. Much remains to be learned, especially about the Malagasy fauna. We need to associate more males and females, observe the biology of *Thyropoeus* and *Micromesomma*, and document the distribution of *Micromesomma*. The monograph and phylogeny presented herein is only a preliminary look at this ancient and fascinating group of Malagasy spiders.

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FIGURES

1-68

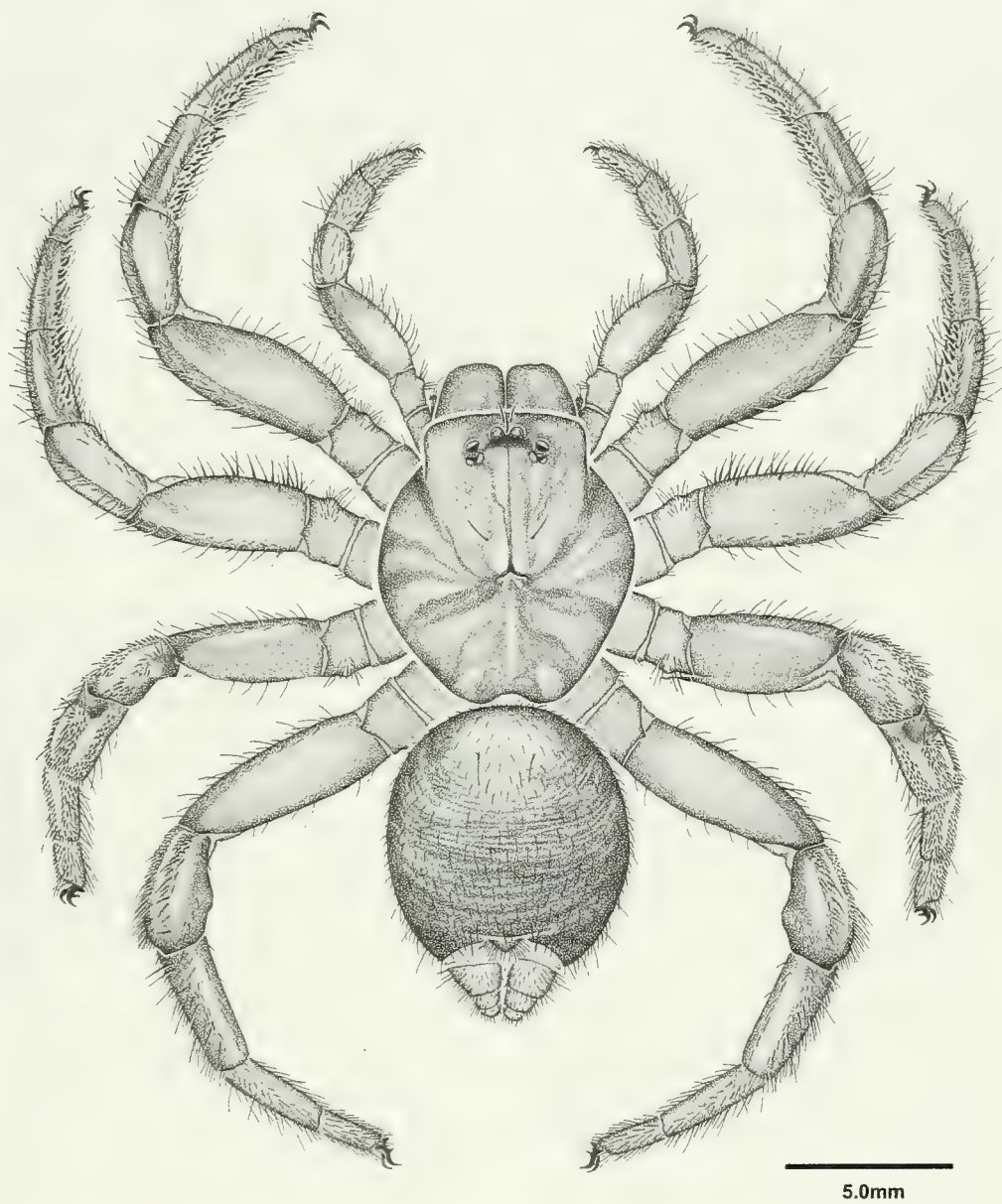


FIGURE 1. *Paramigas milloti*, new species, holotype female, dorsal. Illustration by JS.

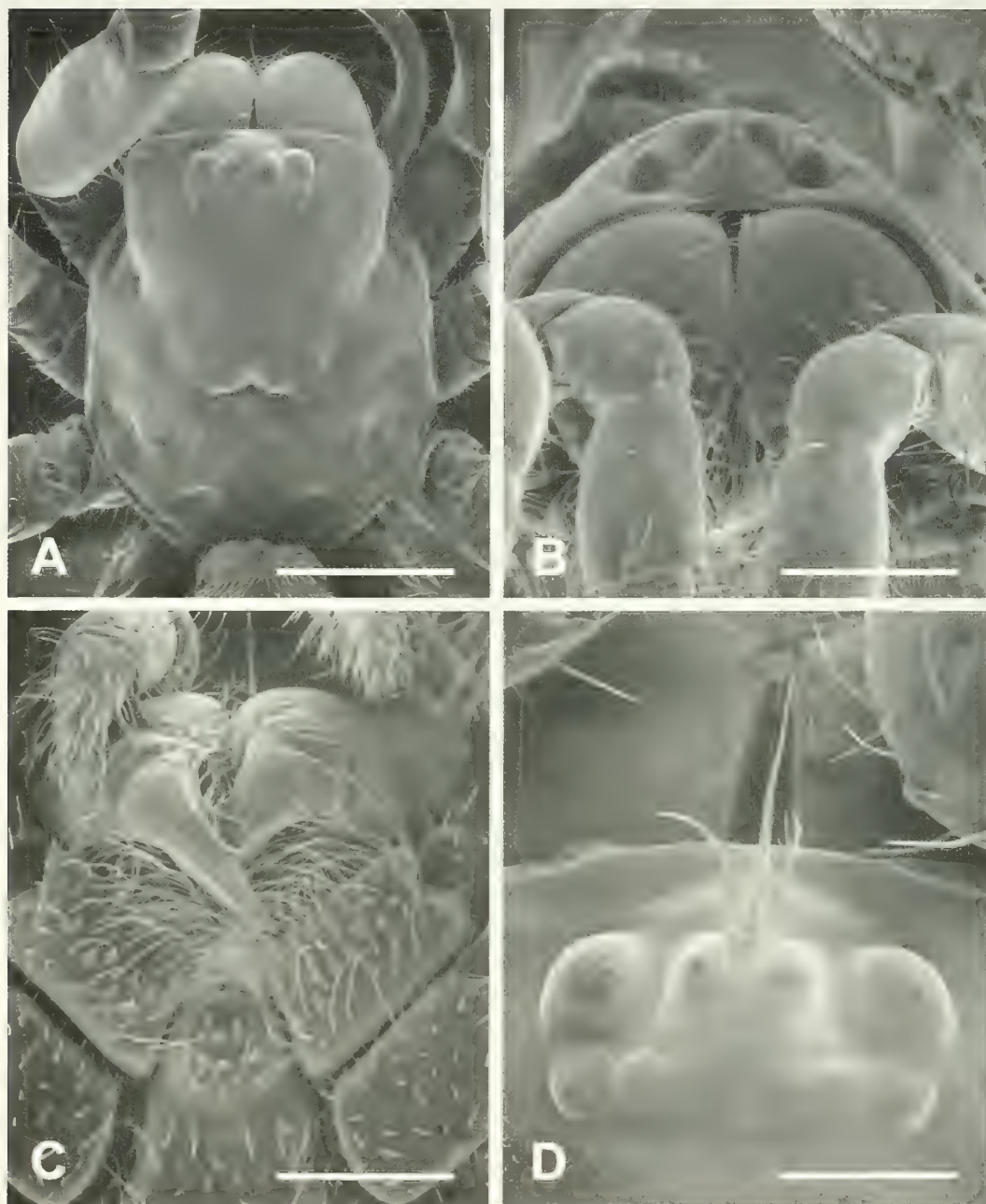


FIGURE 2. *Paramigas* spp., juveniles. A, B. Reserve Speciale Ivohibe, Madagascar. C, D. Ambanizana, Masoala, Madagascar. A. Cephalothorax, dorsal. B. Cephalothorax, anterior. C. Apex of sternum, labium, and mouthparts, ventral. D. Ocular area, dorsal. Scale bars: A = 1000 μm , B = 430 μm , C = 500 μm , D = 250 μm .

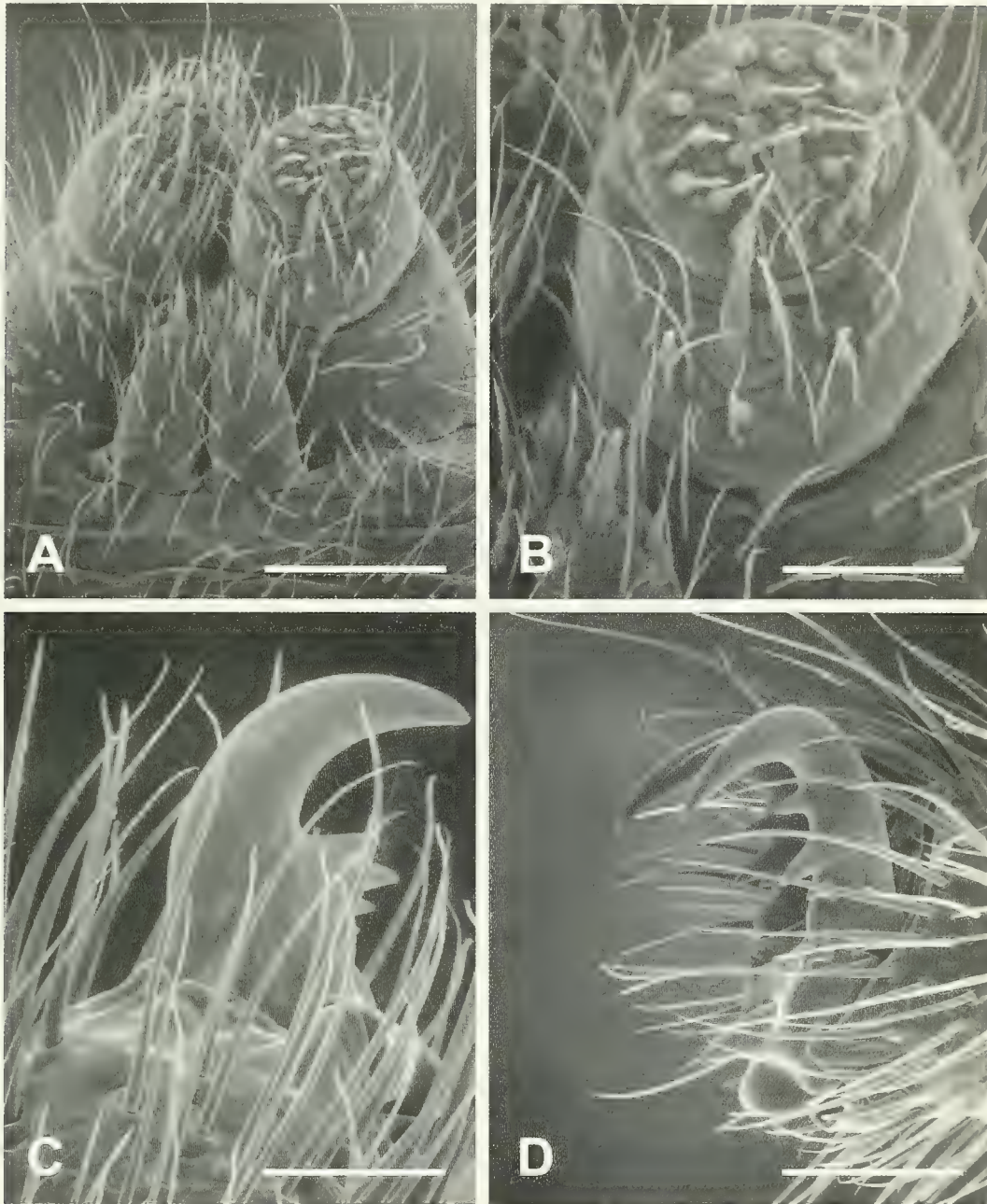


FIGURE 3. Morphology of *Paramigas*. A, B. Juvenile from Ambanizana, Masoala, Madagascar. C, D. *Paramigas oracle*, new species, female from Talatakely, Madagascar. A. Spinnerets, ventral. B. Left spinnerets, ventral. C. Pedipalpal tarsus claw. D. Tarsus I claws. Scale bars: A = 250 μm , B = 120 μm , C = 100 μm , D = 200 μm .

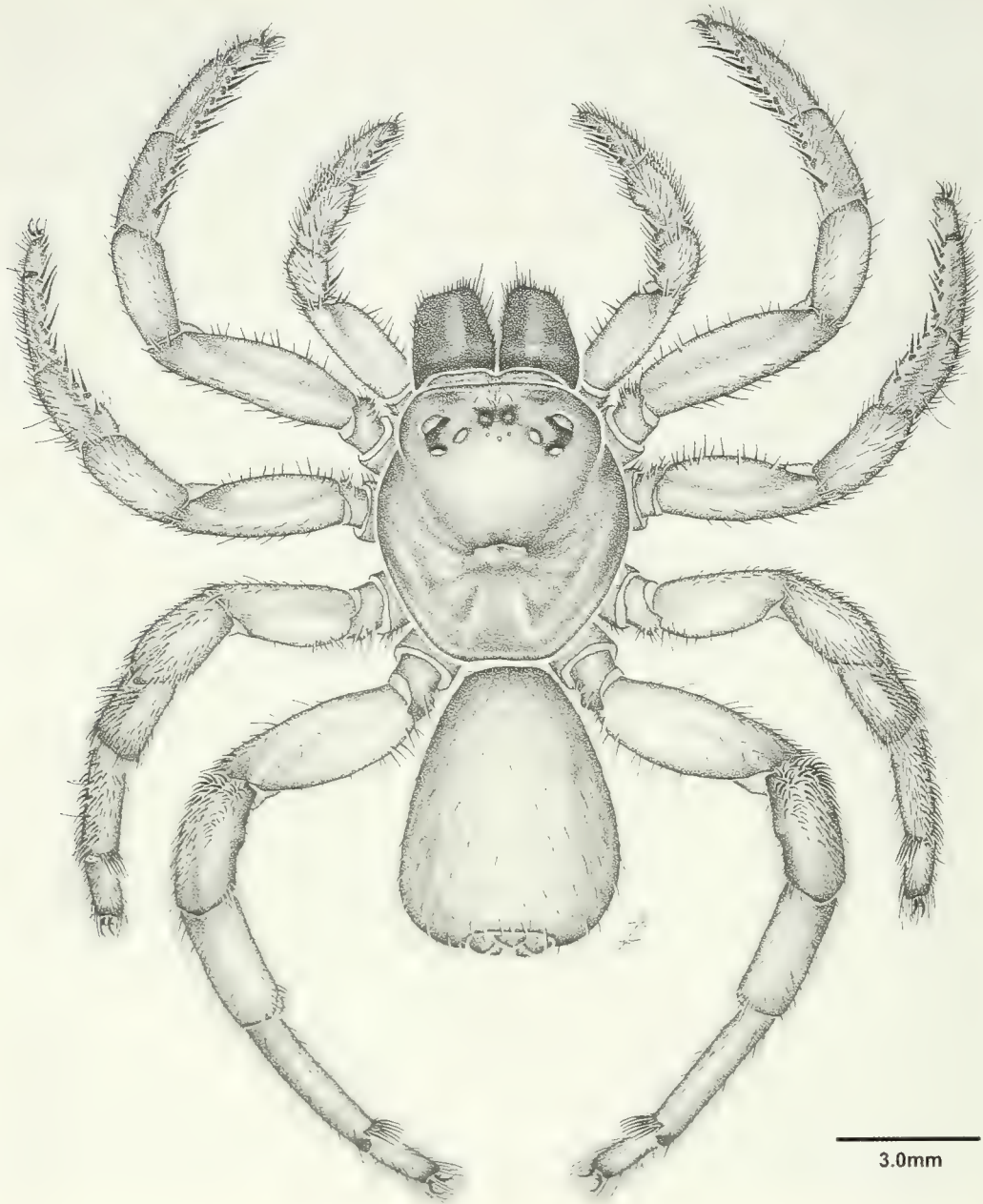


FIGURE 4. *Calathotarsus coronatus*, female from Cerro La Campana, Chile, dorsal. Illustration by JS.

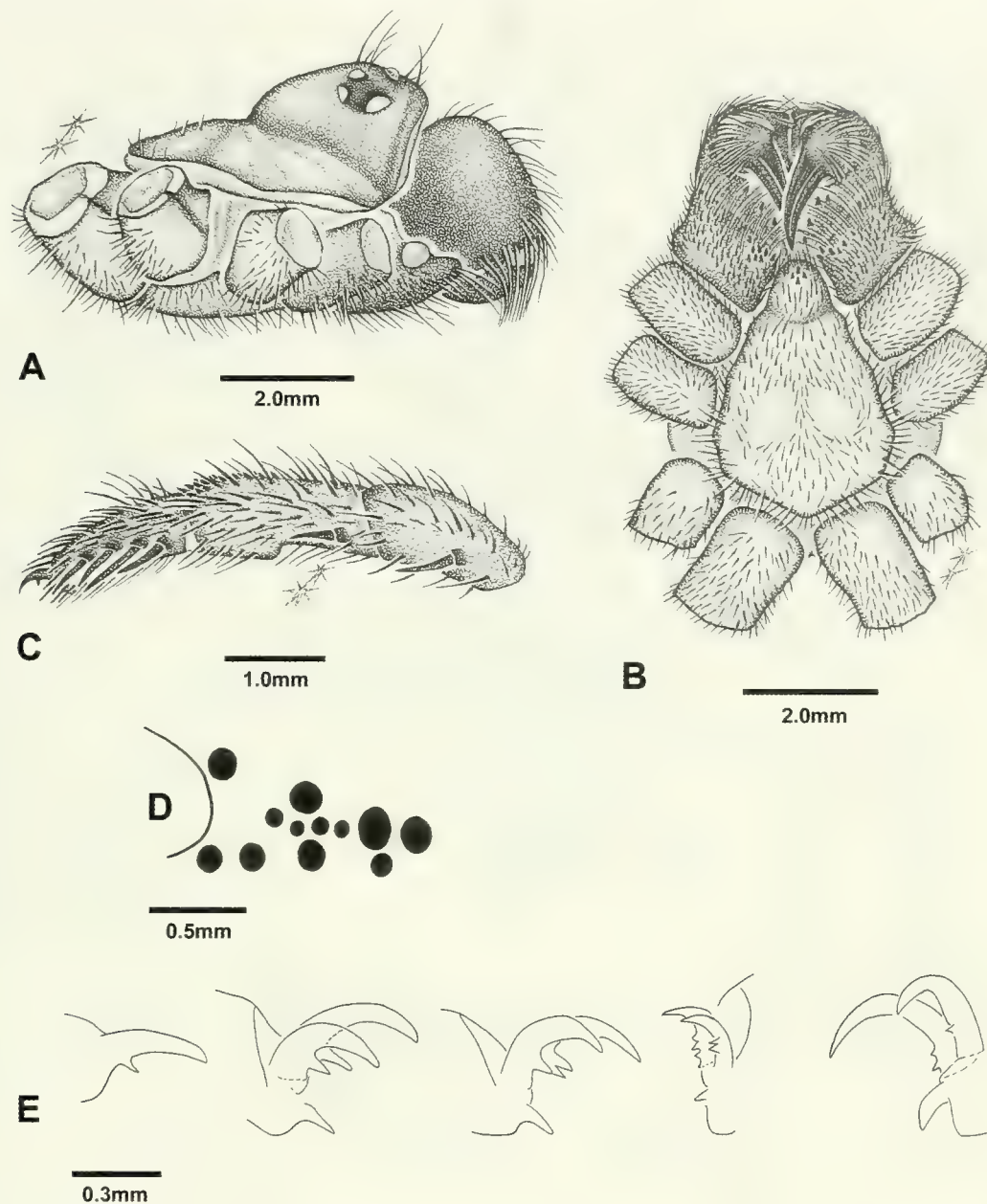


FIGURE 5. *Calathotarsus* female morphology. A, B. *Calathotarsus simoni* from Cerro Negro, Argentina. C-E. *Calathotarsus coronatus* from Cerro La Campana, Chile. A. Cephalothorax, lateral. B. Cephalothorax, ventral. C. Right pedipalp, prolateral. D. Dentition of right chelicera. E. Right tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A-C by JS, D by JL, E by CG.

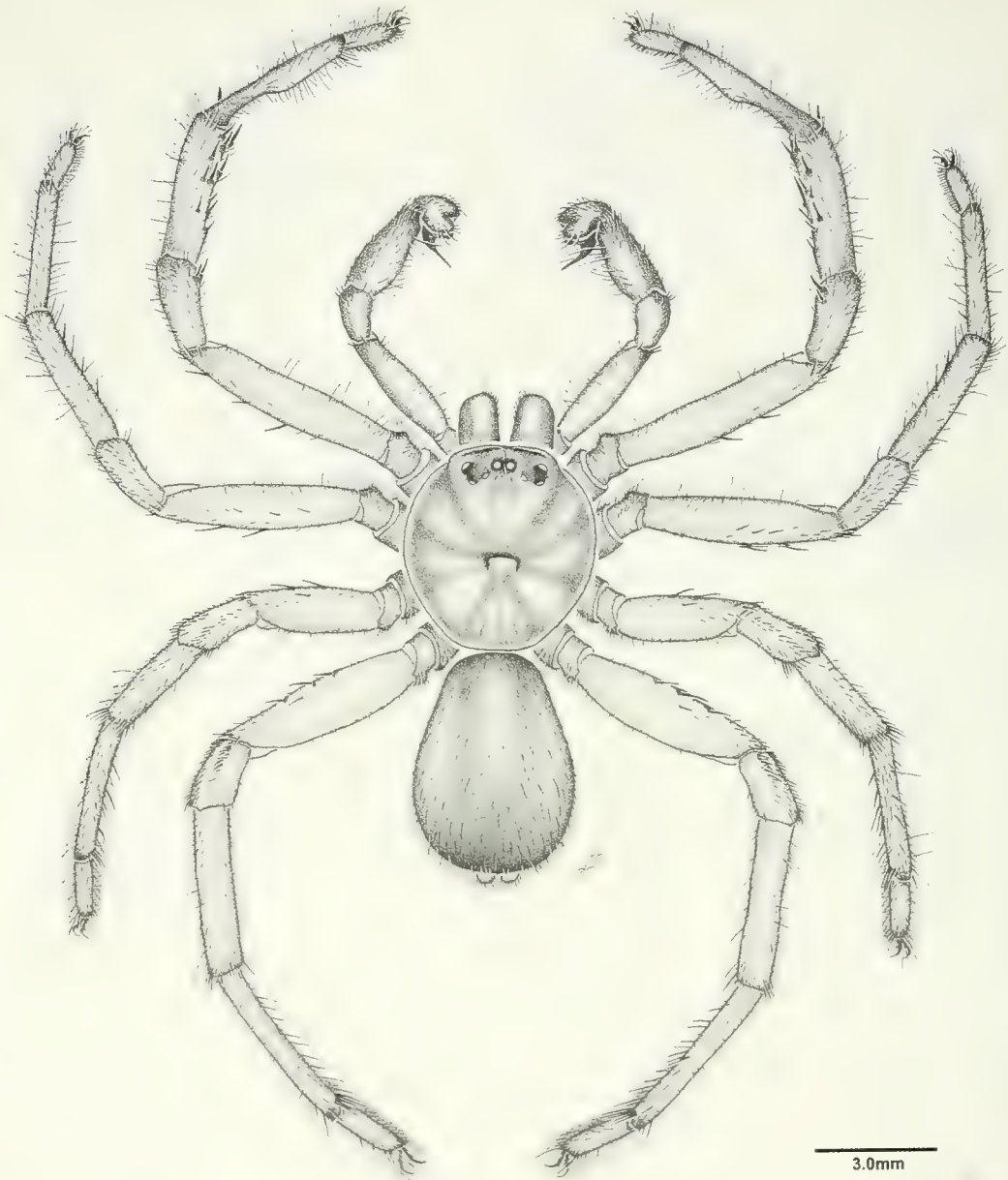


FIGURE 6. *Calathotarsus coronatus*, male from Cerro La Campana, Chile, dorsal. Illustration by JS.

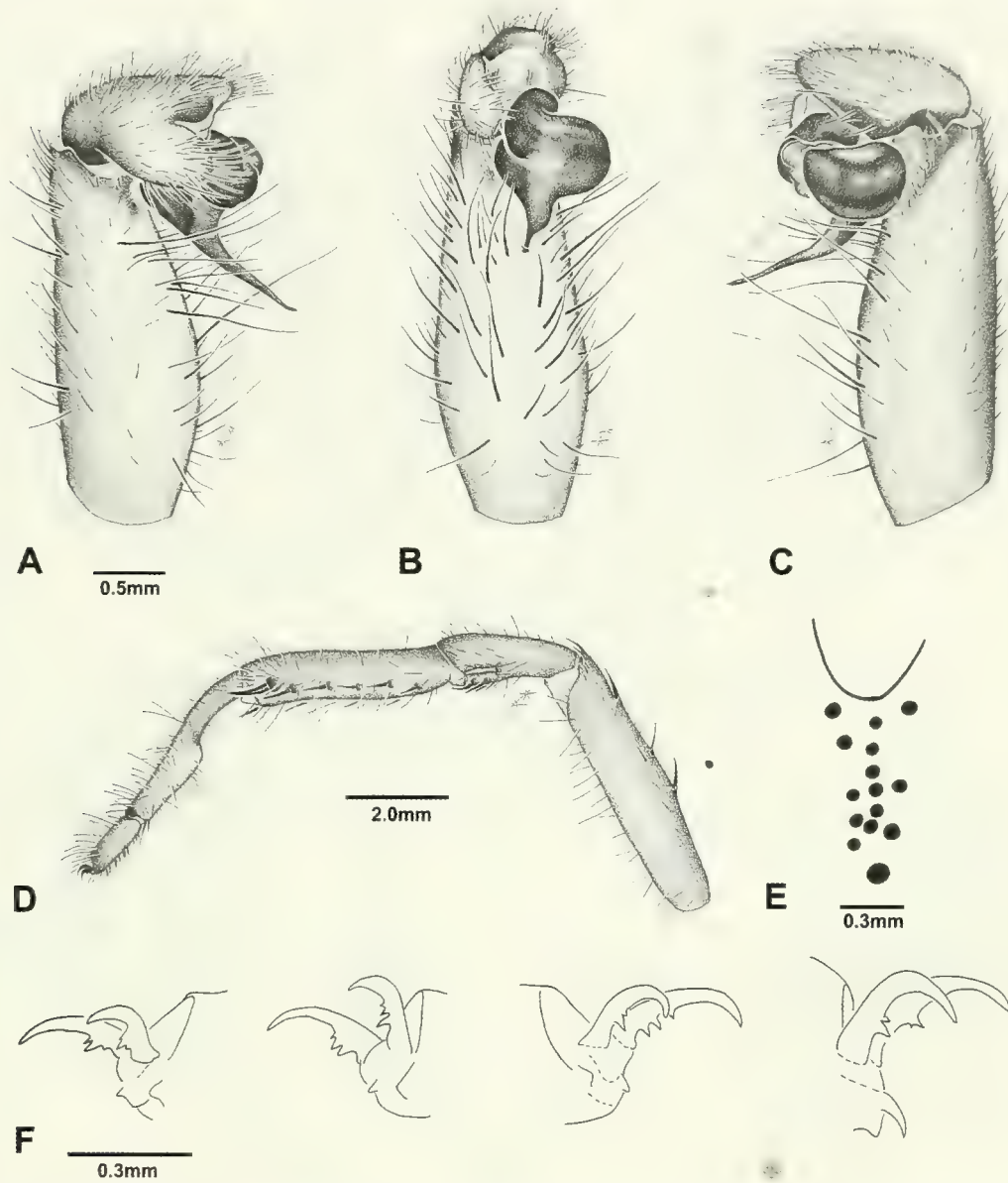


FIGURE 7. *Calathotarsus coronatus*, male from Cerro La Campana, Chile. A-C. Left pedipalp tibia and tarsus. A. Prolateral. B. Ventral. C. Retrolateral. D. Leg I, retrolateral. E. Dentition of right chelicera. F. Left tarsal claws: leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A-D by JS, E by JL, F by CG.

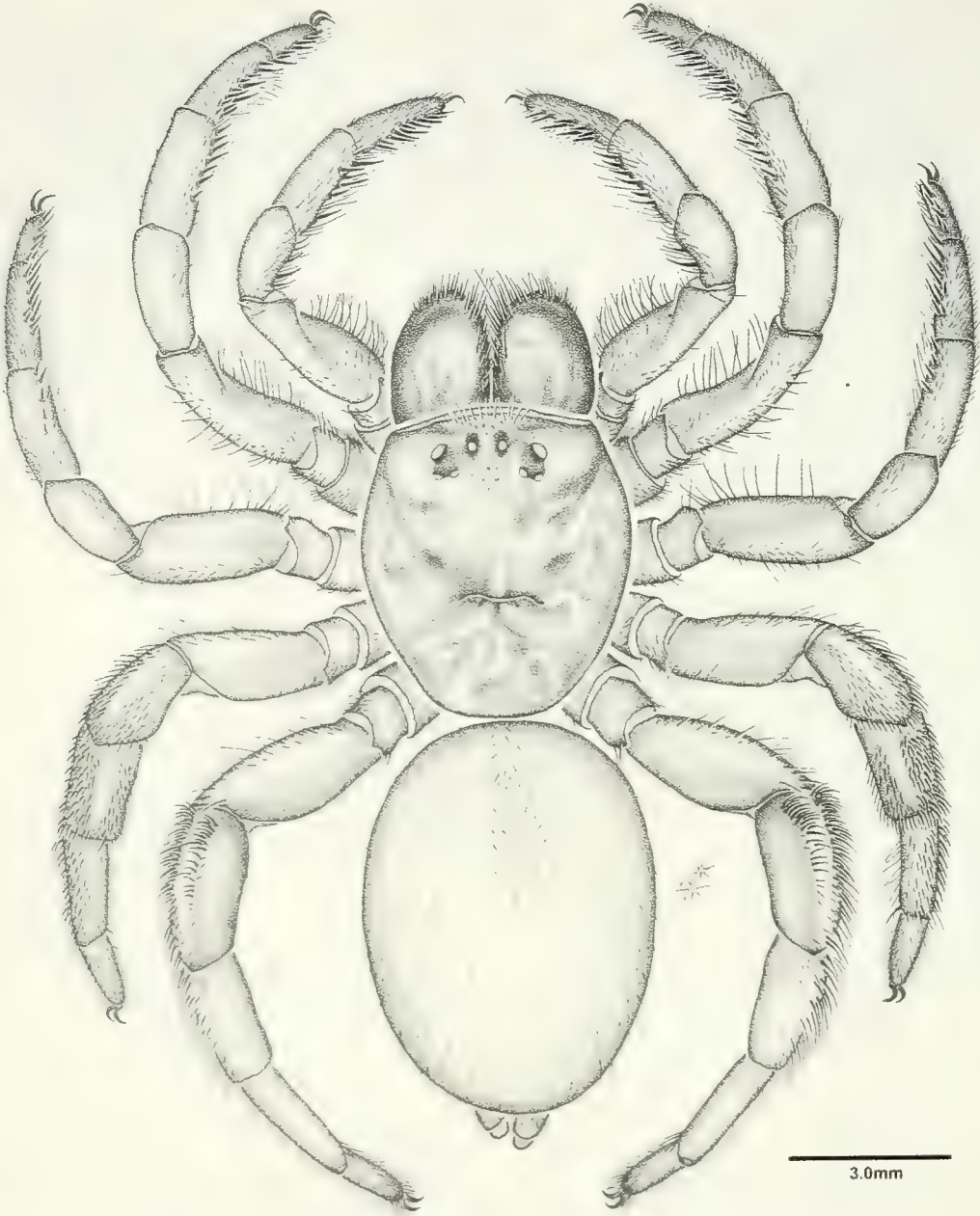


FIGURE 8. *Heteromigas dovei*, female from from Patersonia, Tasmania, dorsal. Illustration by JS.

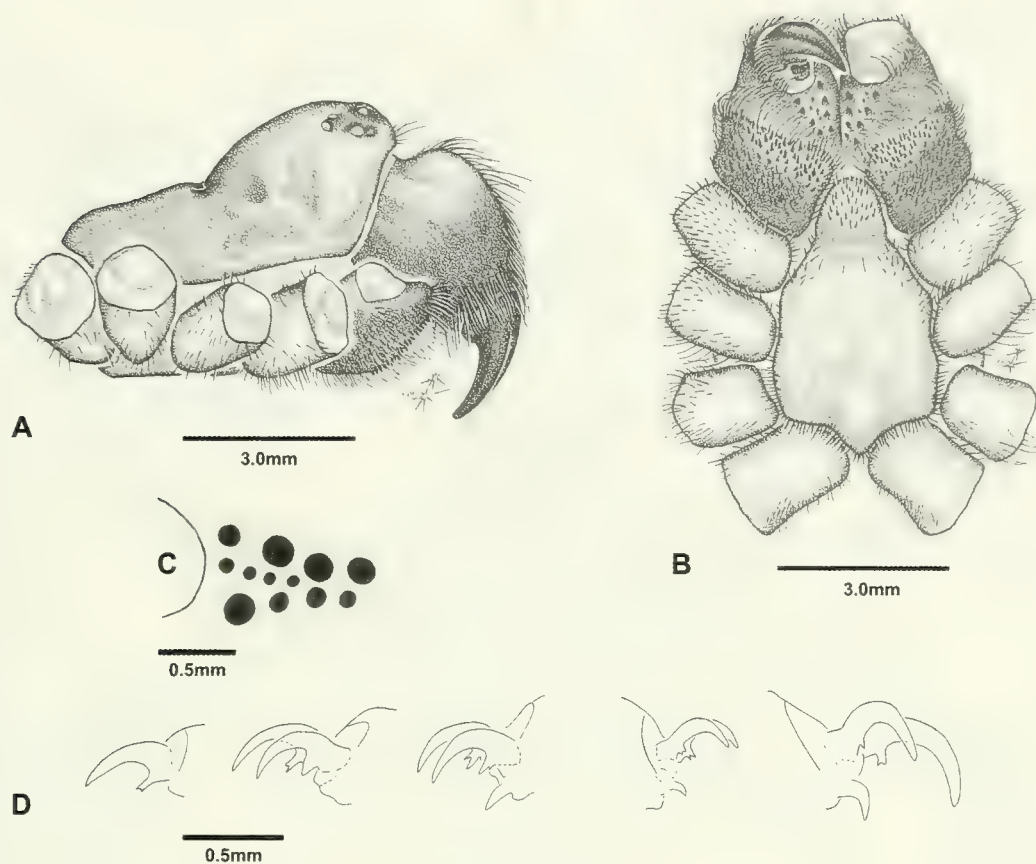


FIGURE 9. *Heteromigas dovei*, female from Patersonia, Tasmania. A. Cephalothorax, lateral. B. Cephalothorax, ventral. C. Dentition of right chelicera. D. Left tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A–B by JS, C by JL, D by CG.

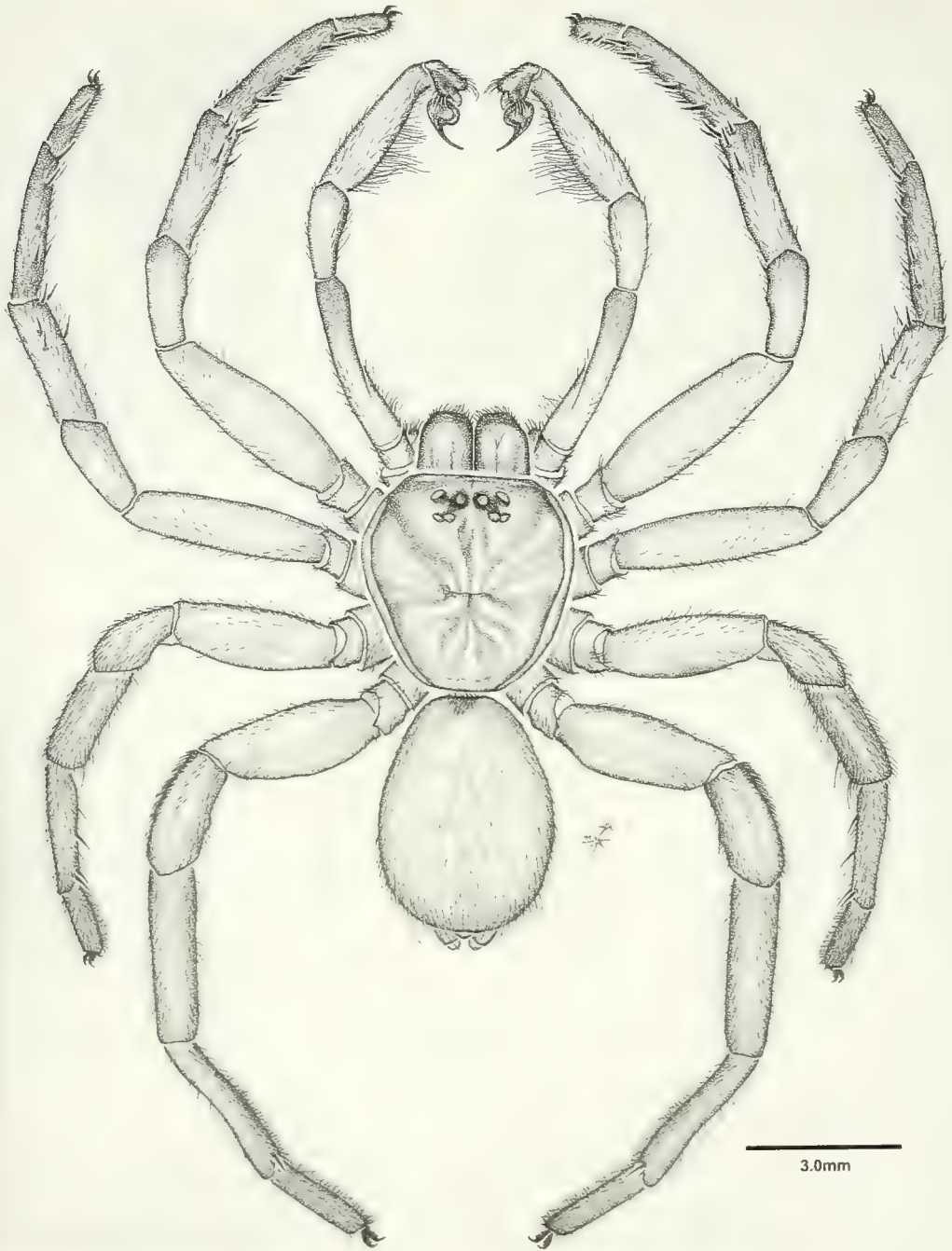


FIGURE 10. *Heteromigas dovei*, male from Patersonia, Tasmania, dorsal. Illustration by JS.

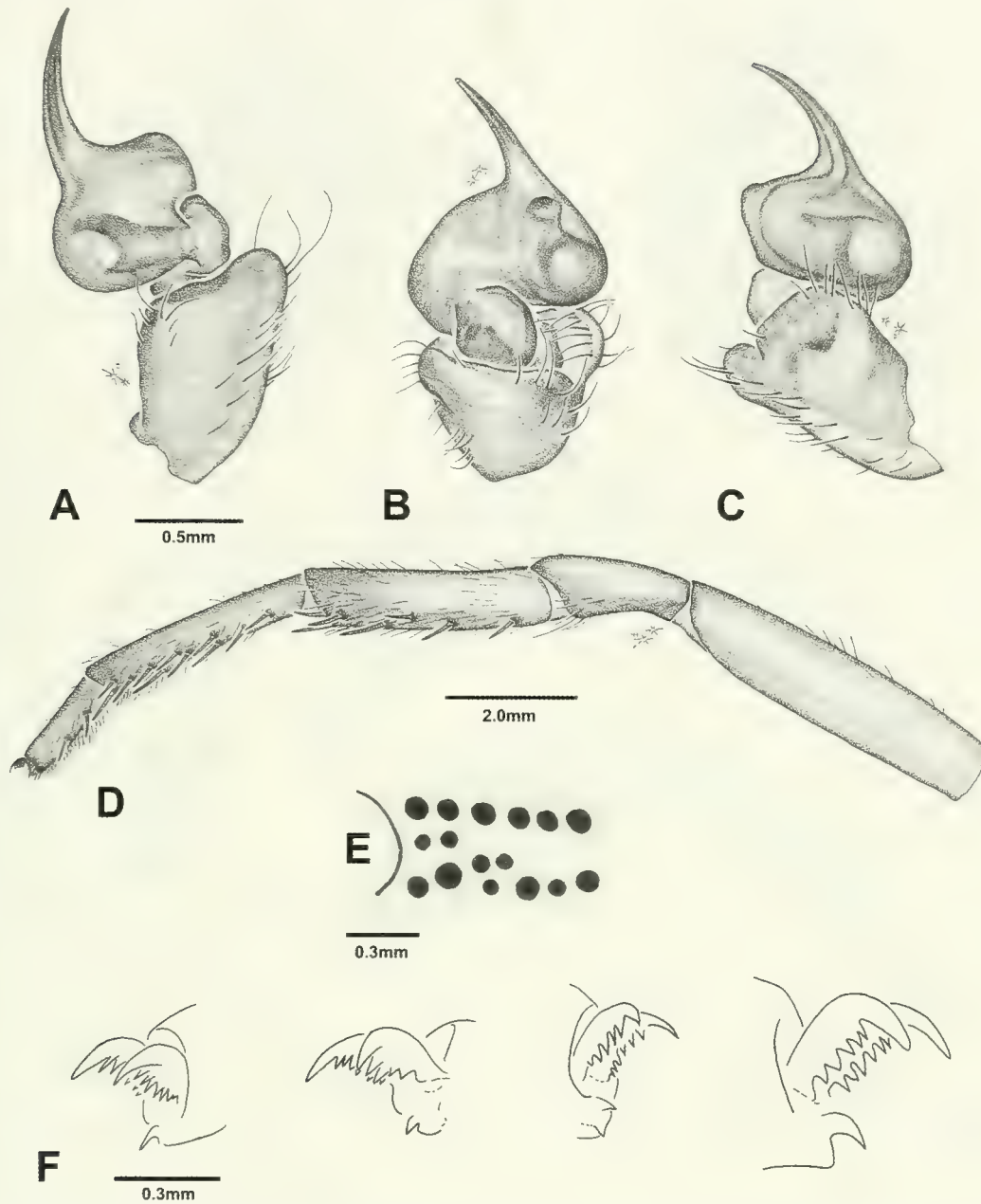


FIGURE 11. *Heteromigas dovei*, male from Patersonia, Tasmania. A-C. Left pedipalp tarsus. A. Retrolateral. B. Ventral. C. Prolateral. D. Left leg I, retrolateral. E. Dentition of right chelicera. F. Left tarsal claws: leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A-D by JS, E by JL, F by CG.

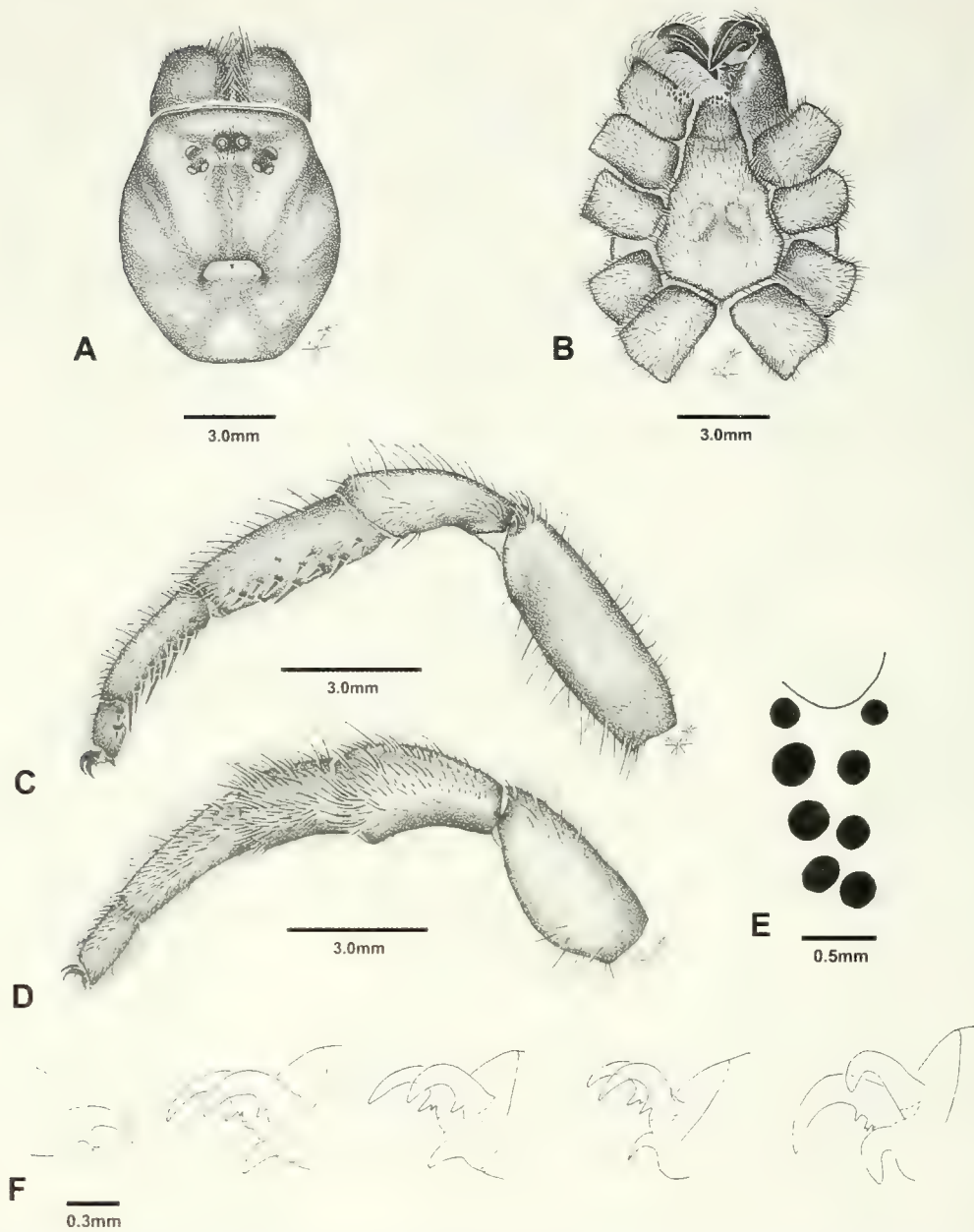


FIGURE 12. *Mallecomigas schlingeri*, holotype female. A. Cephalothorax, dorsal. B. Cephalothorax, ventral. C. Left leg I, retrolateral. D. Right leg III, prodorsal. E. Dentition of right chelicera. F. Tarsal claws: right pedipalp, left leg I retrolateral, left leg II retrolateral, right leg III prolateral, right leg IV prolateral. Illustrations A–D by JS, E by JL, F by CG.

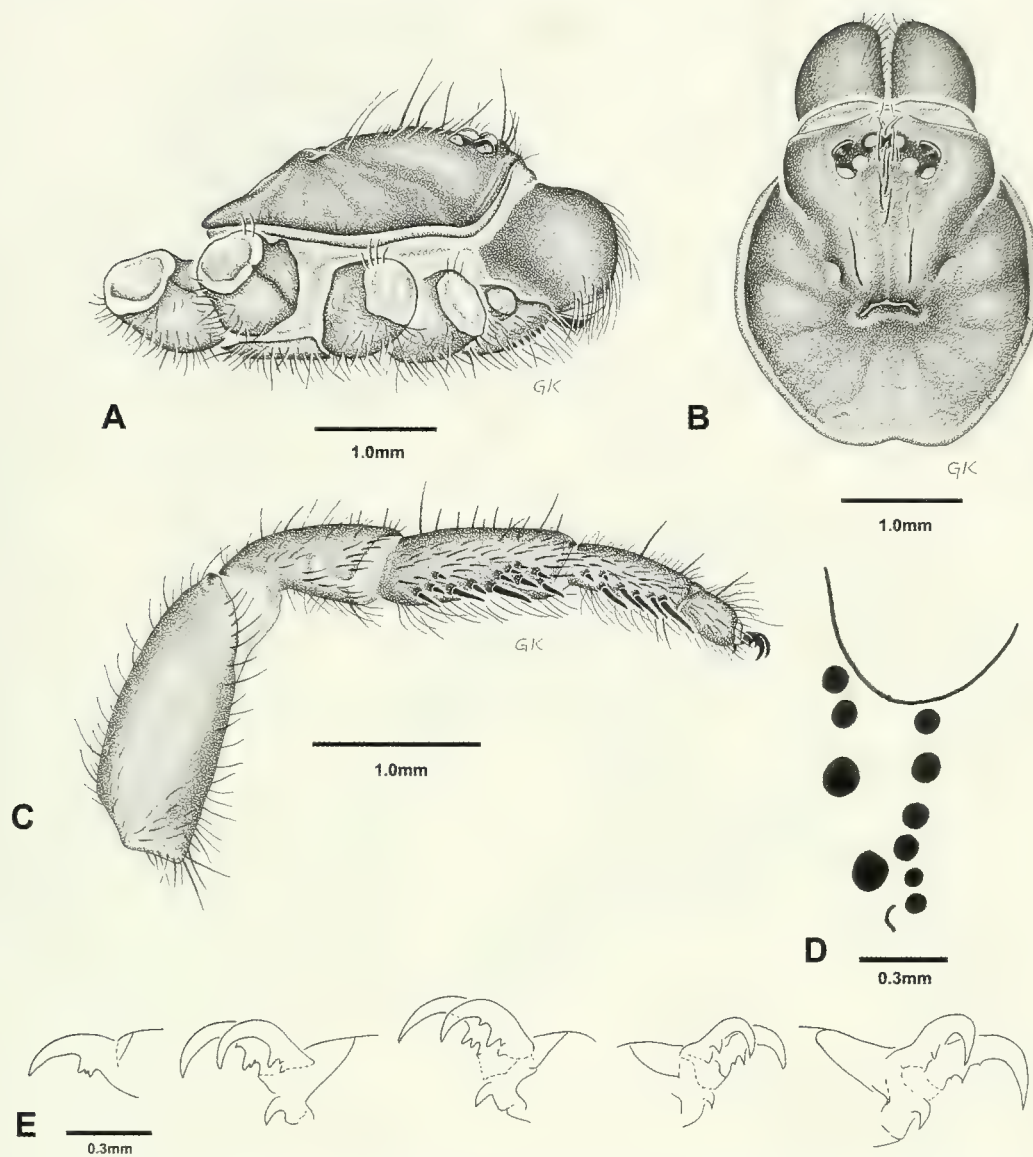


FIGURE 13. *Migas gatenbyi*, female from Wellington, New Zealand. A. Cephalothorax, lateral. B. Cephalothorax, dorsal. C. Right leg I, retrolateral. D. Dentition of right chelicera. E. Left tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A–C by VK, D by JL, E by CG.

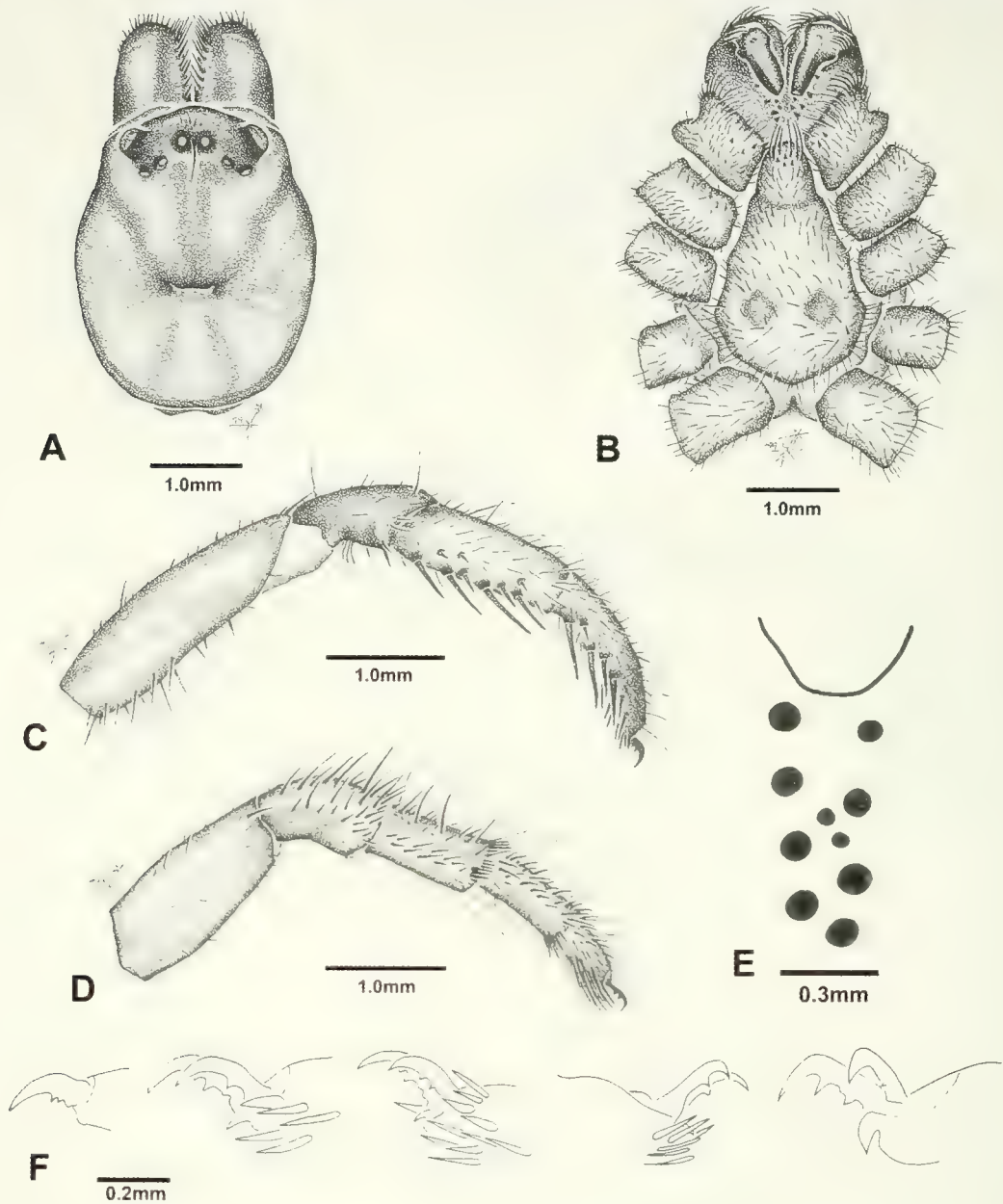


FIGURE 14. *Goloboffia vellardi*, female from Guanaqueros, Chile. A. Cephalothorax, dorsal. B. Cephalothorax, ventral. C. Right leg I, retrolateral. D. Left leg III, prolateral. E. Dentition of right chelicera. F. Left tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III retrolateral, leg IV prolateral. Illustrations A-D by JS, E by JL, F by CG.

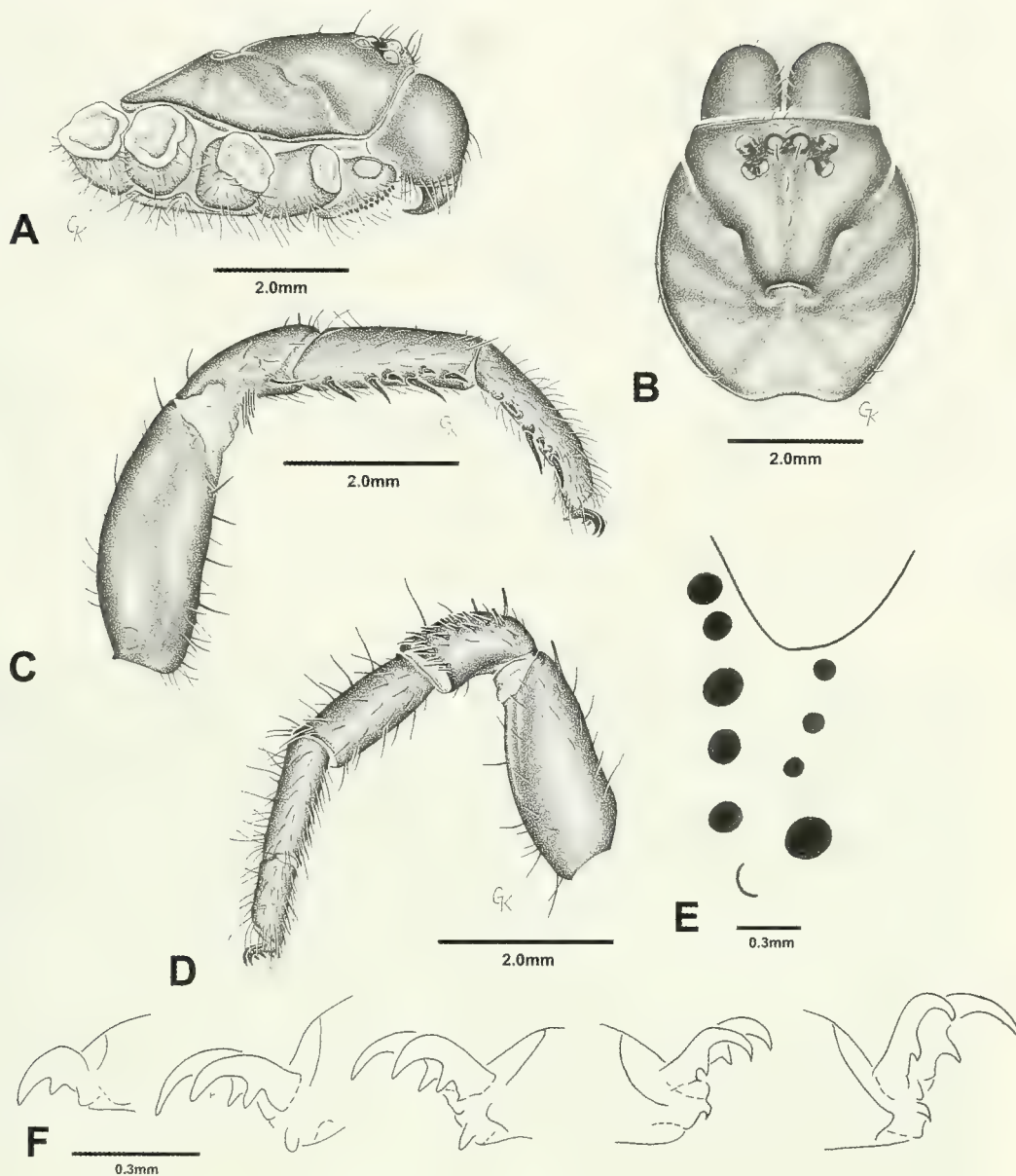


FIGURE 15. *Moggridgea intermedia*, female from Diepwalle, South Africa. A. Cephalothorax, lateral. B. Cephalothorax, dorsal. C. Right leg I, retrolateral. D. Right leg III, prolateral. E. Dentition of right chelicera. F. Left tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A–D by VK, E by JL, F by CG.

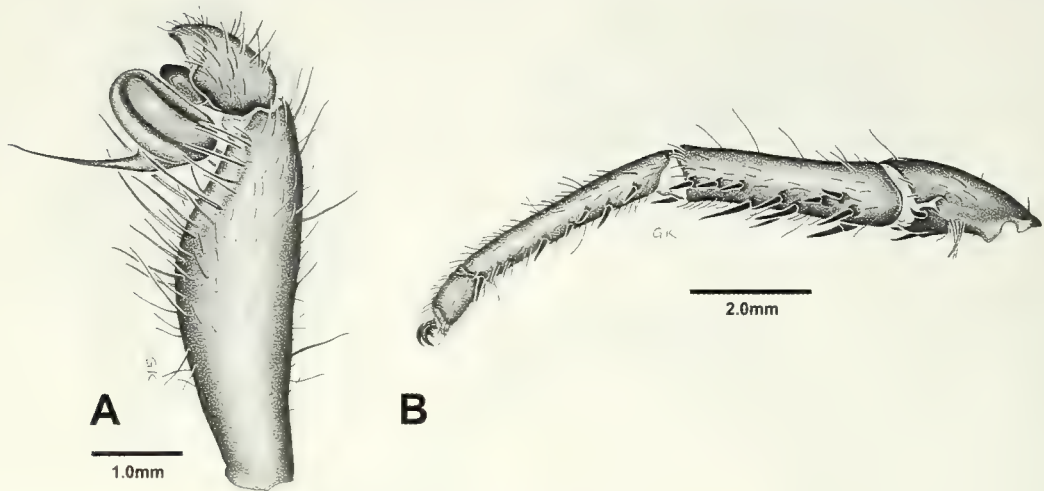


FIGURE 16. *Moggridgea peringueyi*, male from Oudtshoorn, South Africa. A. Left pedipalp tibia and tarsus, retrolateral. B. Right leg I, retrolateral. Illustrations by VK.

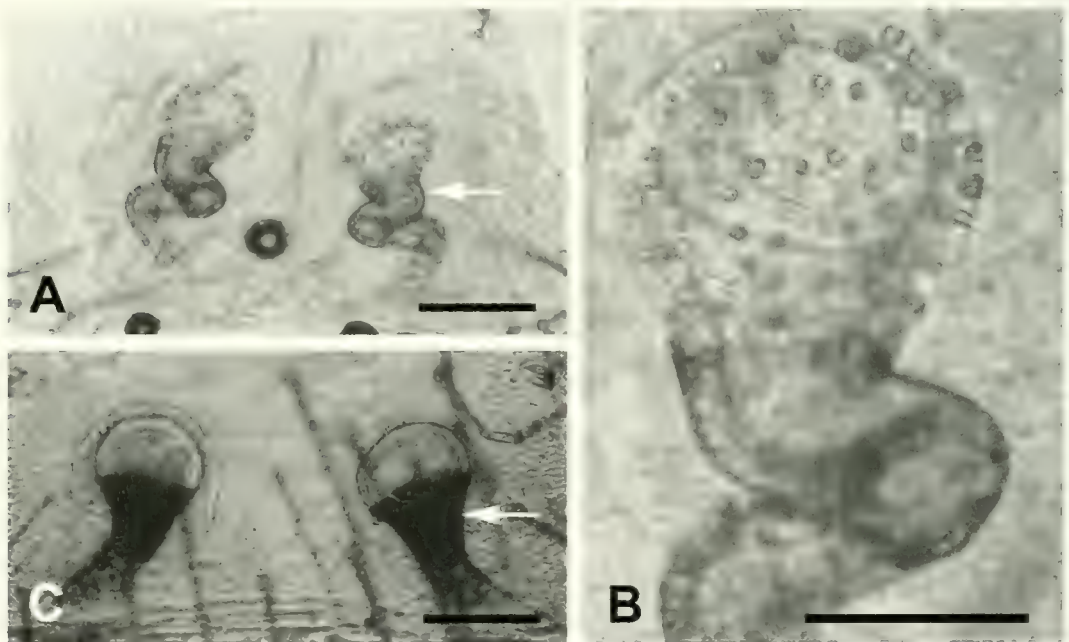


FIGURE 17. Spermathecae of *Moggridgea* spp., dorsal. A, B. *M. tingle* paratype (WAM 90/1112), Valley of the Giants, Australia. C. *M. intermedia*, Diepwalle, South Africa. Arrows to bands of sclerotization. Scale bars for A, C = 0.2 mm, for B = 0.1 mm.

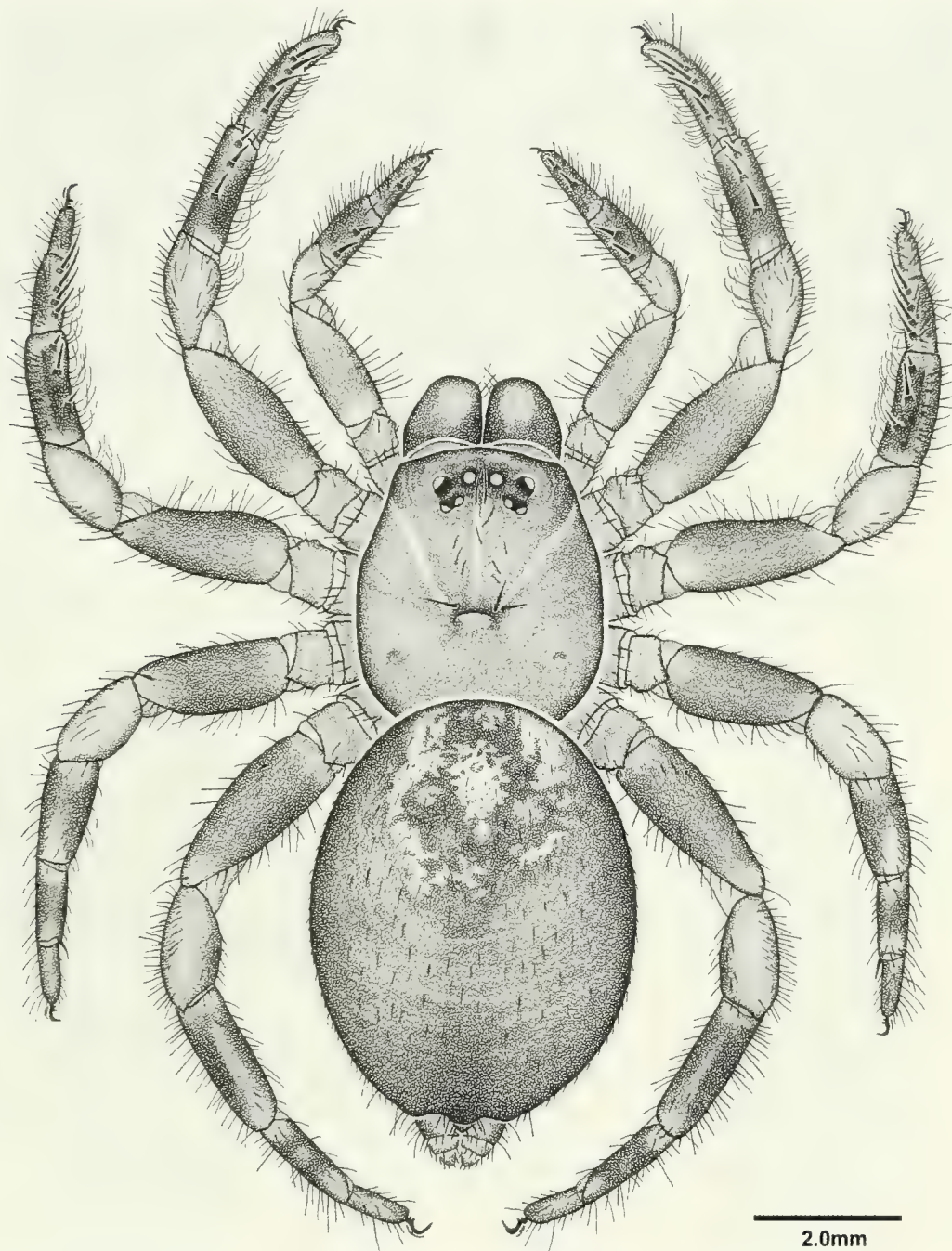


FIGURE 18. *Poecilomigas basilleupi*, female from Mazumbai, Tanzania, dorsal. Illustration by JS.

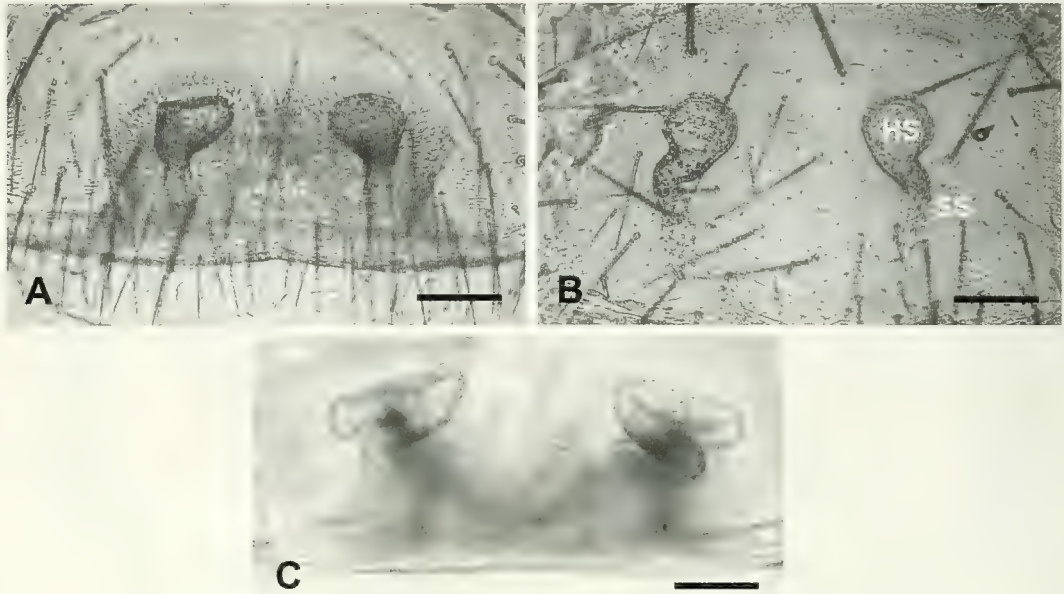


FIGURE 19. Spermathecae of Migidae, dorsal. A. *Poecilomigas basilleupi*, Mazumbai, Tanzania. B. *Poecilomigas abrahami*, Sordwana Bay, South Africa. C. *Migas gatenbyi*, Wellington, New Zealand. HS - spermathecal head, SS - spermathecal stalk. Scale bars: = 0.2 mm.

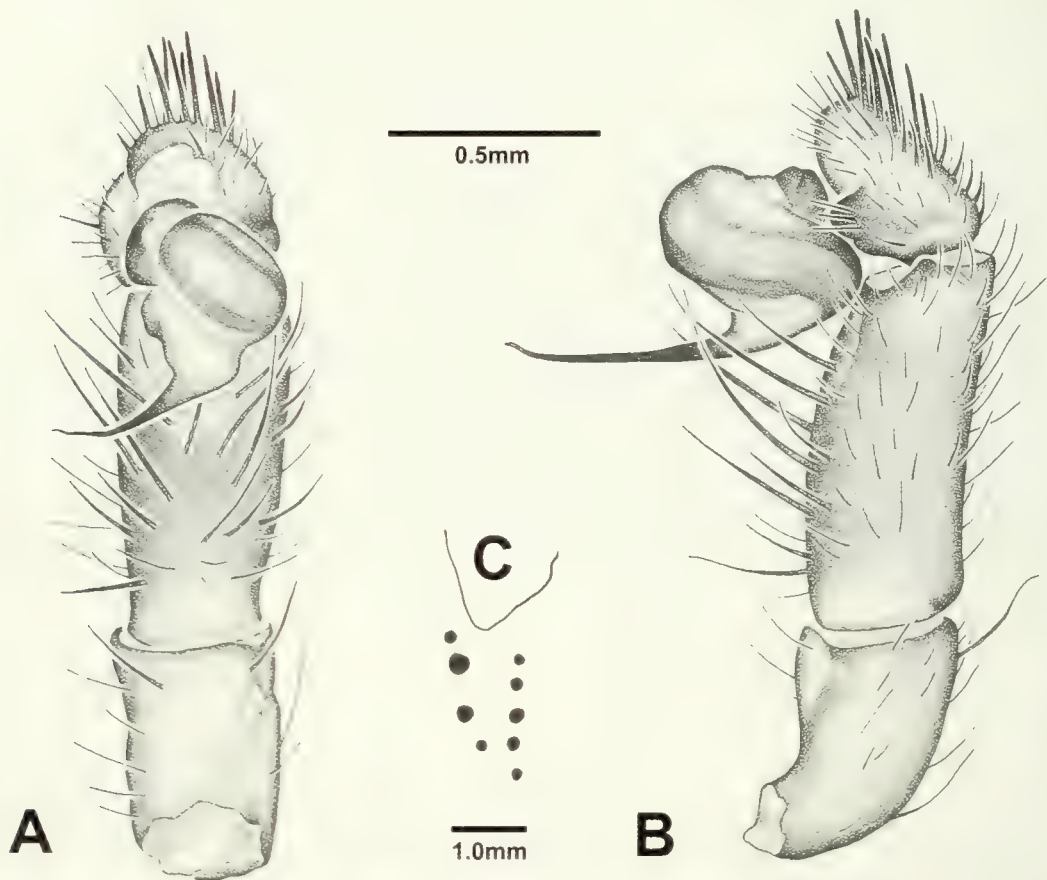


FIGURE 20. *Poecilomigas basilleupi*, male from Mazumbai, Tanzania. A. B. Left pedipalp patella-tarsus. A. Ventral. B. Retro-lateral. C. Dentition of right chelicera. Illustrations A, B by JS, C by CG.

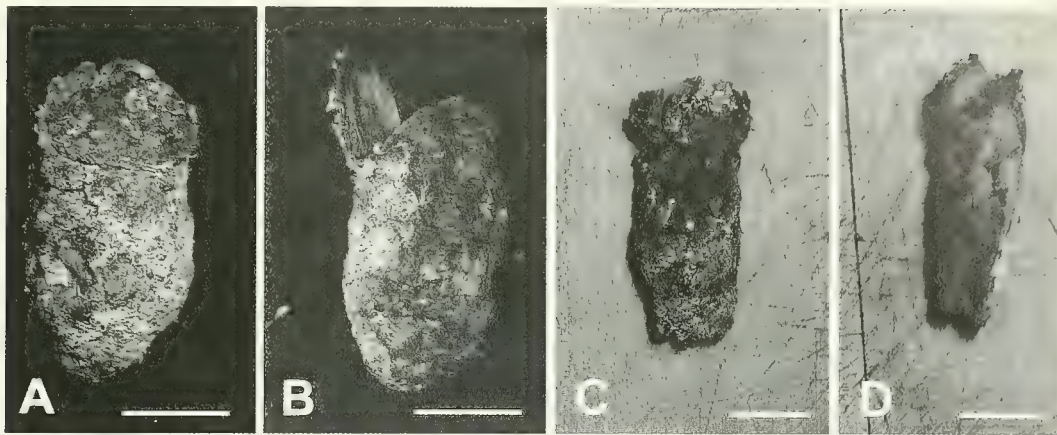
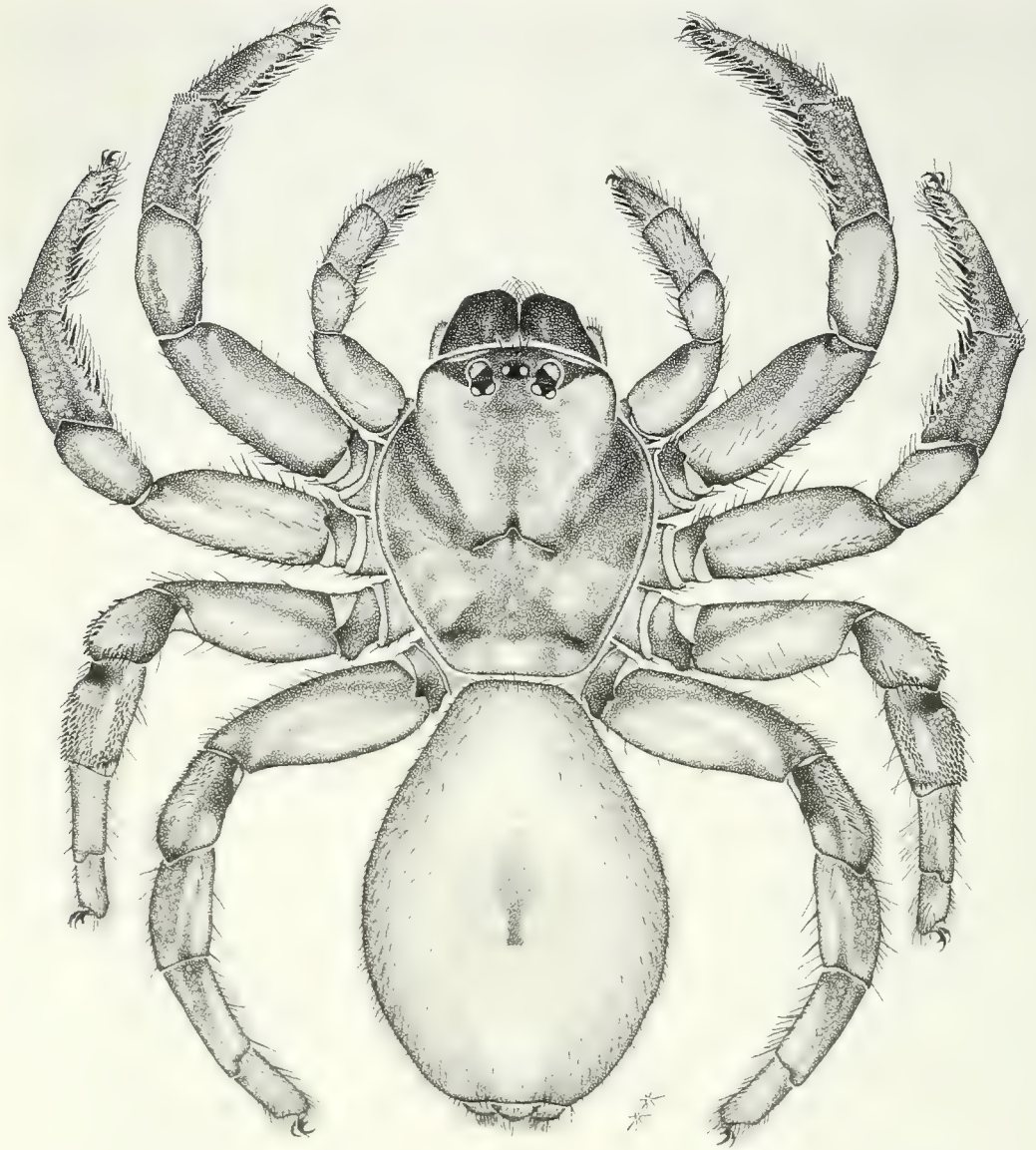


FIGURE 21. Nests of *Paramigas*. A, B. *P. perroti* (lectotype of *P. subrufus*). C, D. *P. oracle*, new species, holotype. A, C. Outer. B, D. Lateral. Scale bars: = 1 cm.



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FIGURE 22. *Micromesomma cowani*, female from MRAC, dorsal. Illustration by JS.

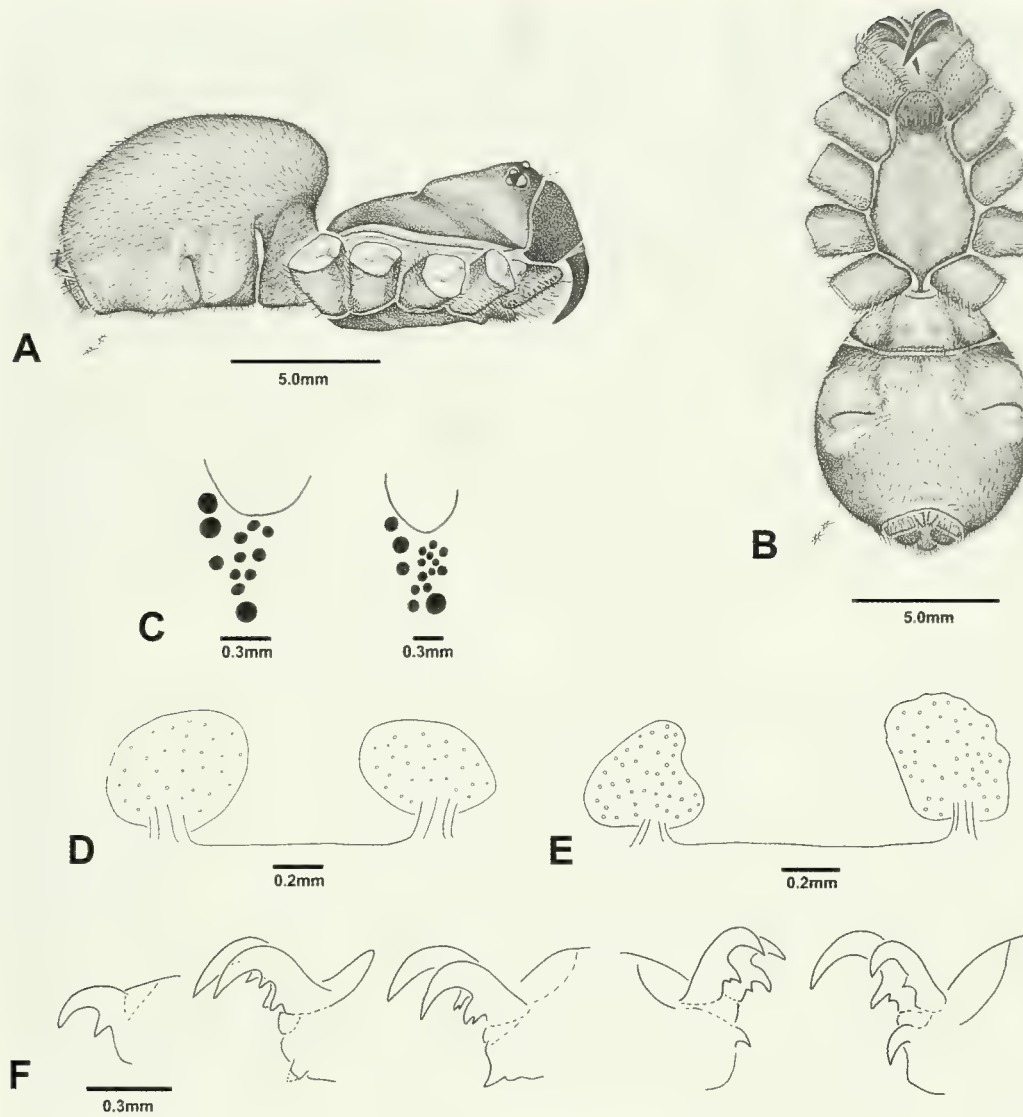


FIGURE 23. *Micromesomma cowani*. A–C, E. Female from MRAC. D. Female from MNHN. F. Lectotype female from BMNH. A. Lateral. B. Ventral. C. Dentition of right chelicera of two individuals. D, E. Spermathecae, dorsal. F. Tarsal claws: pedipalp, left leg I retrolateral, left leg II retrolateral, left leg III prolateral, right leg IV prolateral. Illustrations A, B by JS, C–E by JL, F by CG.

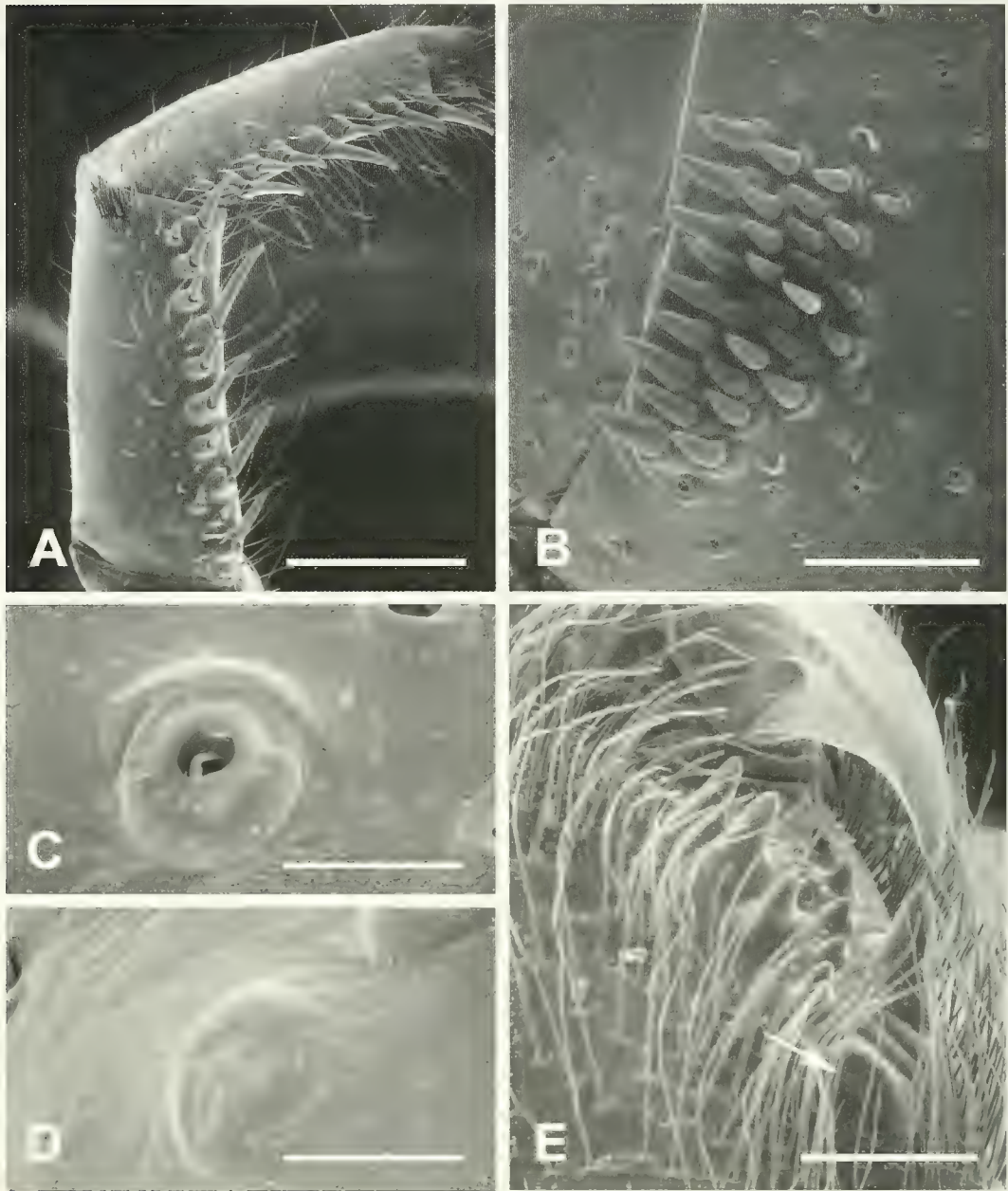


FIGURE 24. *Micromesomma cowani*, female from MNHN. A. Leg I, retrolateral. B. Tibia-metatarsus I junction, dorsal, showing thorns. C. Tarsus IV trichobothrial base. D. Tarsal organ IV. E. Right chelicera. Arrow to intercheliceral basal swelling. Scale bars: A = 1000 μ m, B = 231 μ m, C, D = 38 μ m, E = 600 μ m.

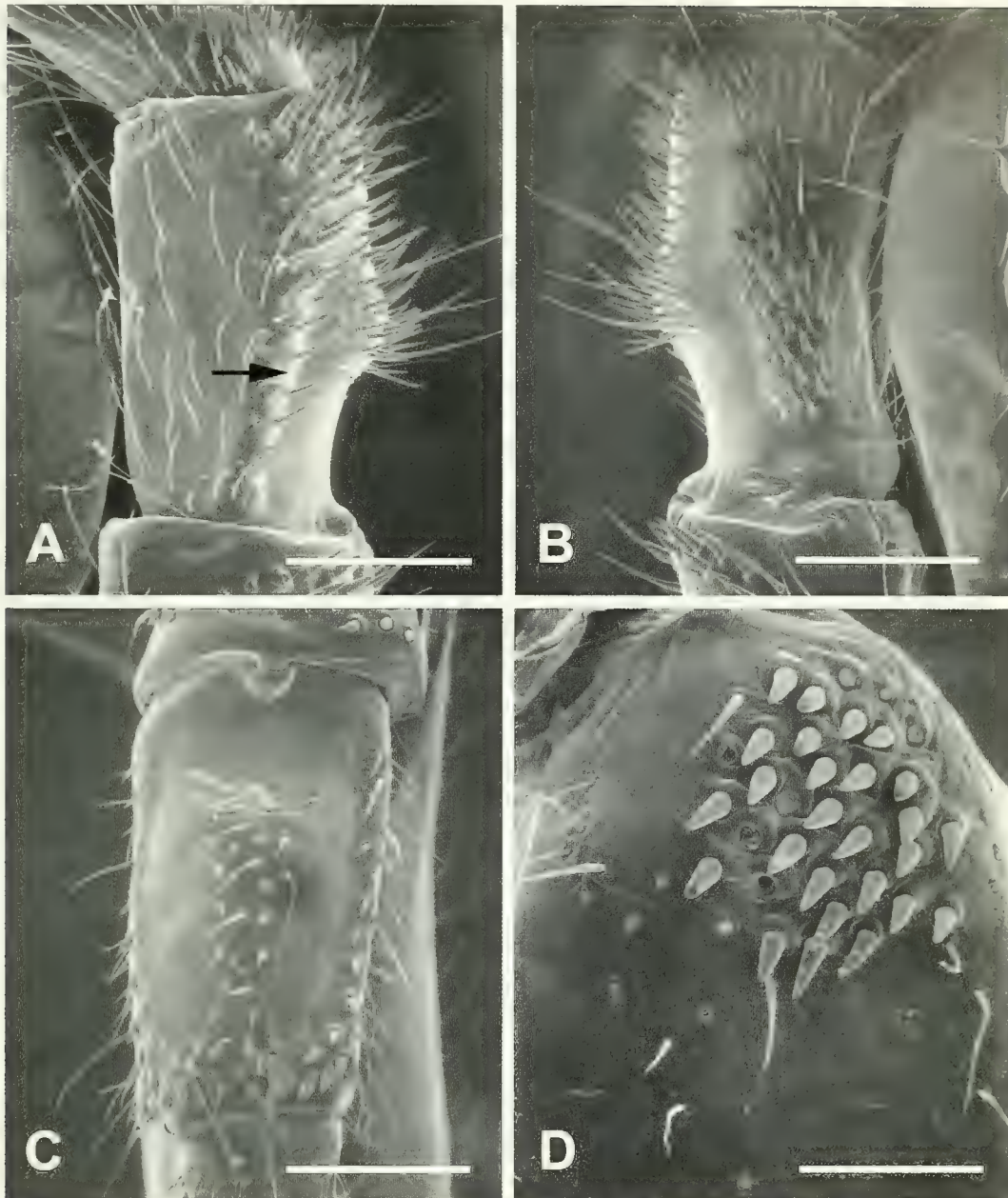


FIGURE 25. A, B, D. *Micromesomma cowani*, female from MNHN. C. *Paramigas oracle*, female from Talatakely, Madagascar. A–C. Tibia III. A. Prolateral. B. Retrolateral. C. Dorsal. D. Coxa III showing thorns. Arrow to prolateral ridge of tibia III. Scale bars: A, B = 750 μ m, C = 600 μ m, D = 300 μ m.

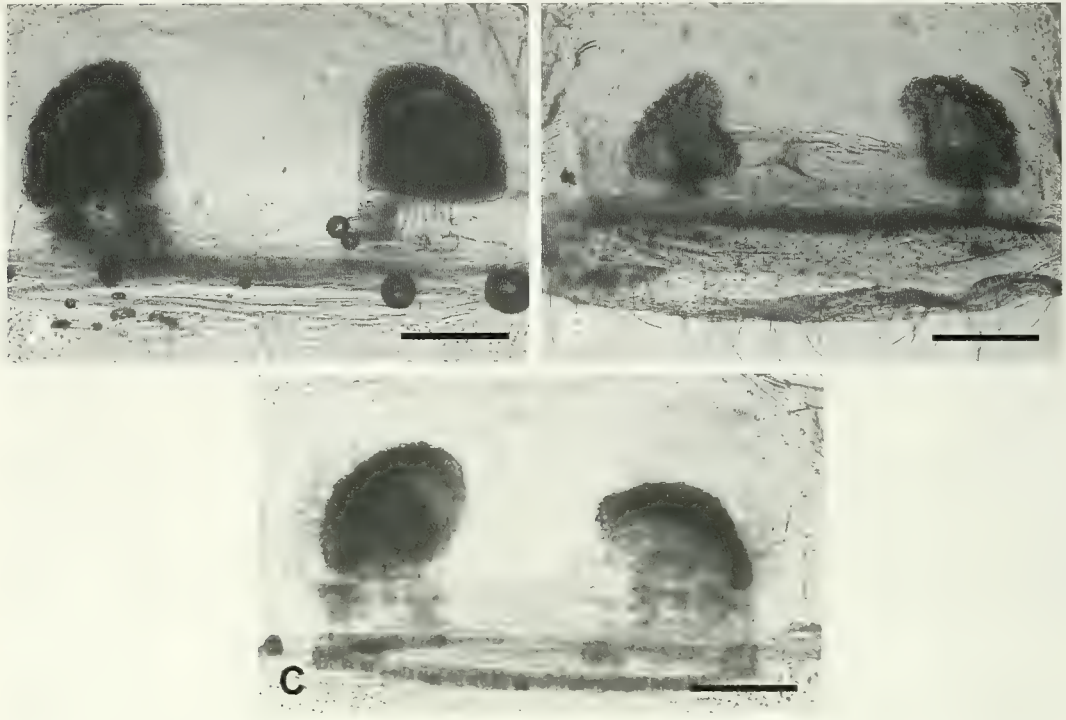


FIGURE 26. Spermathecae of *Micromesomma cowani*, dorsal. A, C. MNHN females. B. MRAC female. Scale bars: = 0.2 mm.

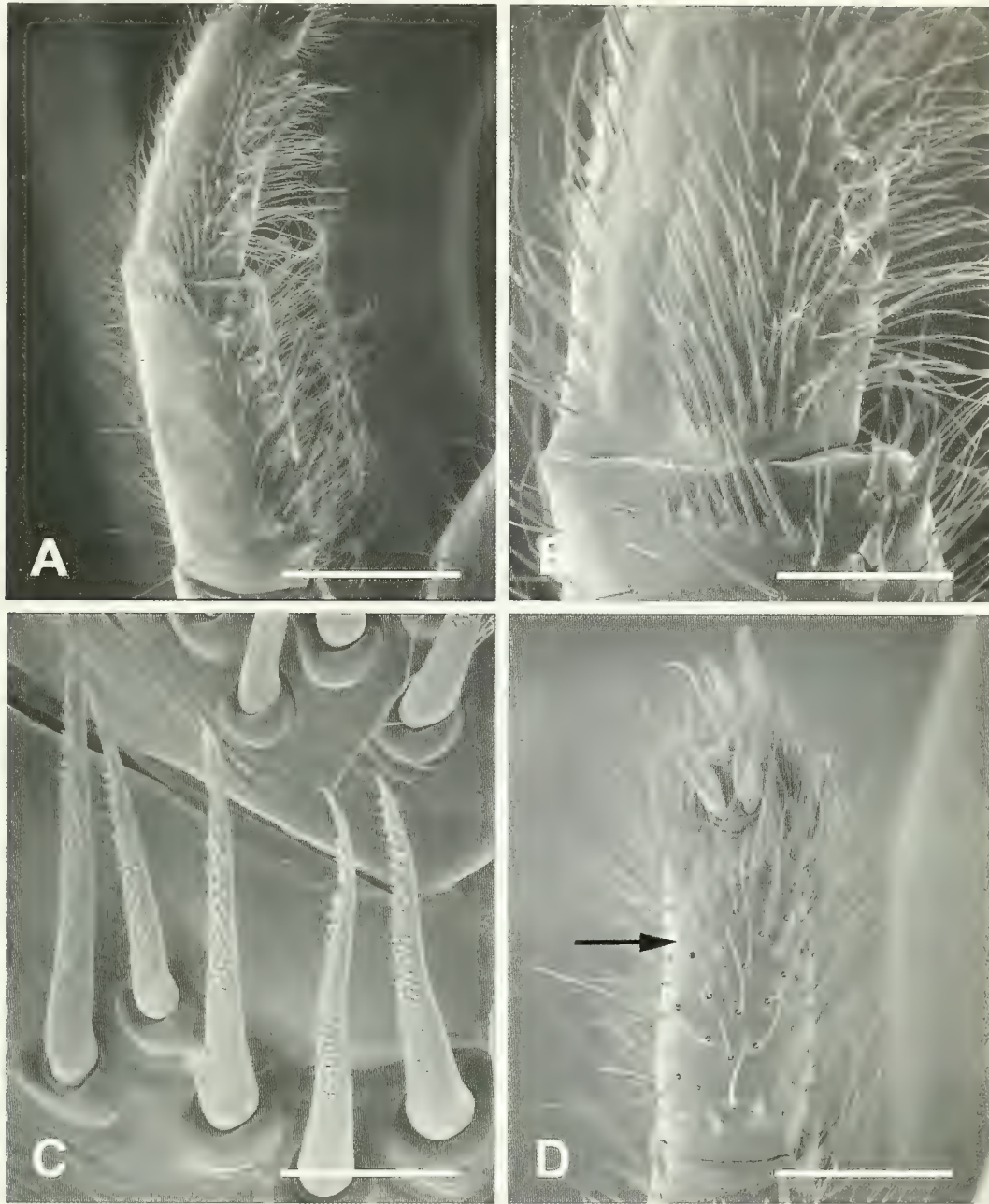


FIGURE 27. *Paramigas oracle*, new species, female from Talatakely, Madagascar. A. Tibia-metatarsus I, retrolateral. B. Retro-lateral view of tibia-metatarsus I junction showing serrate, procumbant setae. C. Dorsal view of serrate, procumbant setae at apex of tibia I. D. Tarsus III, dorsal, showing trichobothrial distribution and tarsal organ (arrow). Scale bars: A = 1000 μ m, B = 430 μ m, C = 75 μ m, D = 270 μ m.

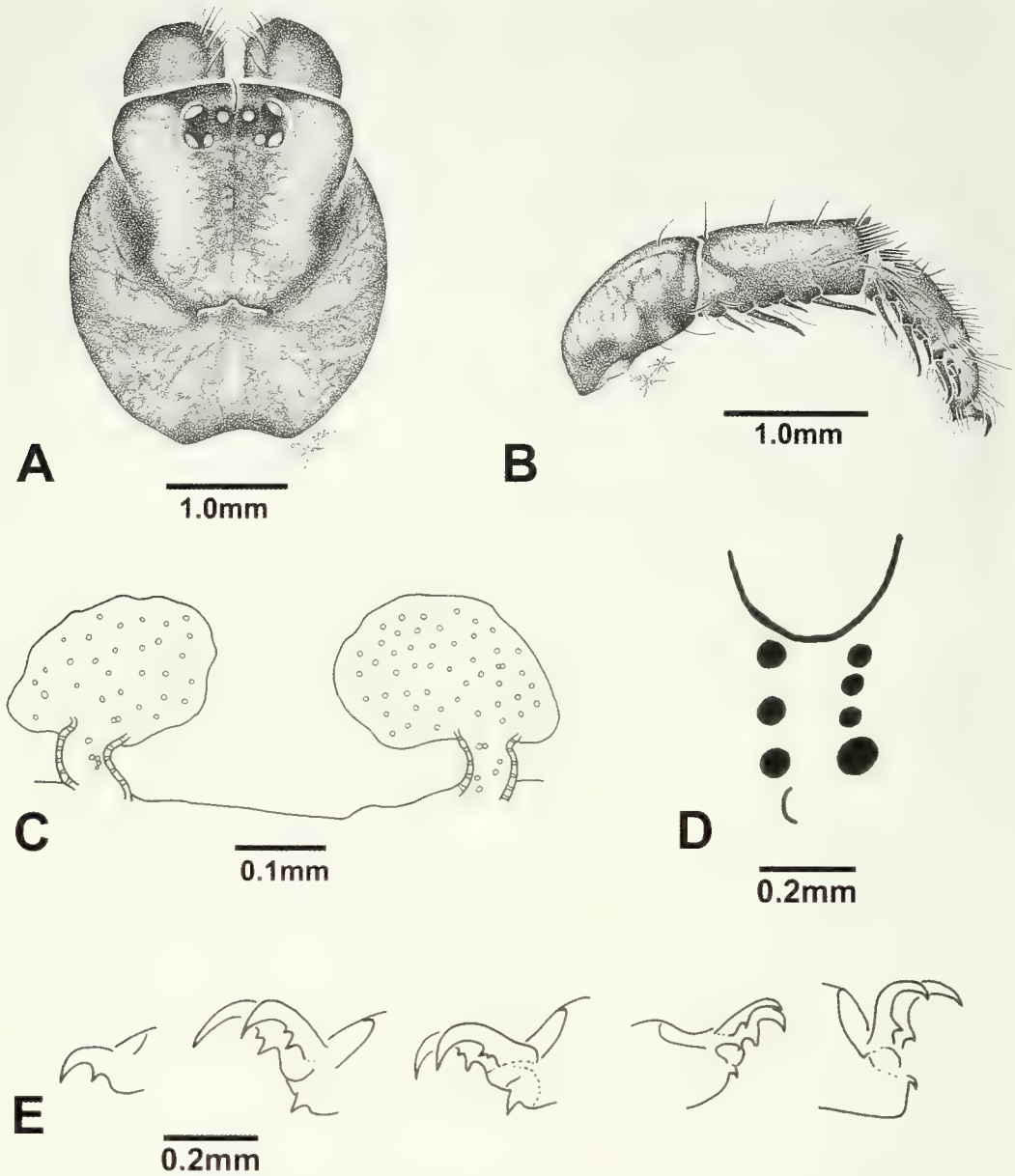


FIGURE 28. *Paramigas alluaudi*, female holotype of *Myrtle alluaudi*. A. Cephalothorax, dorsal. B. Right leg I, retrolateral. C. Spermathecae, dorsal. D. Dentition of right chelicera. E. Left tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A, B by JS, C, D by JL, E by CG.

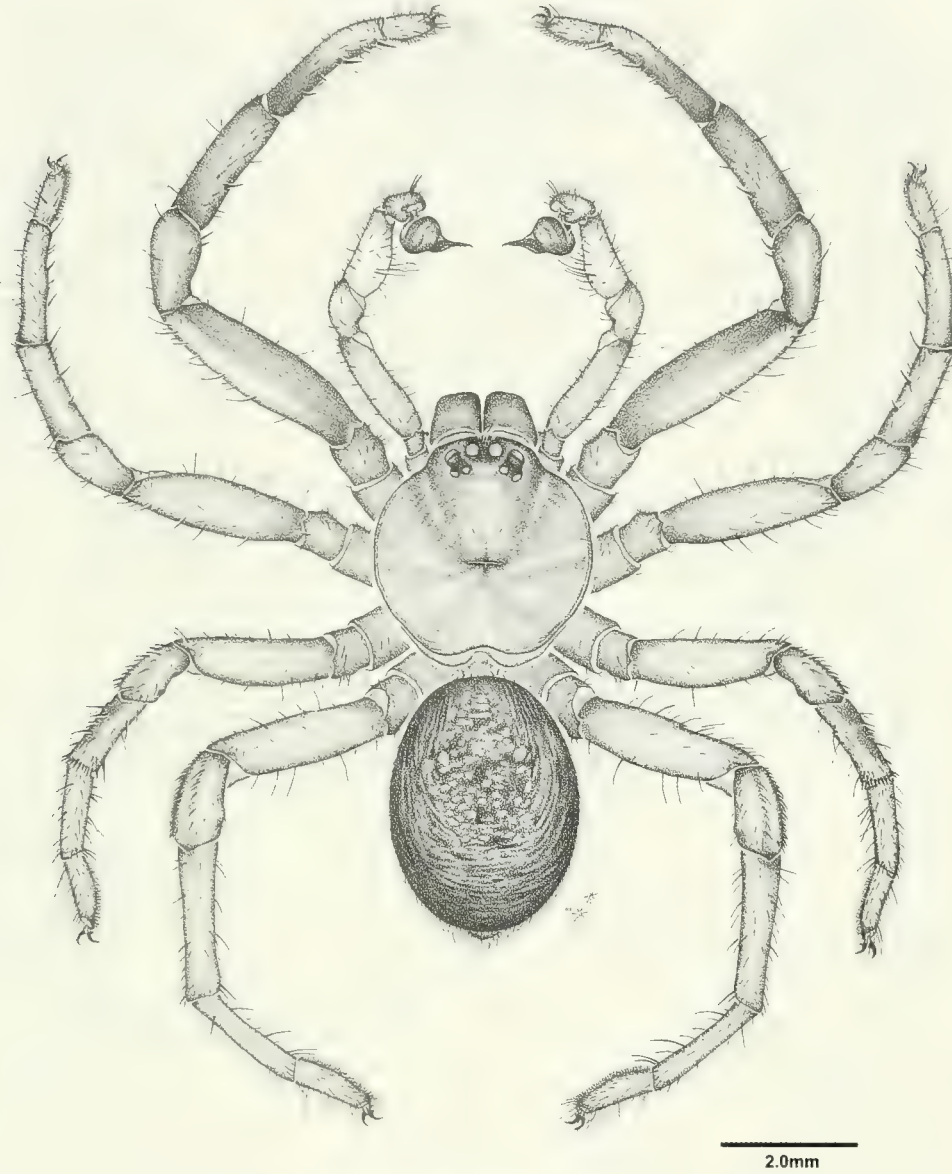


FIGURE 29. *Paramigas andasibe* Raven, new species, male from Ambohitantely, Madagascar, dorsal. Illustration by JS.

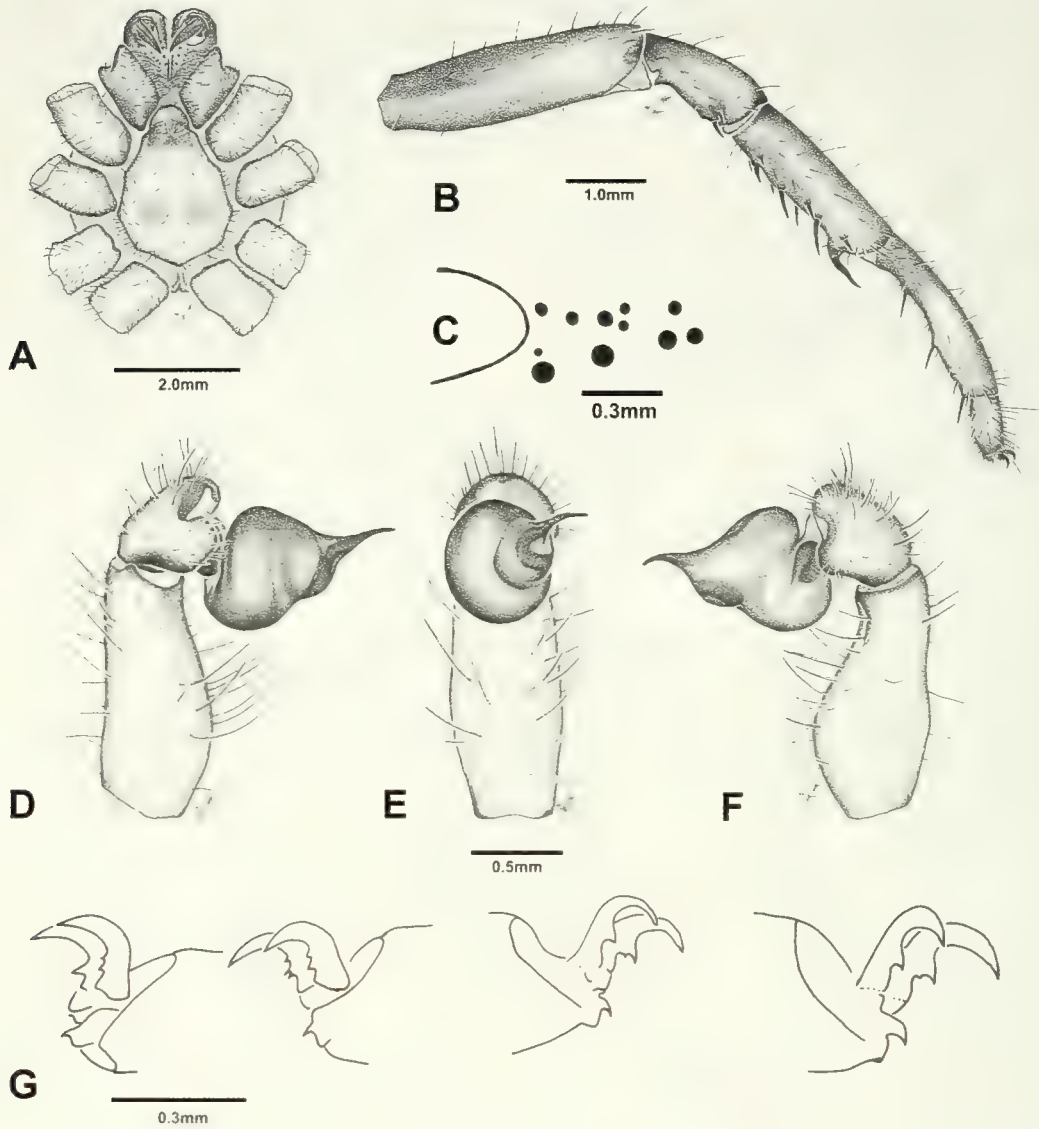


FIGURE 30. *Paramigas andasibe* Raven, new species, male from Ambohitantely, Madagascar. A. Cephalothorax, ventral. B. Right leg I, retrolateral. C. Dentition of right chelicera. D–F. Left pedipalp tibia-tarsus. D. Prolateral. E. Ventral. F. Retrolateral. G. Left tarsal claws: leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A, B, D–F by JS, C by JL, G by CG.

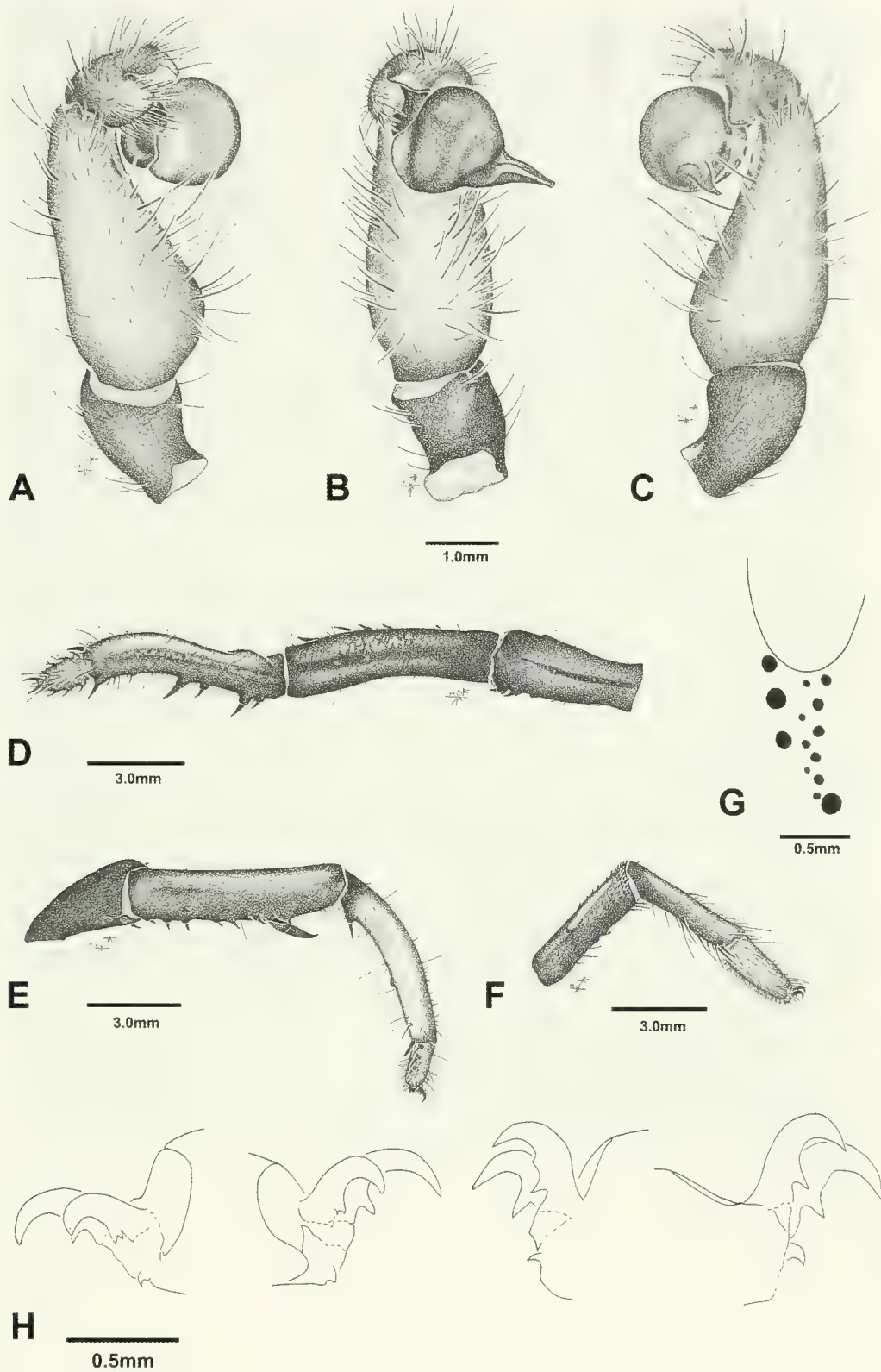


FIGURE 31 *Paramigas andasibe* Raven, new species, holotype male. A–C. Left pedipalp patella-tarsus. A. Prolateral. B. Ventral. C. Retrolateral. D. Right patella-tarsus I, dorsal. E. Right patella-tarsus I, retrolateral. F. Left tibia-tarsus III, retrolateral. G. Dentition of right chelicera. H. Tarsal claws: right leg I, retrolateral, left leg II retrolateral, left leg III and right IV, pro-lateral. Illustrations A–F by JS, G by JL, H by CG.

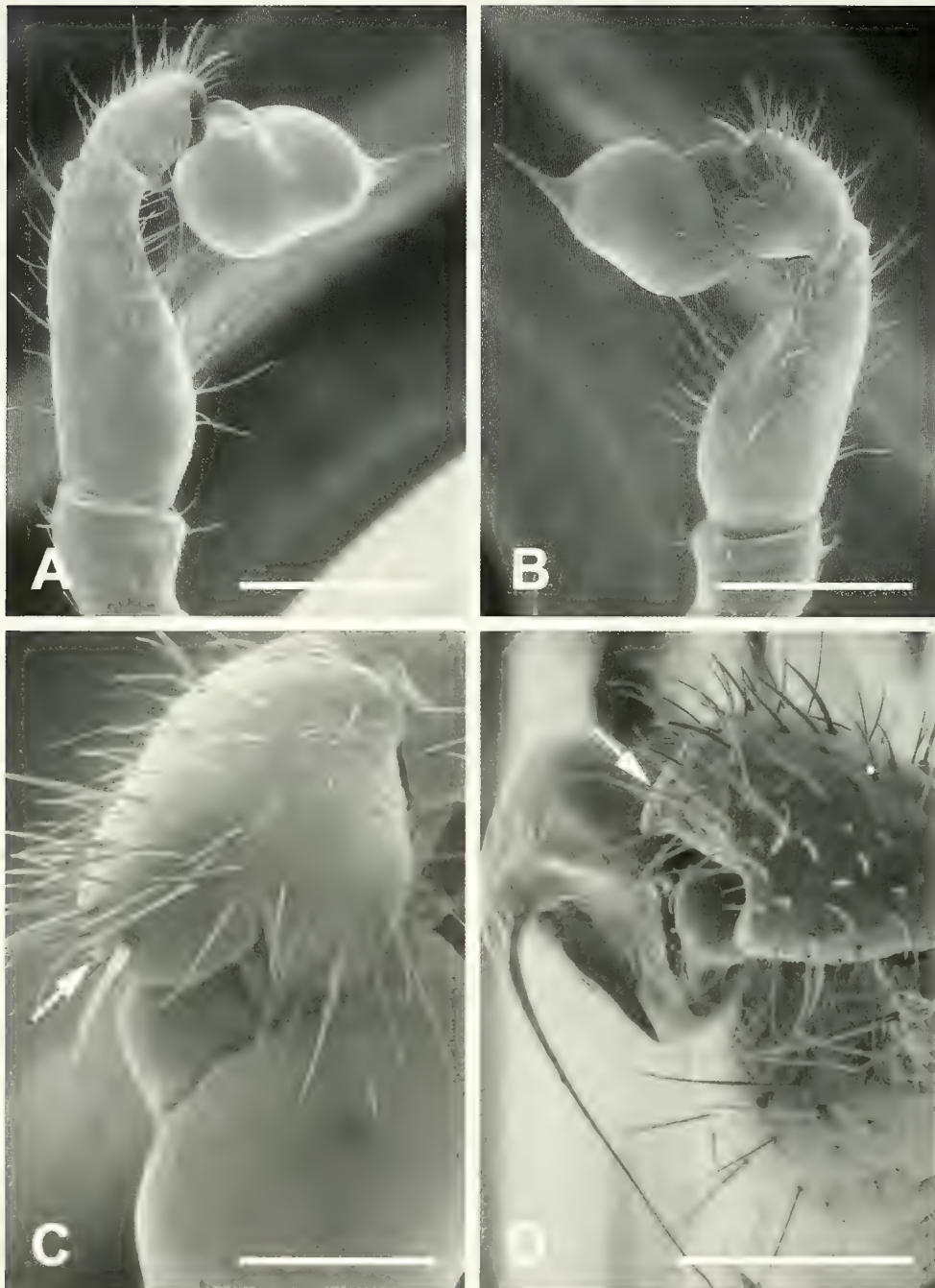


FIGURE 32. Pedipalpi of male Migidae. A-C. *Paramigas andasibe* Raven, new species, from Manakambahiny, Madagascar, right pedipalp. A. Patella-tarsus, retrolateral. B. Patella-tarsus, prolateral. C. Tarsus, dorsal. D. *Moggridgea pseudocrudeni* from Alicedale, South Africa, apex of pedipalpal tarsus. Arrows to ectal lobe of tarsus. Scale bars: A, B = 1000 μ m, C, D = 380 μ m.

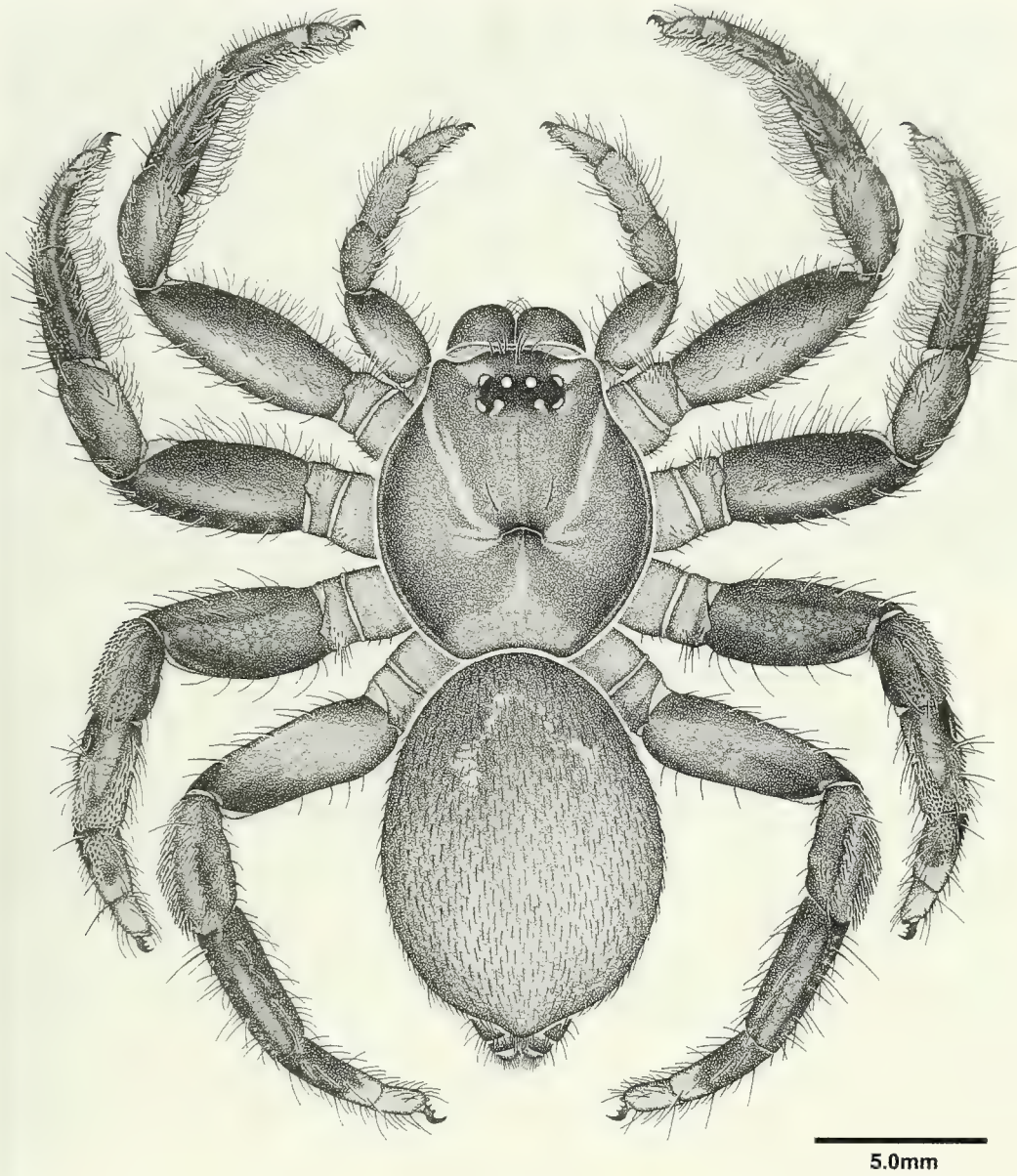


FIGURE 33. *Paramigas goodmani*, new species, holotype female, dorsal. Illustration by JS.

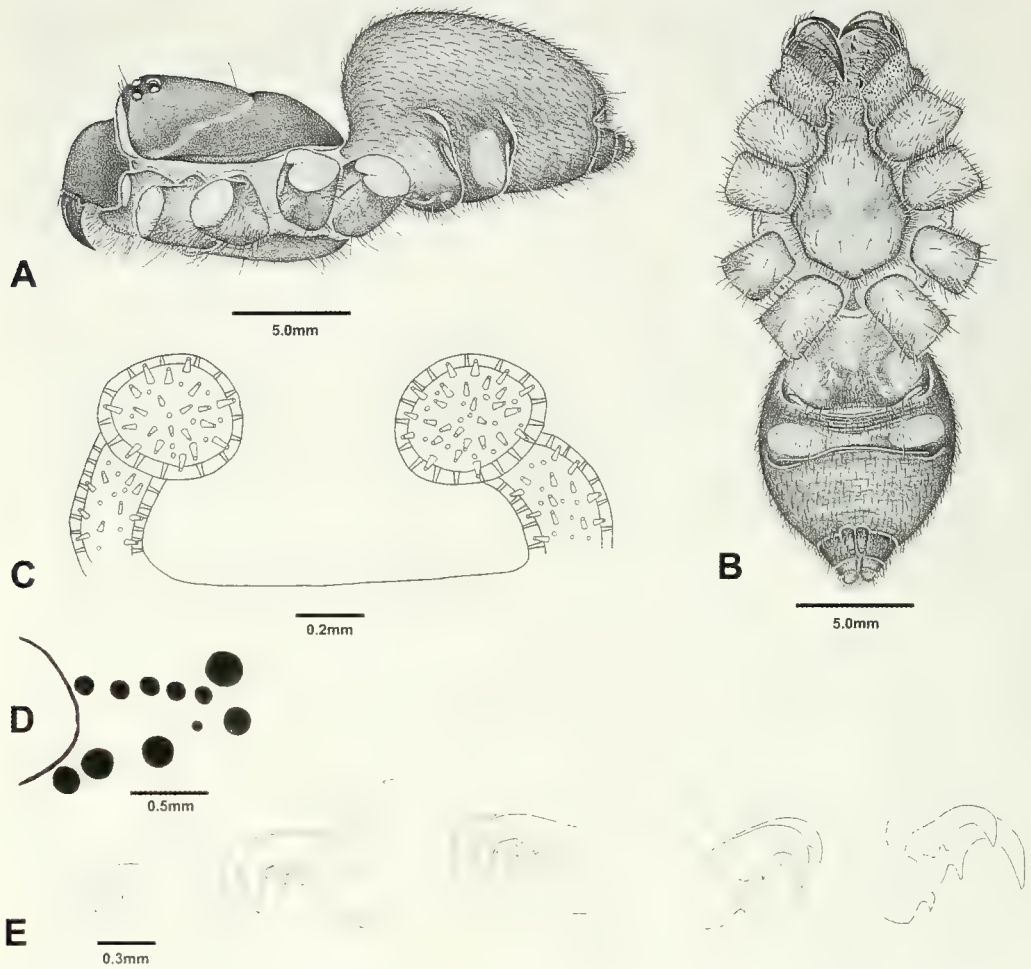


FIGURE 34. *Paramigas goodmani*, new species, holotype female. A. Lateral. B. Ventral. C. Spermathecae, dorsal. D. Denti- tion of right chelicera. E. Left tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A, B by JS, C, D by JL, E by CG.

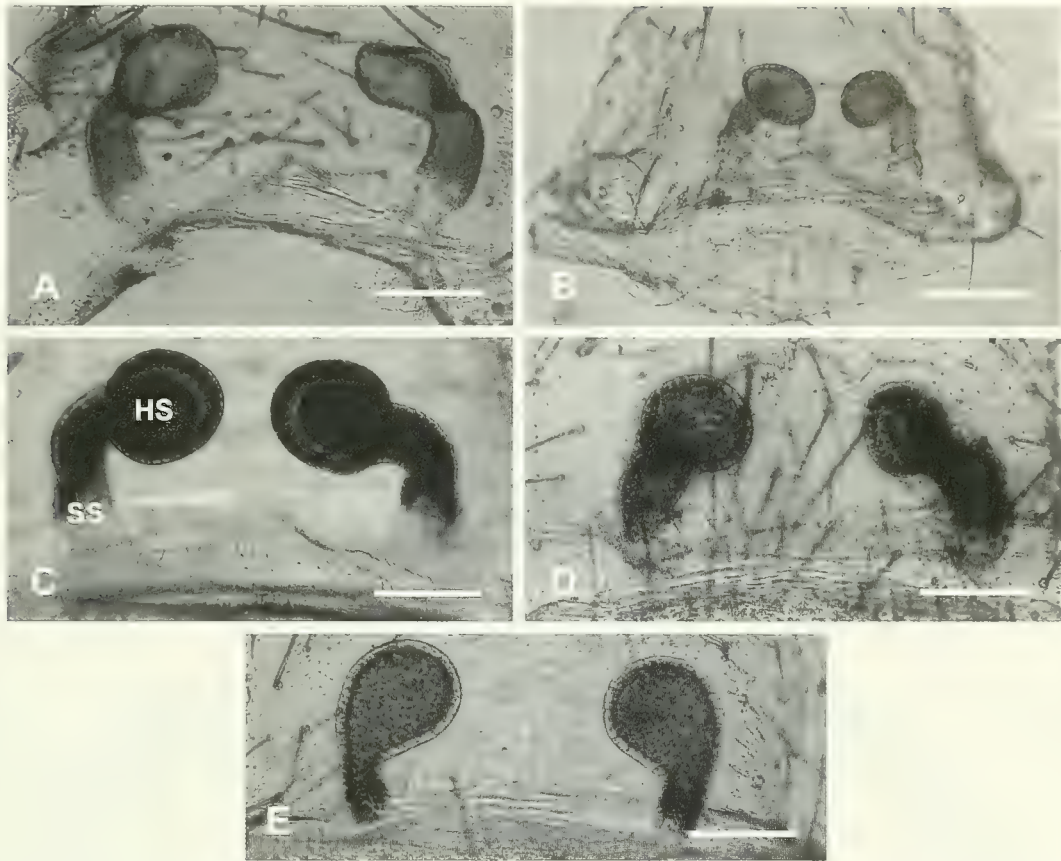


FIGURE 35. Spermathecae of *Paramigas* spp., dorsal. A. *P. perroti* (large female, MRAC). B. *P. perroti* (small female, MRAC). C. *P. perroti* (syntype of *Paramigas subrufus*). D. *P. goodmani*, holotype. E. *P. milloti*, holotype. HS – spermathecal head, SS – spermathecal stalk. Scale bars: = 0.4 mm.

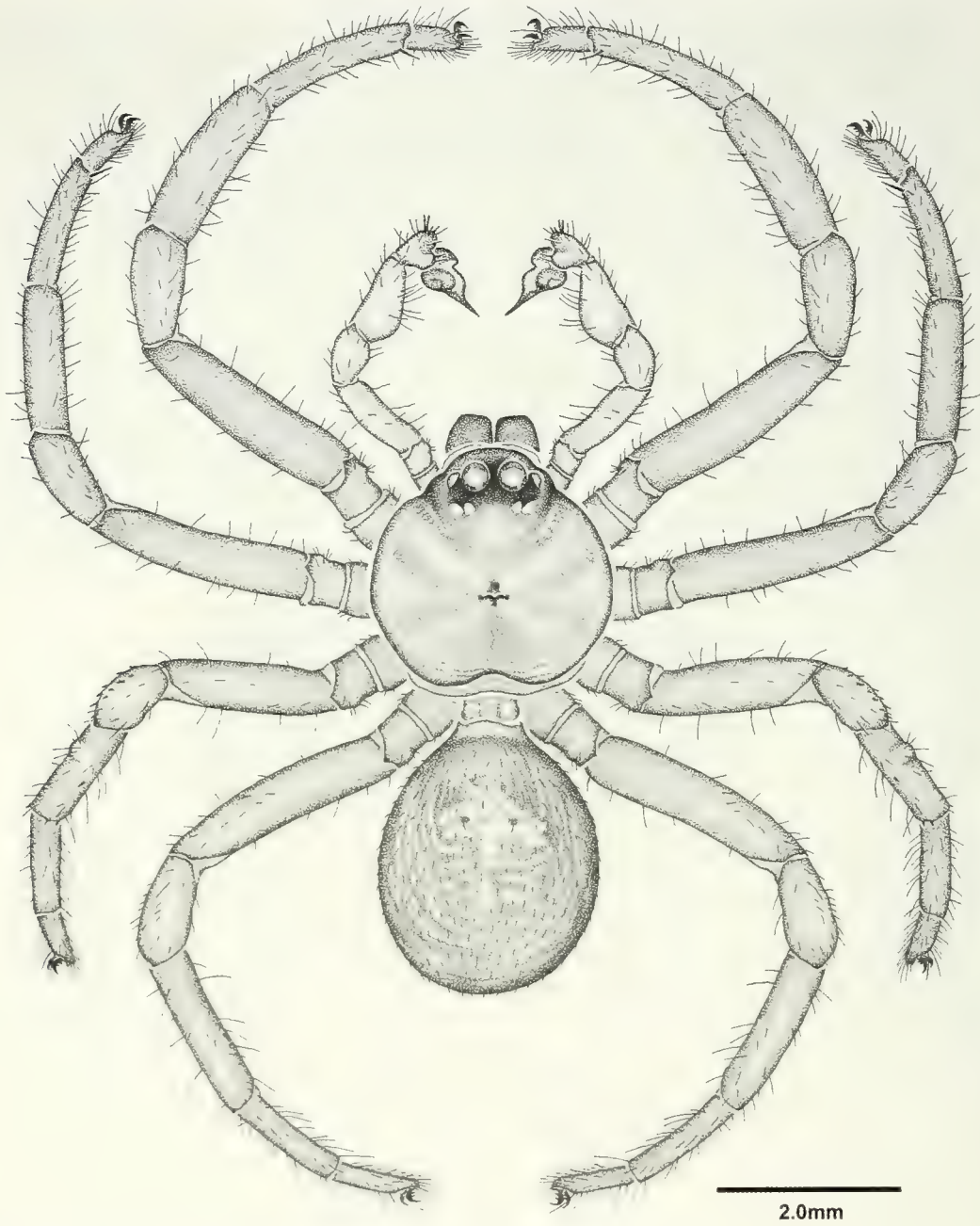


FIGURE 36. *Paramigas macrops*, new species, holotype male, dorsal. Illustration by JS.

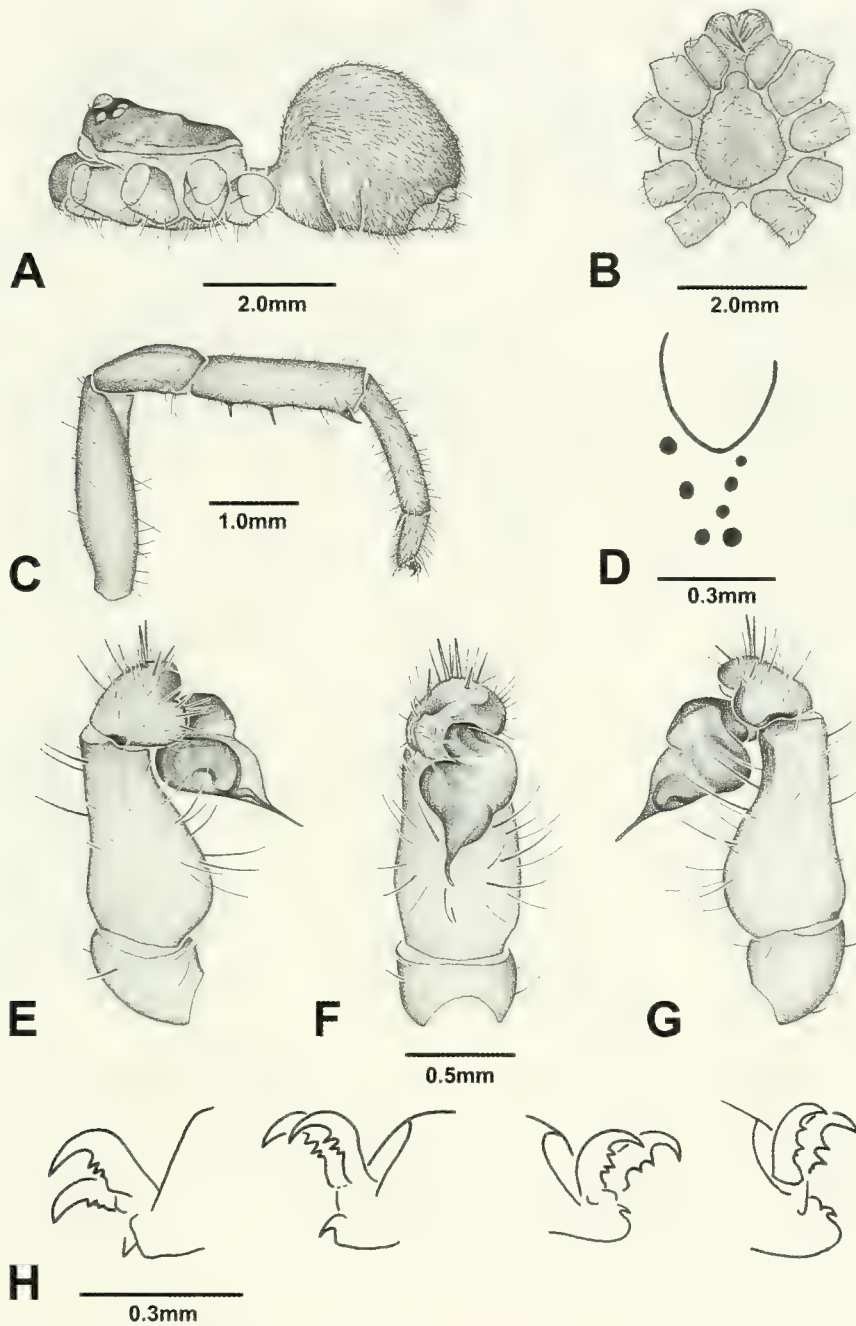


FIGURE 37. *Paramigas macrops*, new species, holotype male. A. Lateral. B. Cephalothorax, ventral. C. Right leg I, retrolateral. D. Dentition of right chelicera. E-G. Left pedipalp patella-tarsus. E. Prolateral. F. Ventral. G. Retrolateral. H. Left tarsal claws: leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A-C, E-G by JS, D by JL, H by CG.

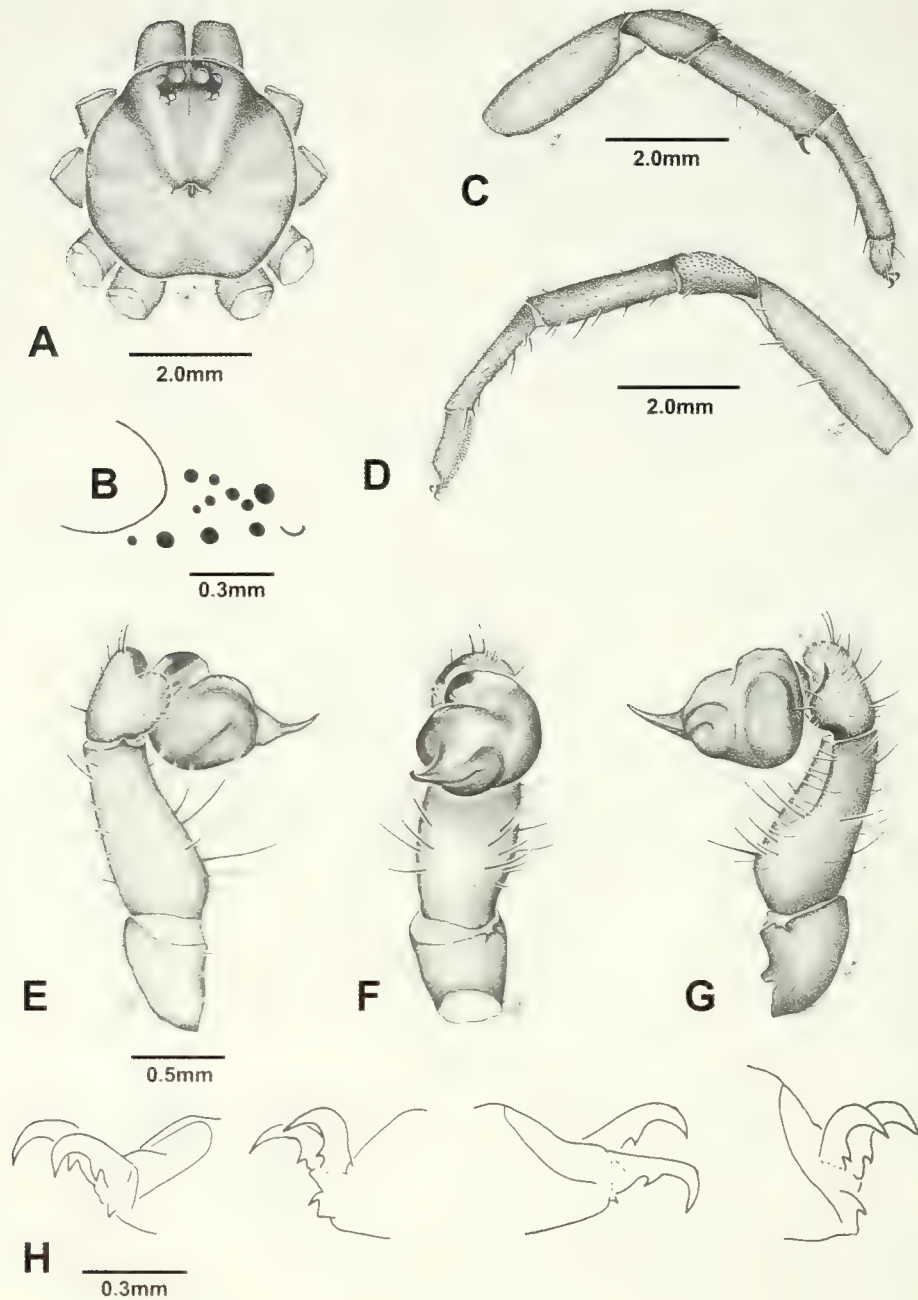


FIGURE 38. *Paramigas manakambus*, new species, holotype male. A. Cephalothorax, dorsal. B. Dentition of right chelicera. C. Right leg I, retrolateral. D. Right leg IV, prolateral. E-G. Left pedipalp patella-tarsus. E. Prolateral. F. Ventral. G. Retrolateral. H. Left tarsal claws: leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A, C-G by JS. B by JL, H by CG.

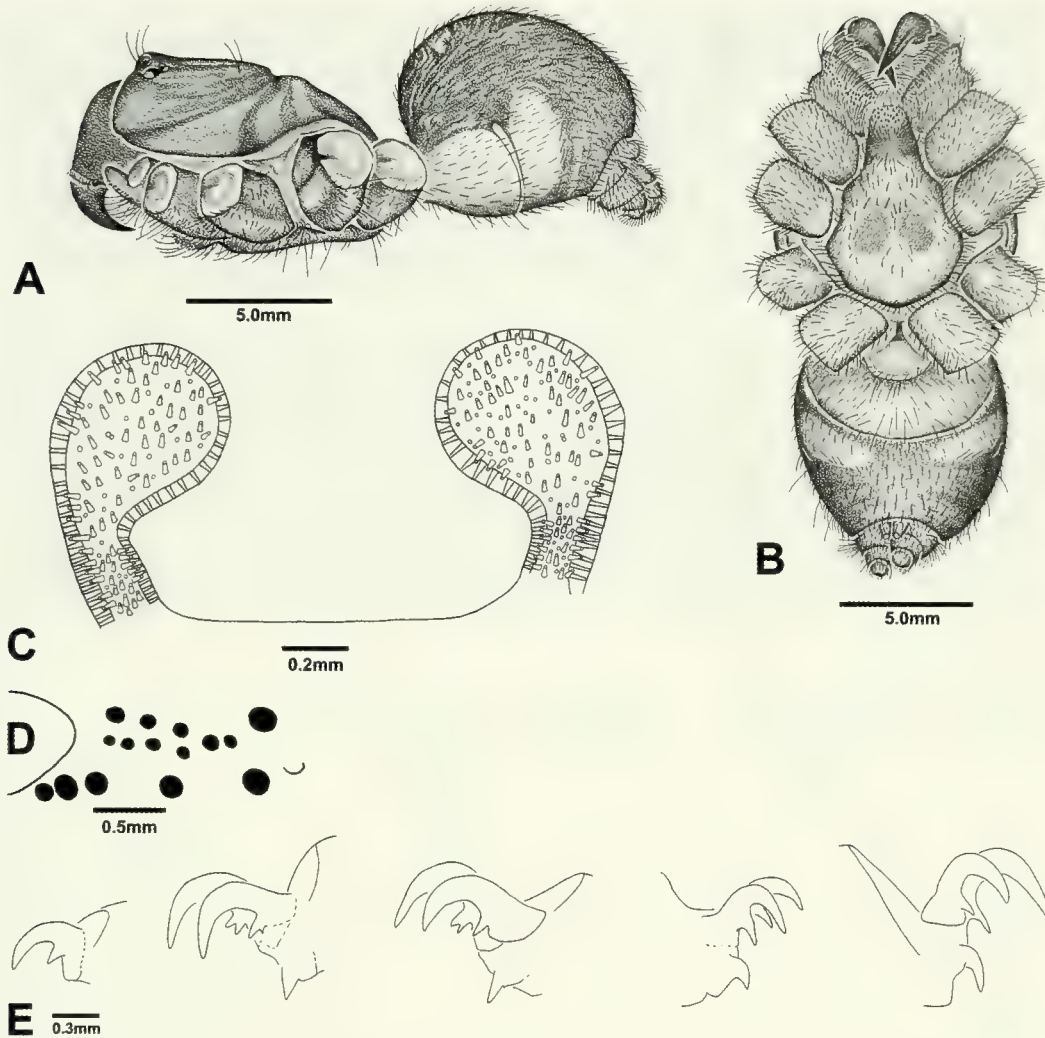


FIGURE 39. *Paramigas milloti*, new species, holotype female. A. Lateral. B. Ventral. C. Spermathecae, dorsal. D. Dentition of right chelicera. E. Left tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A, B by JS, C, D by JL, E by CG.

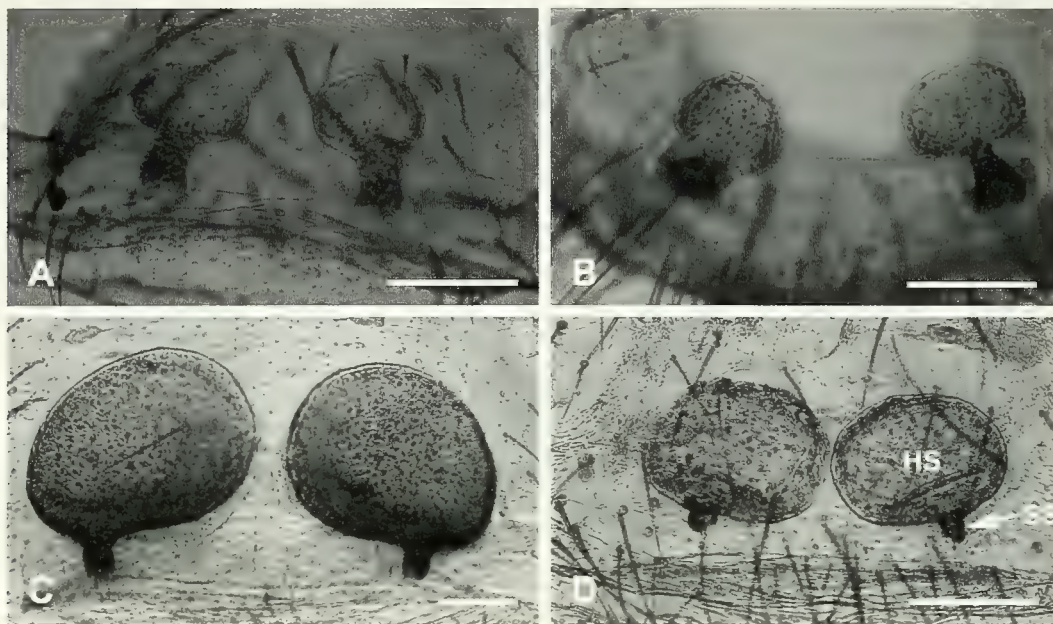


FIGURE 40. Spermathecae of *Paramigas* spp., dorsal. A. *P. oracle*, Talatakely, Madagascar. B. *P. oracle*, holotype (SS fore-shortened in this view). C. *P. pauliani* (small paratype of *Legendrella pauliani*). D. *P. pauliani* (large paratype of *Legendrella pauliani*). HS – spermathecal head, SS – spermathecal stalk. Scale bars: = 0.3 mm.

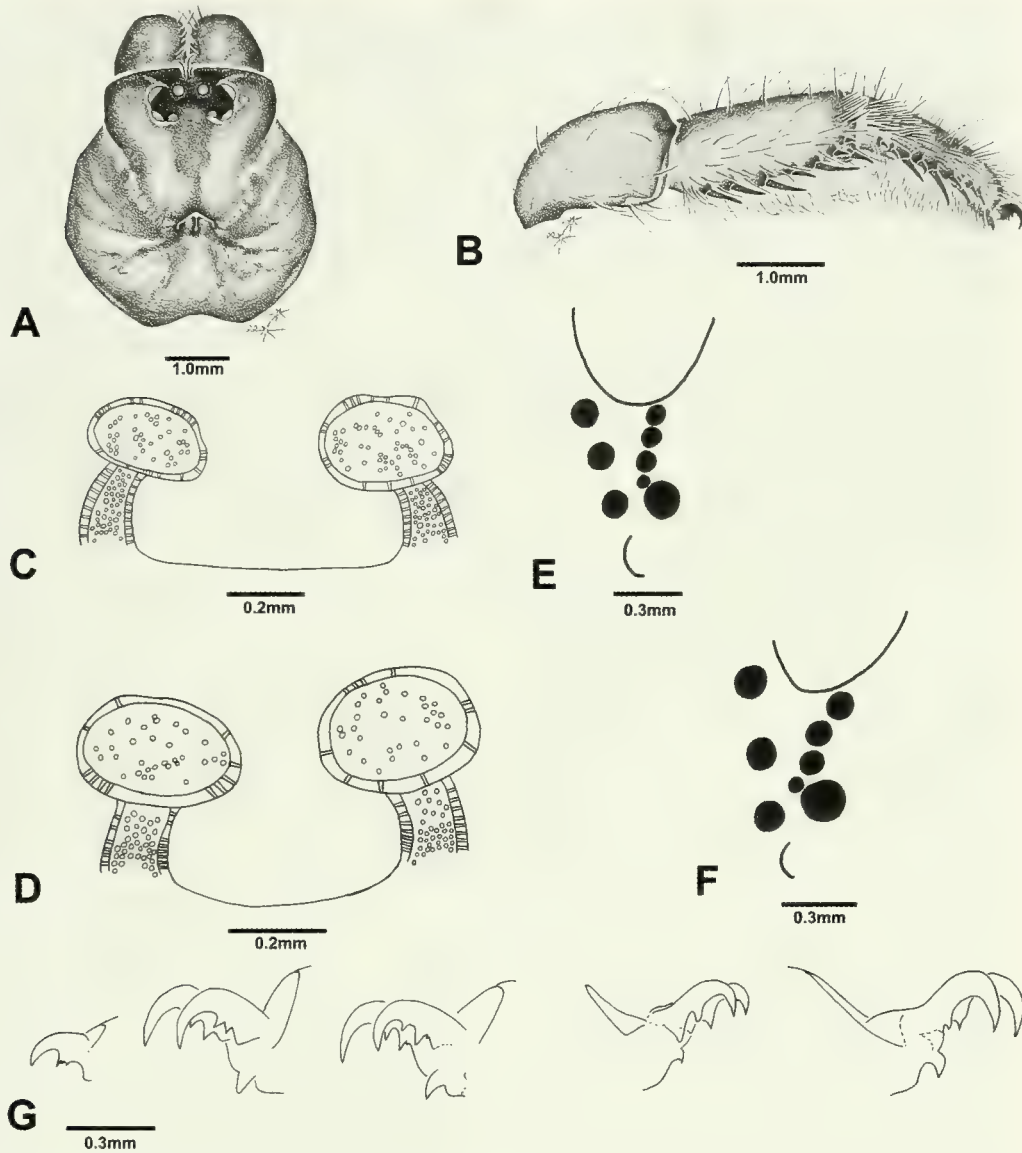


FIGURE 41. *Paramigas oracle*, new species, female. A–C, F, G holotype. D, E. Talatakeley, Madagascar. A. Cephalothorax, dorsal. B. Right leg I, retrolateral. C, D. Spermathecae, dorsal. E, F. Dentition of right chelicera. G. Left tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A, B by JS, C–F by JL, G by CG.

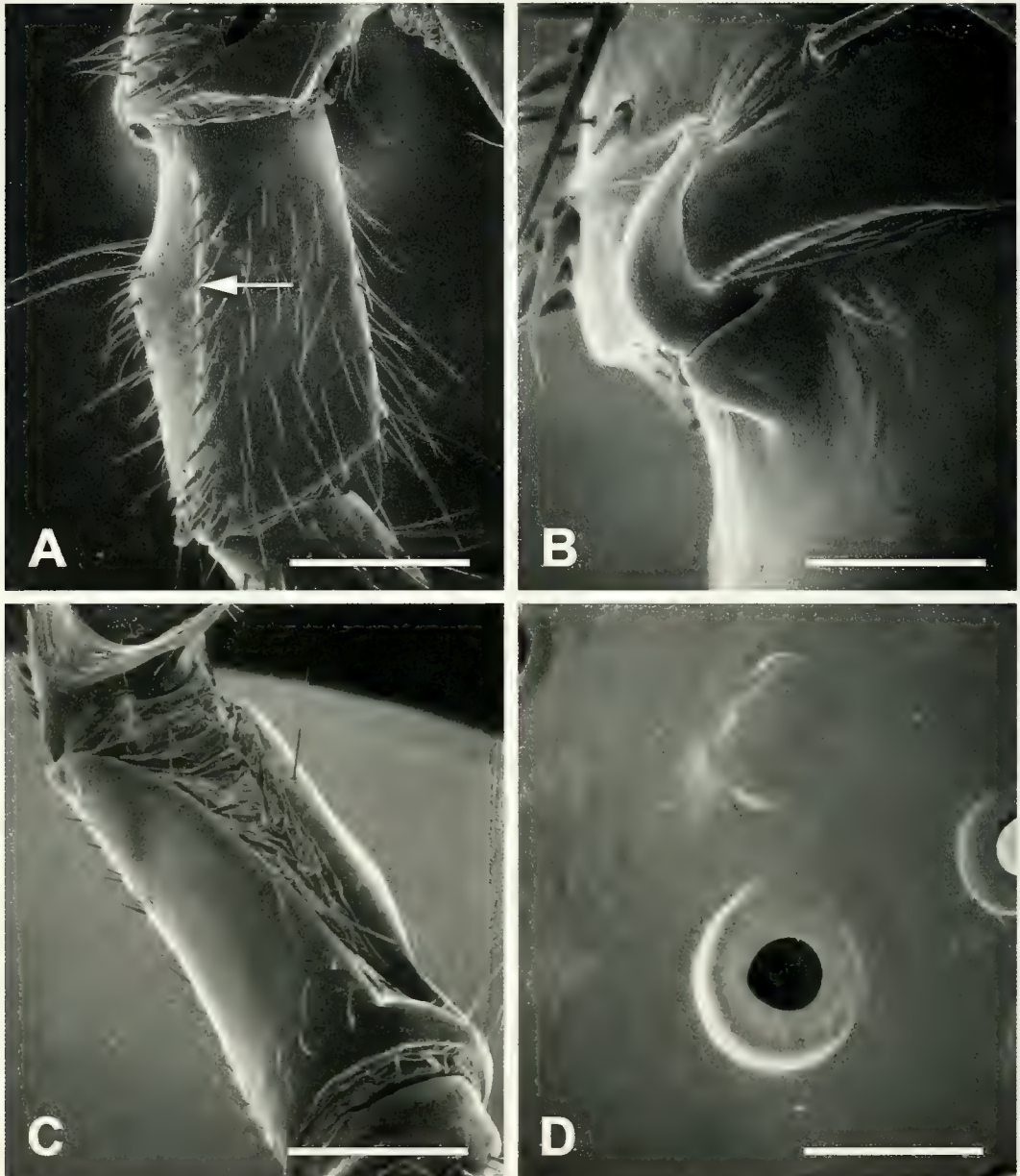


FIGURE 42. *Paramigas oracle*, new species, female from Talatakely, Madagascar. A. Tibia III, prolateral. B. Junction of patella-tibia III. C. Venter of femur III showing membrane. D. Tarsal organ and trichobothrium on tarsus III. Arrow to prolateral ridge of tibia III. Scale bars: A = 600 μ m, B = 250 μ m, C = 750 μ m, D = 38 μ m.

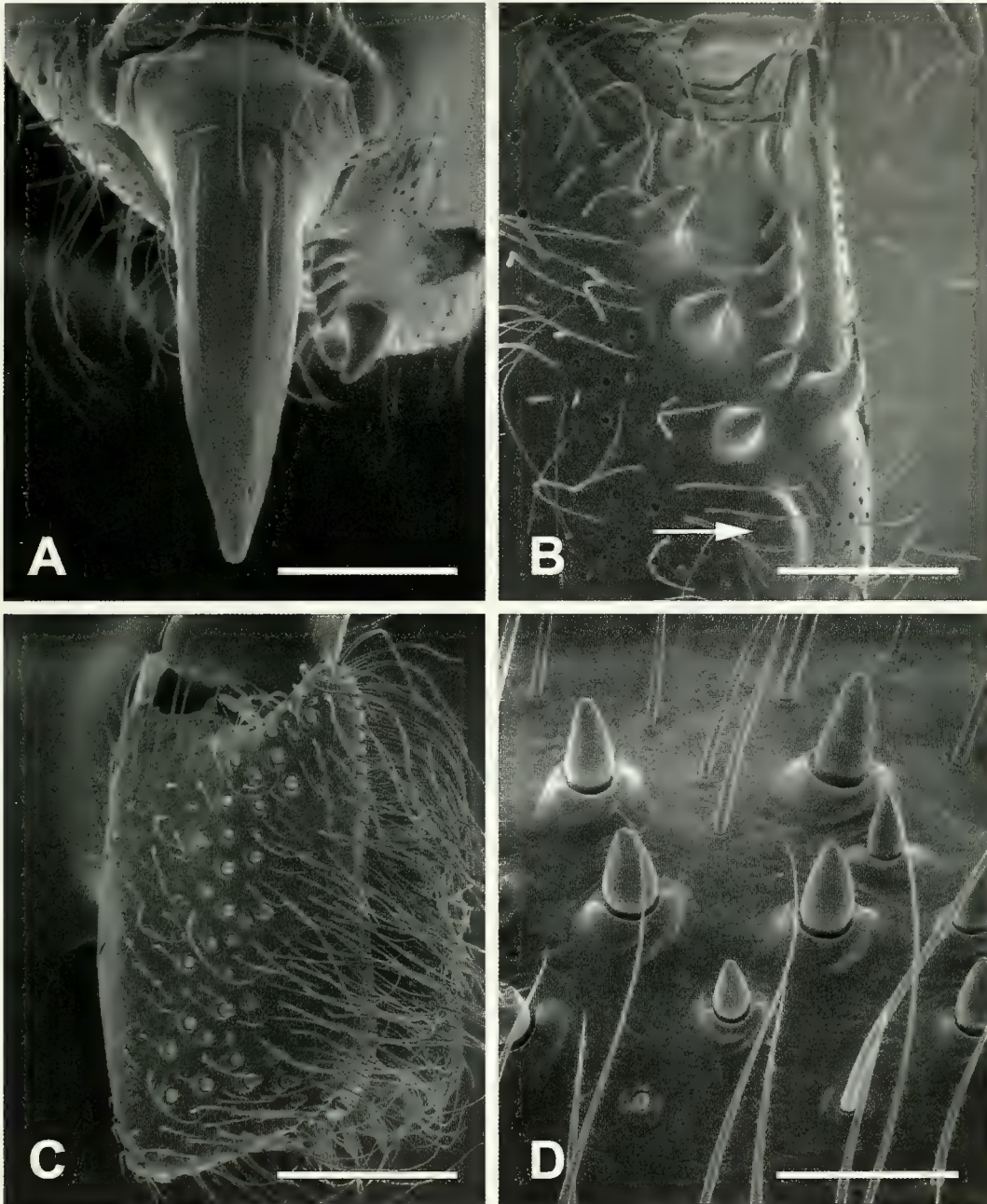


FIGURE 43. *Paramigas oracle*, new species, female from Talatakely, Madagascar. A. Fang. B. Dentition of fang furrow (arrow to basal swelling on chelicera). C. Right pedipalpal coxa. D. Cusps on right pedipalpal coxa. Scale bars: A = 500 μm , B = 430 μm , C = 600 μm , D = 120 μm .

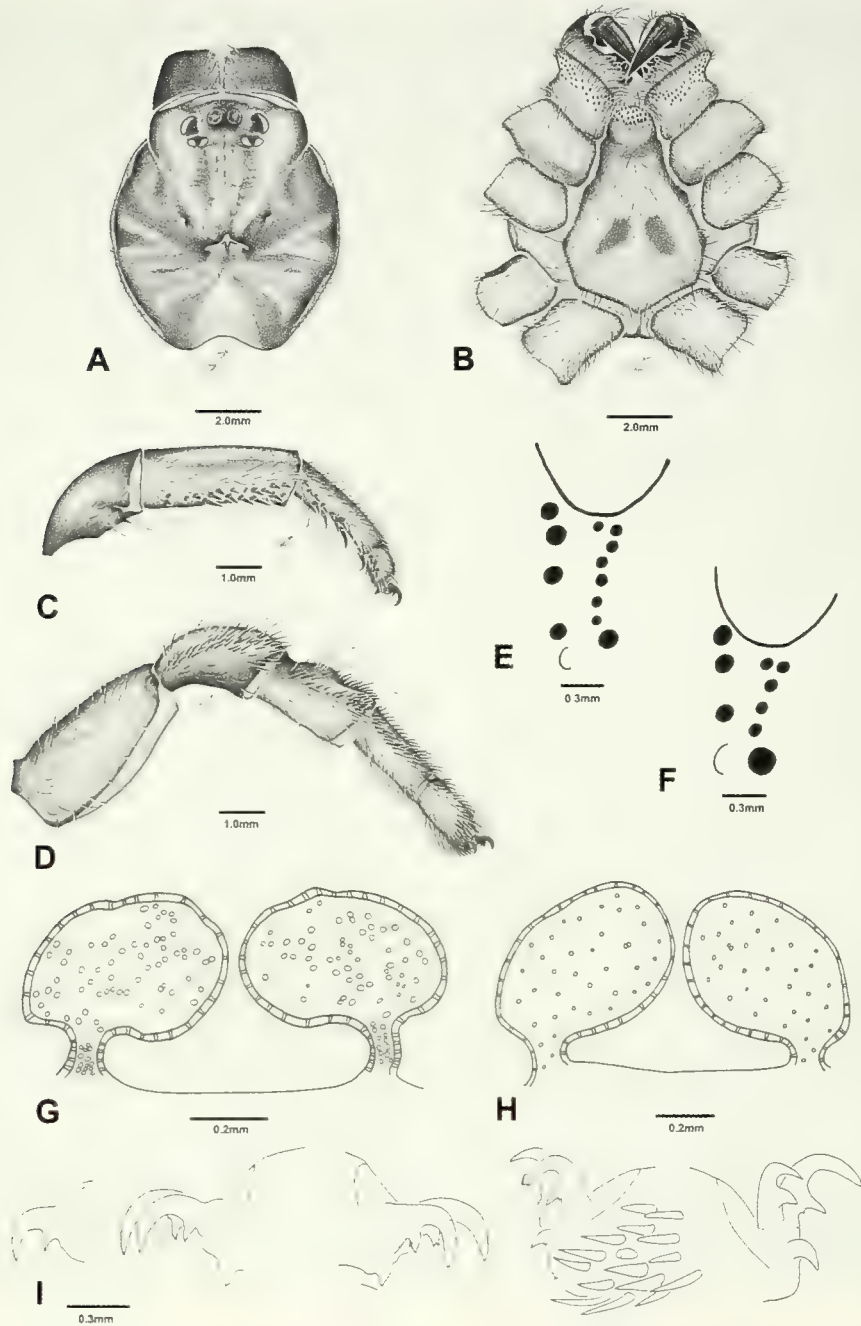


FIGURE 44. *Paramigas pauliani*, female. A–E. Holotype of *Legendrella pauliani*. F–I. Paratypes of *Legendrella pauliani*. A. Cephalothorax, dorsal. B. Cephalothorax, ventral. C. Right leg I, retrolateral. D. Left leg III, prolateral. E, F. Dentition of right chelicera. G, H. Spermathecae, dorsal. I. Tarsal claws: pedipalp, left leg I retrolateral, right leg II retrolateral, right leg III prolateral, left leg IV prolateral. Illustrations A–D by JS, E–H by JL, I by CG.

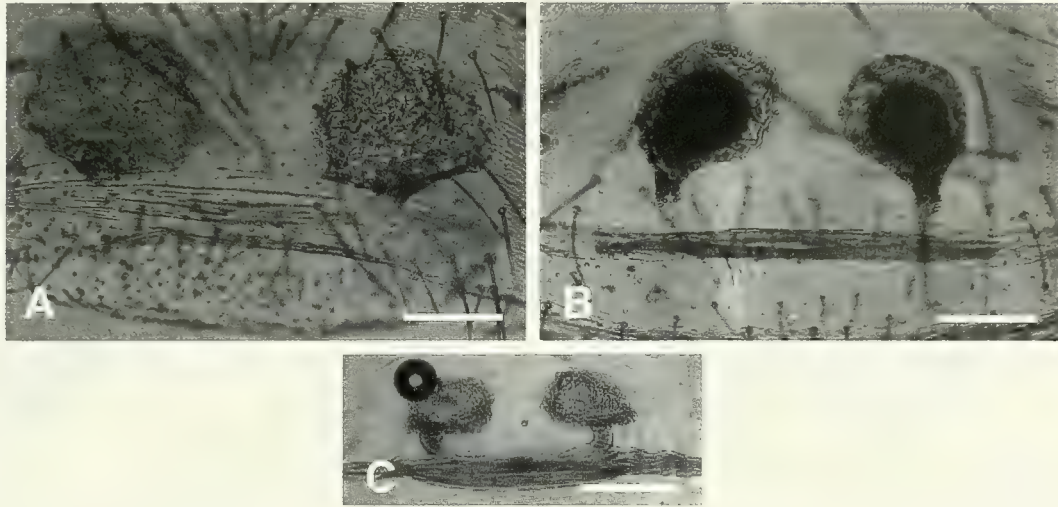


FIGURE 45. Spermathecae of *Paramigas* spp., dorsal. A. *P. pectinatus*, holotype (narrow stalks of spermathecae partially hidden). B. *P. rothorum*, holotype. C. *P. alluaudi* (holotype of *Myrtale alluaudi*). Scale bars: = 0.2 mm.

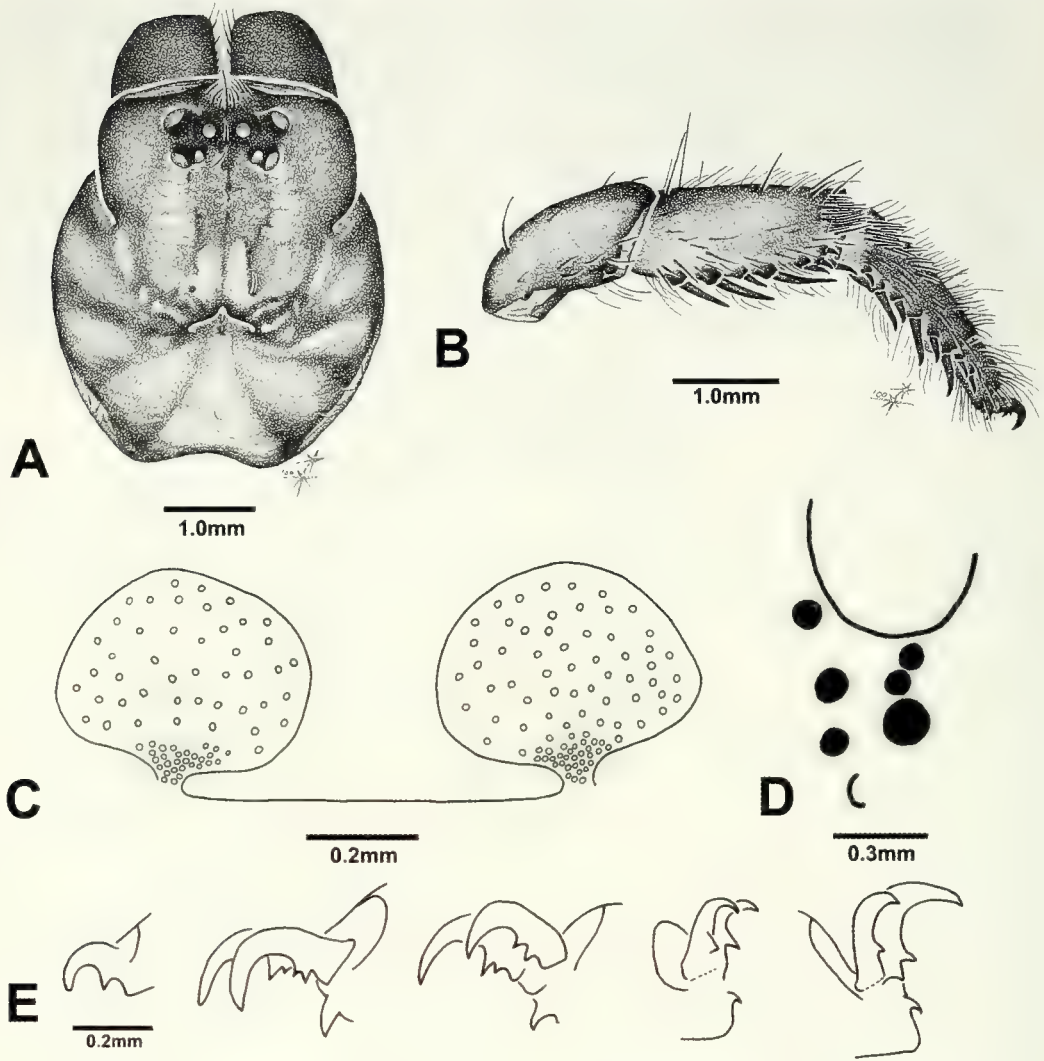


FIGURE 46. *Paramigas pectinatus*, new species, holotype female. A. Cephalothorax, dorsal. B. Right leg I, retrolateral. C. Spermathecae, dorsal. D. Dentition of right chelicera. E. Left tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A, B by JS, C, D by JL, E by CG.

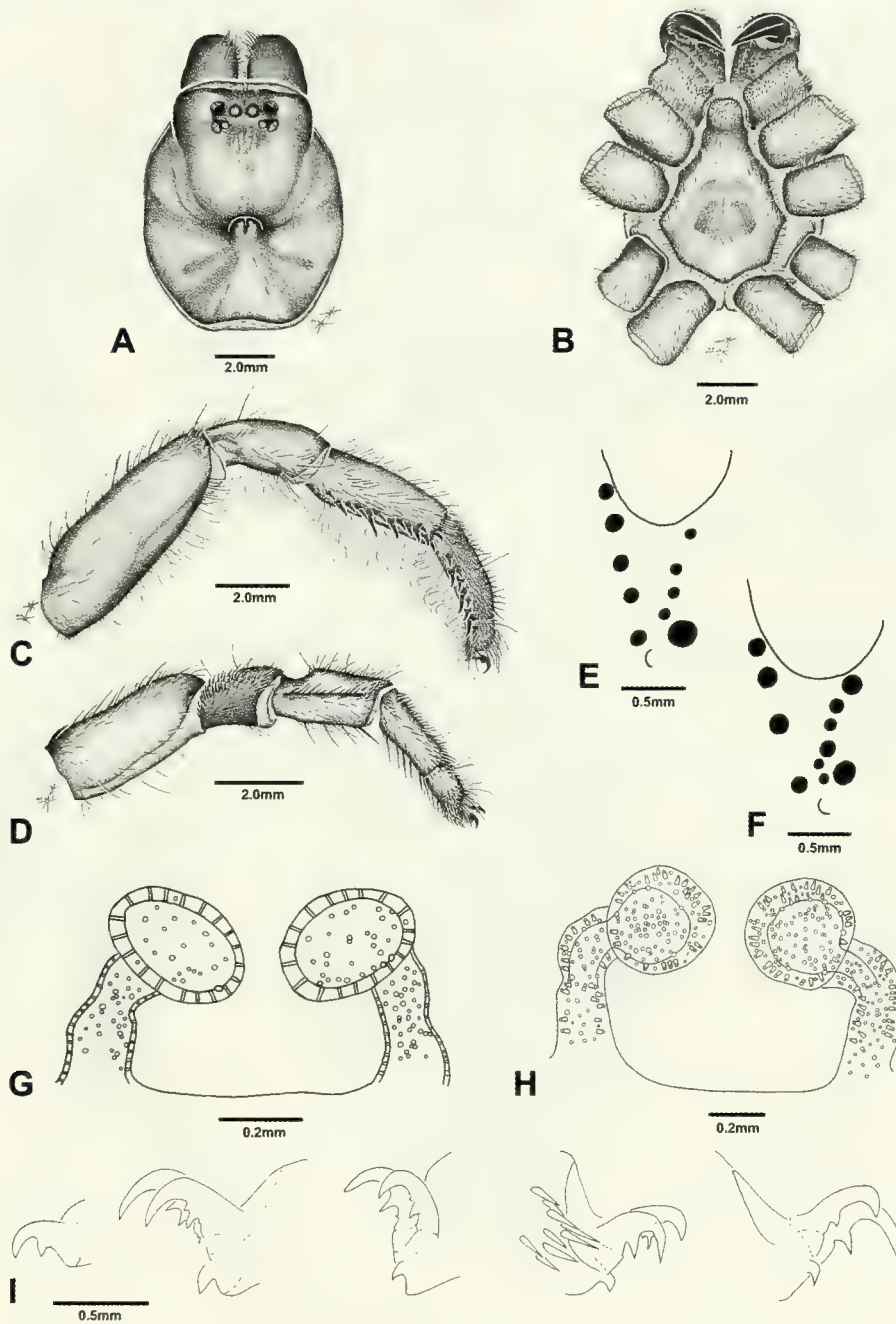


FIGURE 47. *Paramigas perroti*, female. A–E, I. Lectotype of *Myrtale perroti*. H. Paralectotype of *Paramigas subrufus*. F, G. MRAC specimens. A. Cephalothorax, dorsal. B. Cephalothorax, ventral. C. Right leg I, retrolateral. D. Left leg III, prolateral. E, F. Dentition of right chelicera. G, H. Spermathecae, dorsal. I. Left tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A–D by JS, E–H by JL, I by CG.

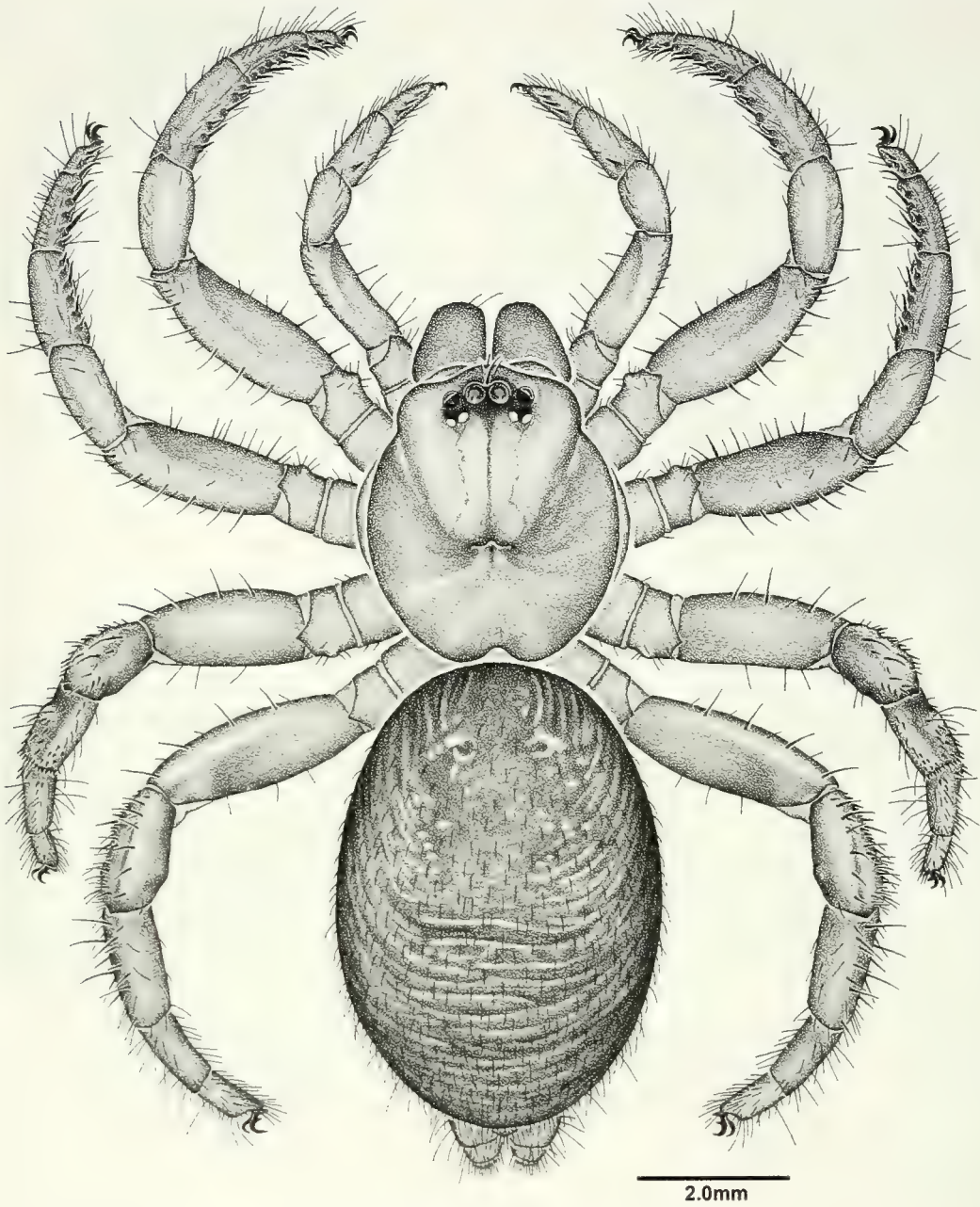


FIGURE 48. *Paramigas rothorum*, new species, holotype female, dorsal. Illustration by JS.

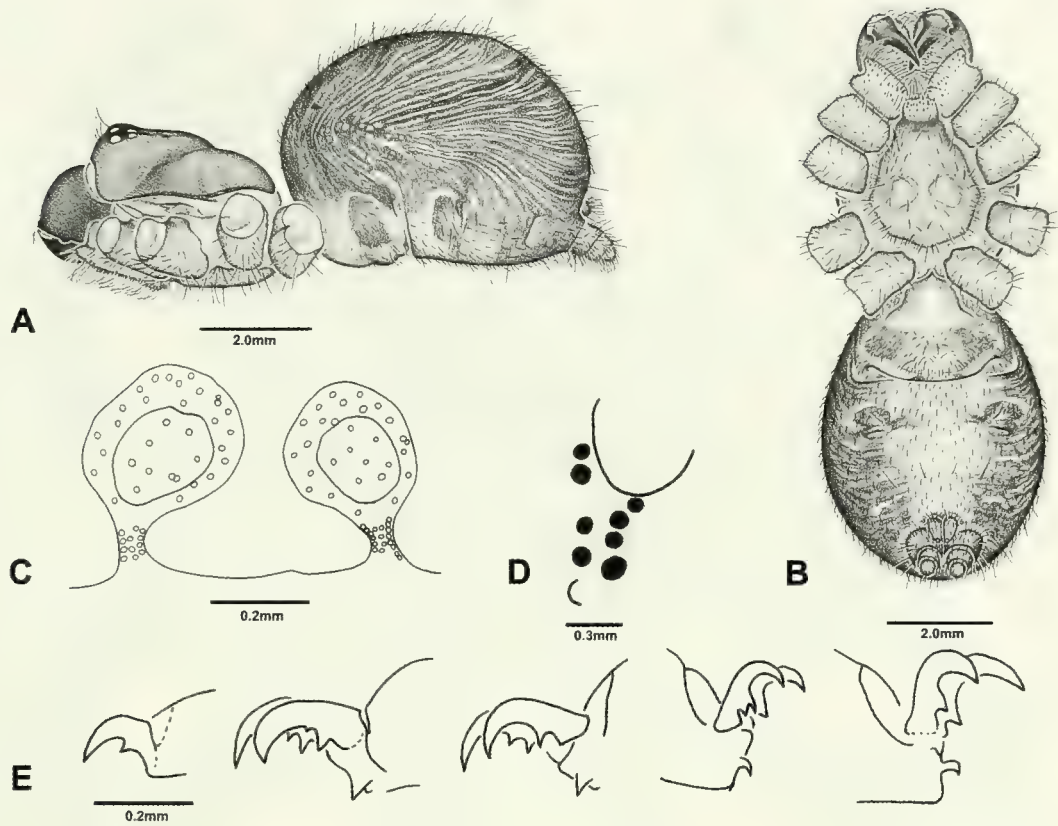


FIGURE 49. *Paramigas rothorum*, new species, holotype female. A. Lateral. B. Ventral. C. Spermathecae, dorsal. D. Denticulation of right chelicera. E. Left tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A, B by JS, C, D by JL, E by CG.

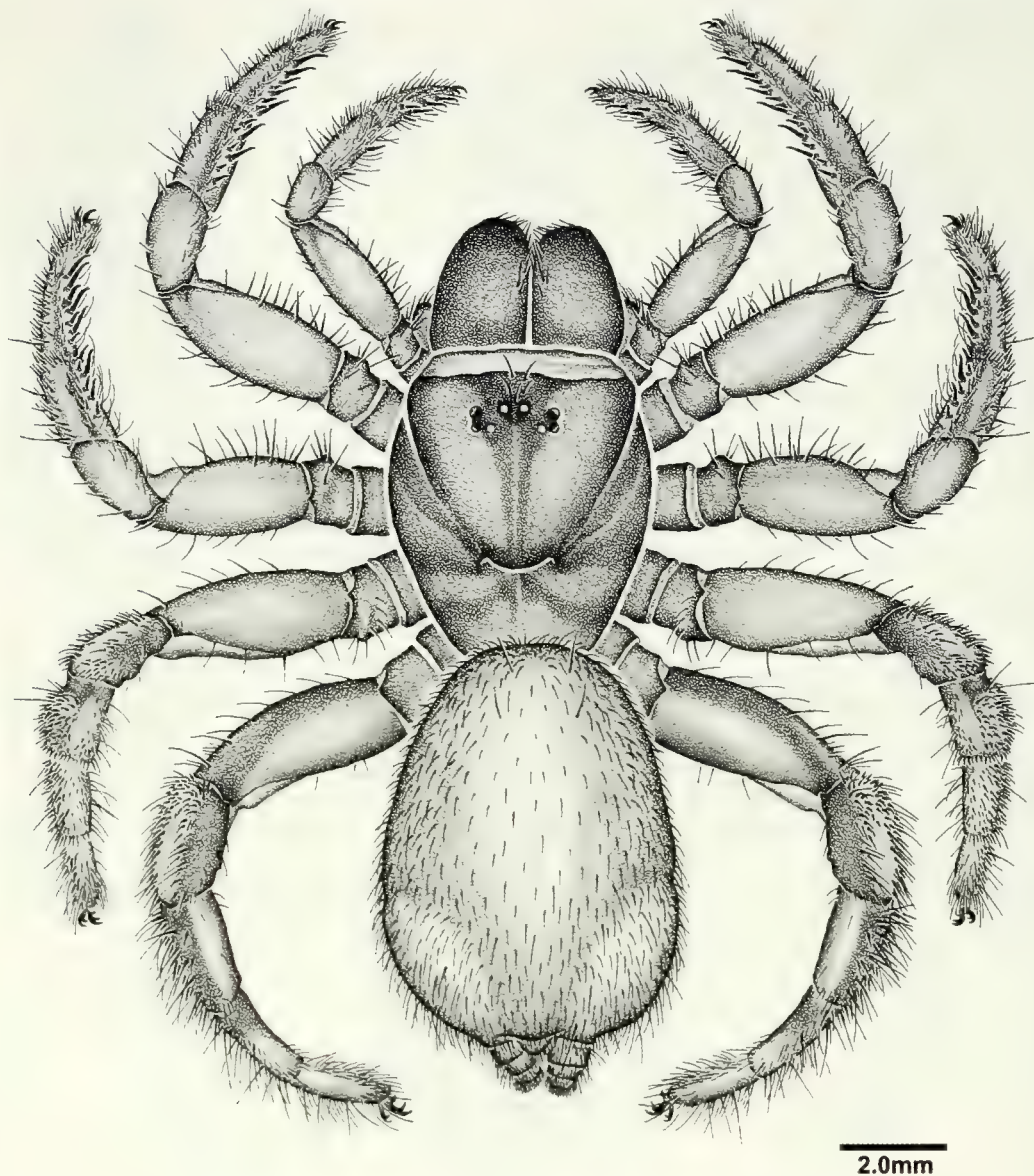


FIGURE 50. *Thyropoeus malagasus*, female from Vohimena, Madagascar, dorsal. Illustration by JS.

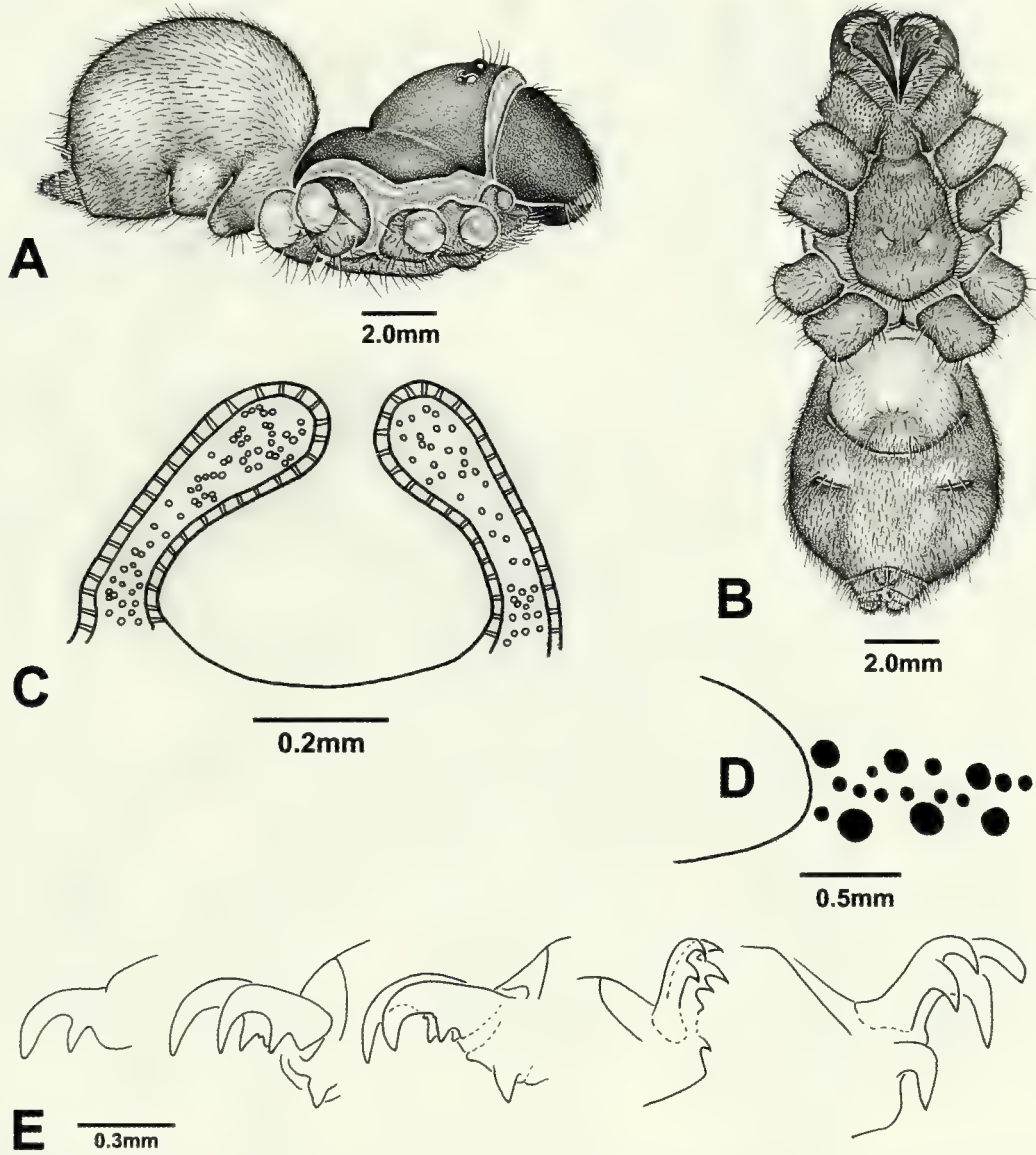


FIGURE 51. *Thyropoeus malagasus*. A–D. Female from Vohimena, Madagascar. E. Holotype female of *Heteromigella malagasa*. A. Lateral. B. ventral. C. Spermathecae, dorsal. D. Dentition of right chelicera. E. Left tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A, B by JS, C, D by JL, E by CG.

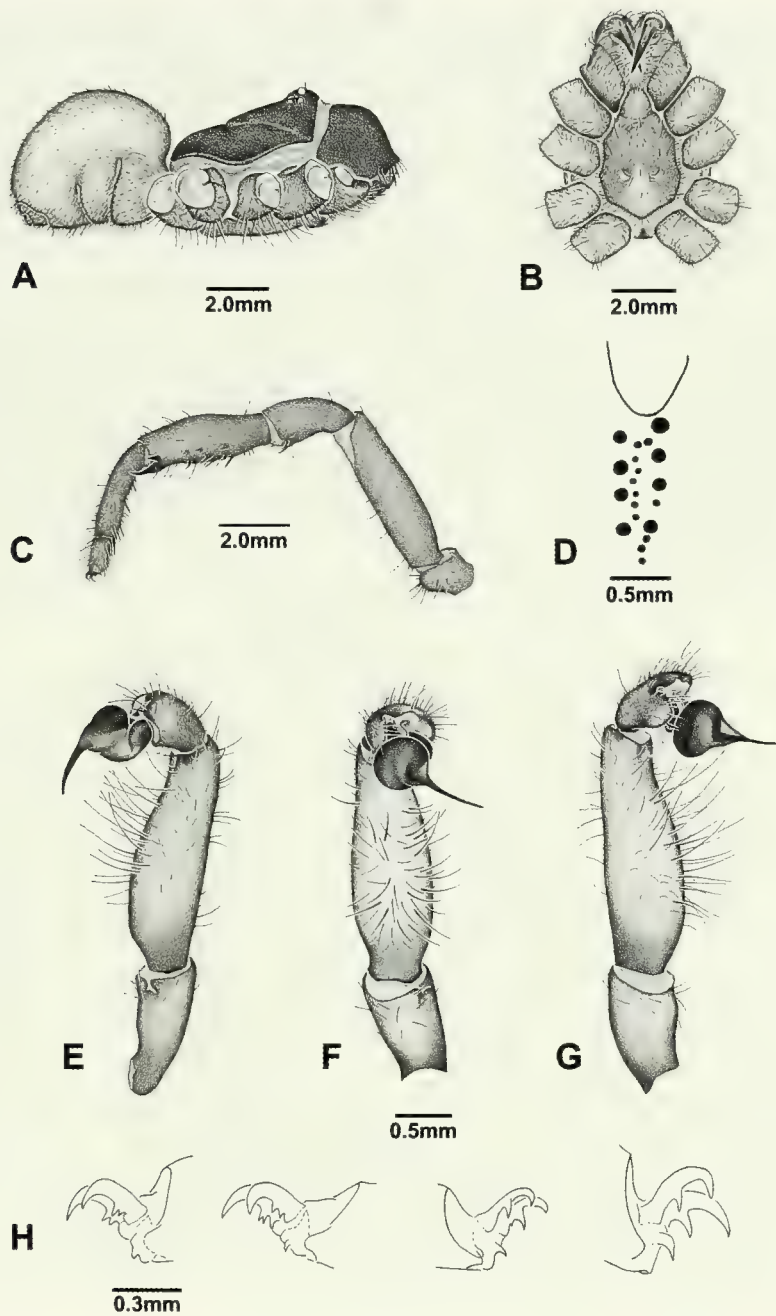


FIGURE 53. *Thyropoeus malagasus*, male from Vohimena, Madagascar. A. Lateral. B. Cephalothorax, ventral. C. Left leg I, retrolateral. D. Dentition of right chelicera. E-G. Left pedipalp patella-tarsus. E. Retrolateral. F. Ventral. G. Prolateral. H. Left tarsal claws: leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A-C, E-G by JS, D by JL, H by CG.

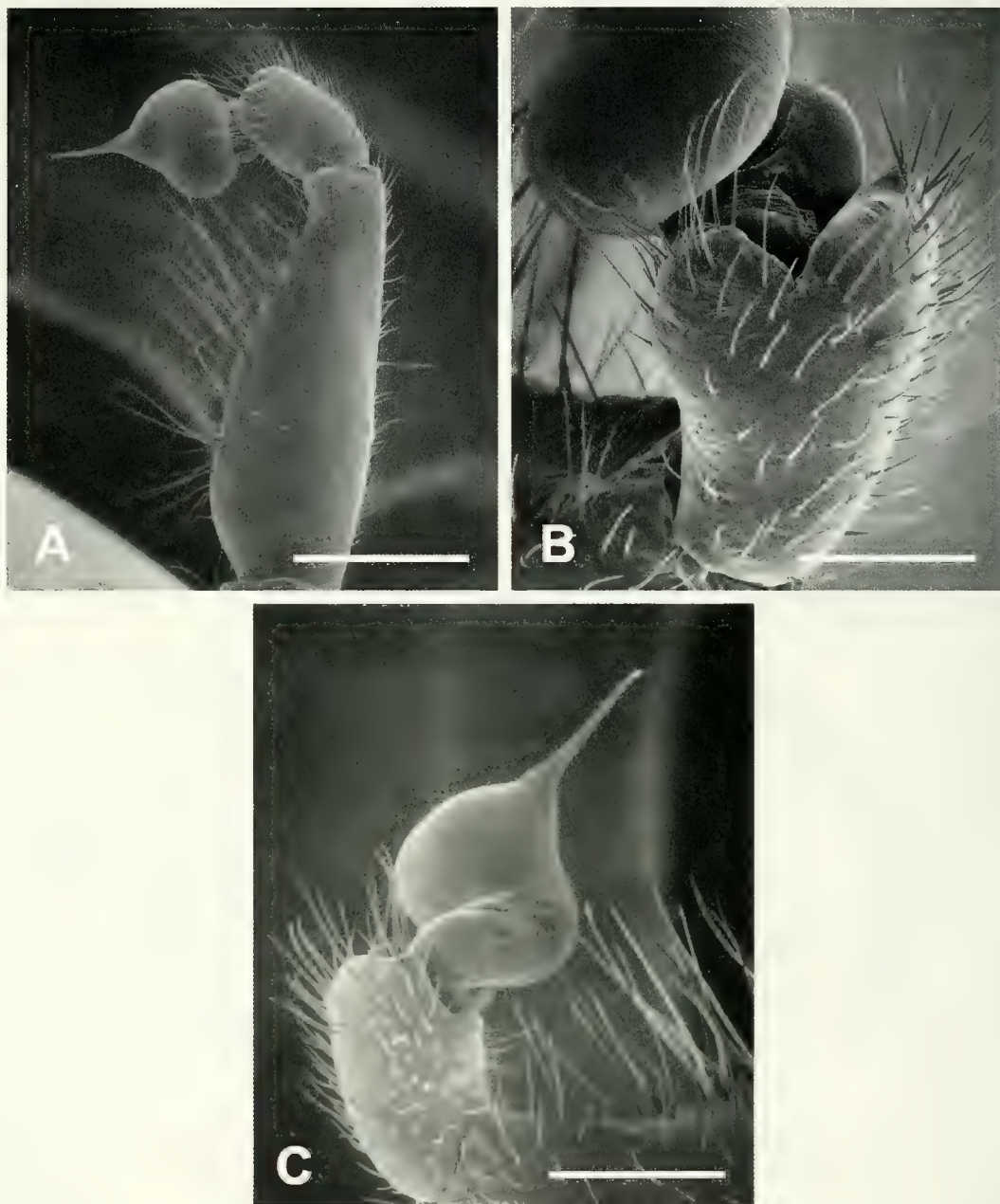


FIGURE 54. *Thyropoeus malagasus*, male from Vohimena, Madagascar, right pedipalpus. A. Tibia-tarsus, proteral. B. Tarsus, dorsal. C. Tarsus, retrolateral. Scale bars: A = 1000 μm , B = 380 μm , C = 600 μm .

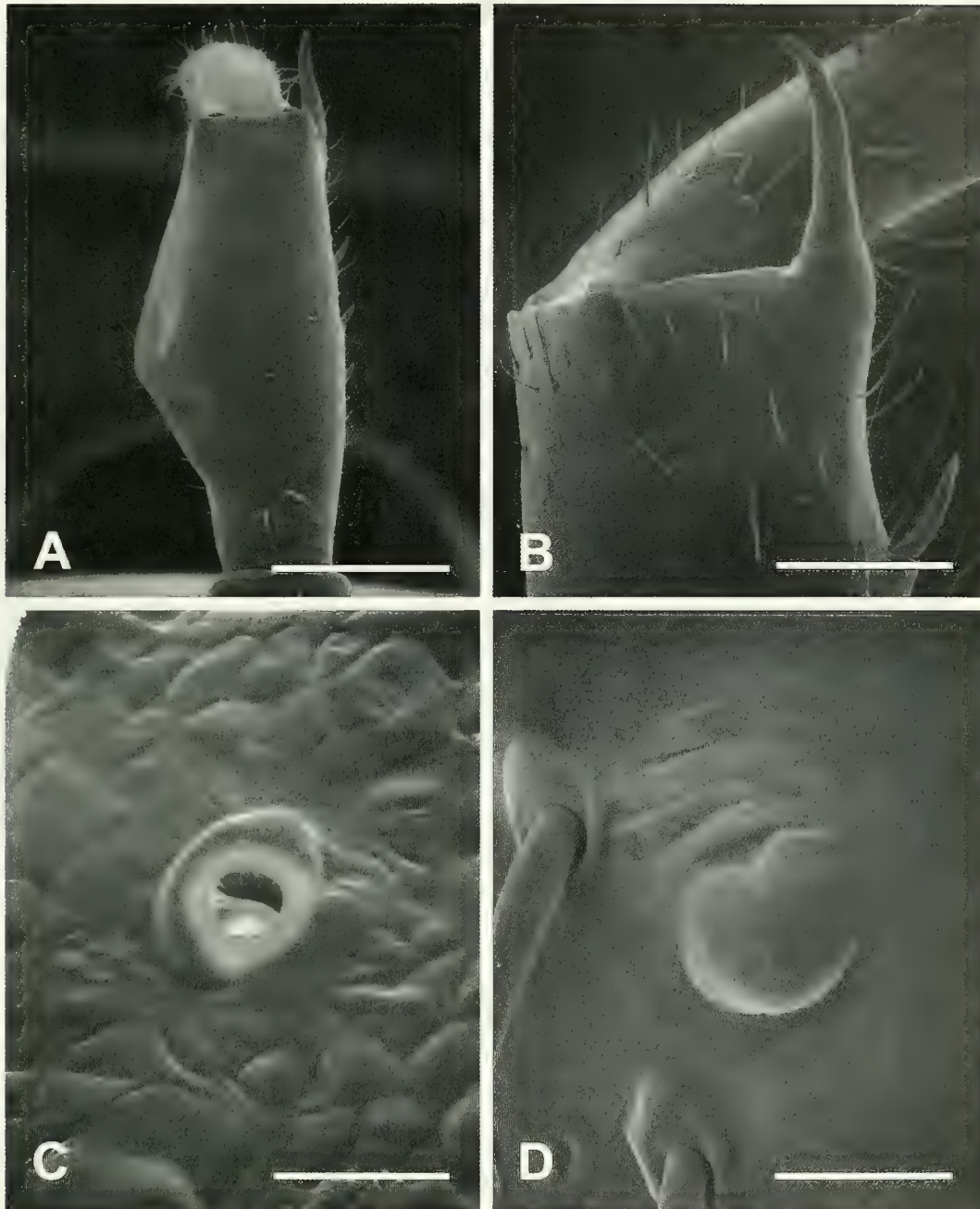


FIGURE 55. *Thyropoeus malagasus*, male from Vohimena, Madagascar. A. Right tibia I, dorsal. B. Apex of right tibia I, retro-lateral. C. Trichobothrial base, metatarsus I. D. Tarsal organ I. Scale bars: A = 1200 μm , B = 500 μm , C, D = 30 μm .

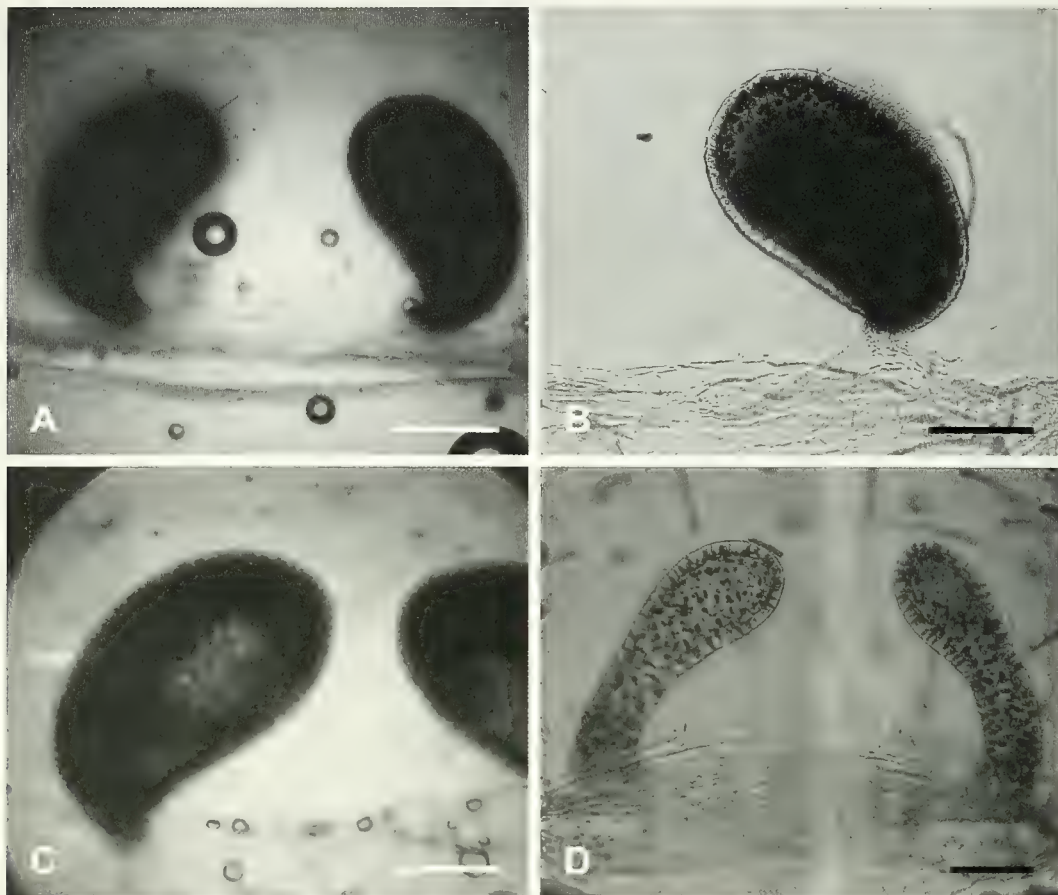


FIGURE 56. Spermathecae of *Thyropoeus* spp., dorsal. A. *T. mirandus*, small female, Ft. Dauphin, Madagascar. B. *T. mirandus*, holotype, left. C. *T. mirandus*, large female, Ft. Dauphin, Madagascar. D. *T. malagasus*, Vohemena, Madagascar. Scale bars: A-C = 0.4 mm. D = 0.2 mm.

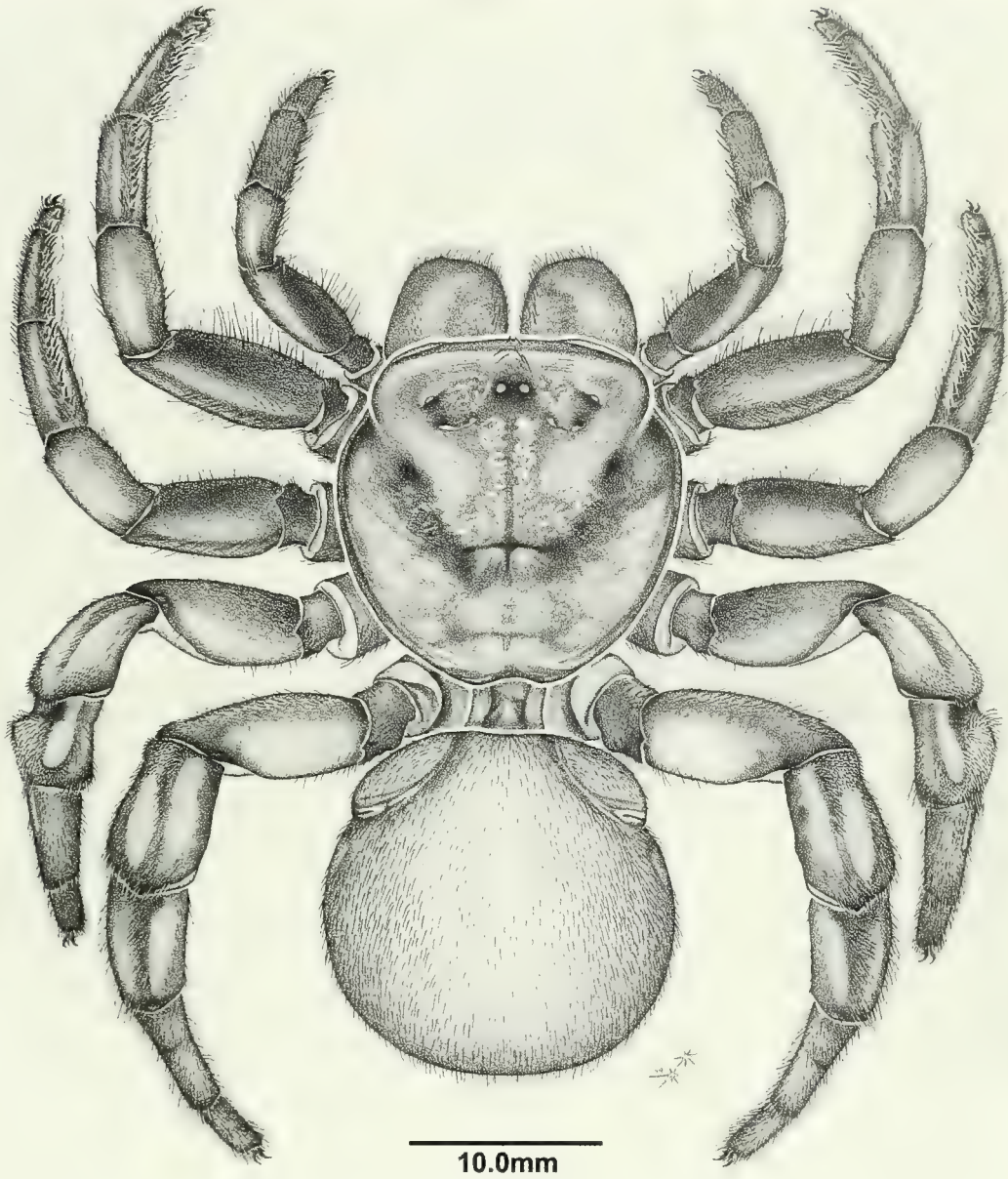


FIGURE 57. *Thyropoeus mirandus*, female holotype, dorsal. Illustration by JS.

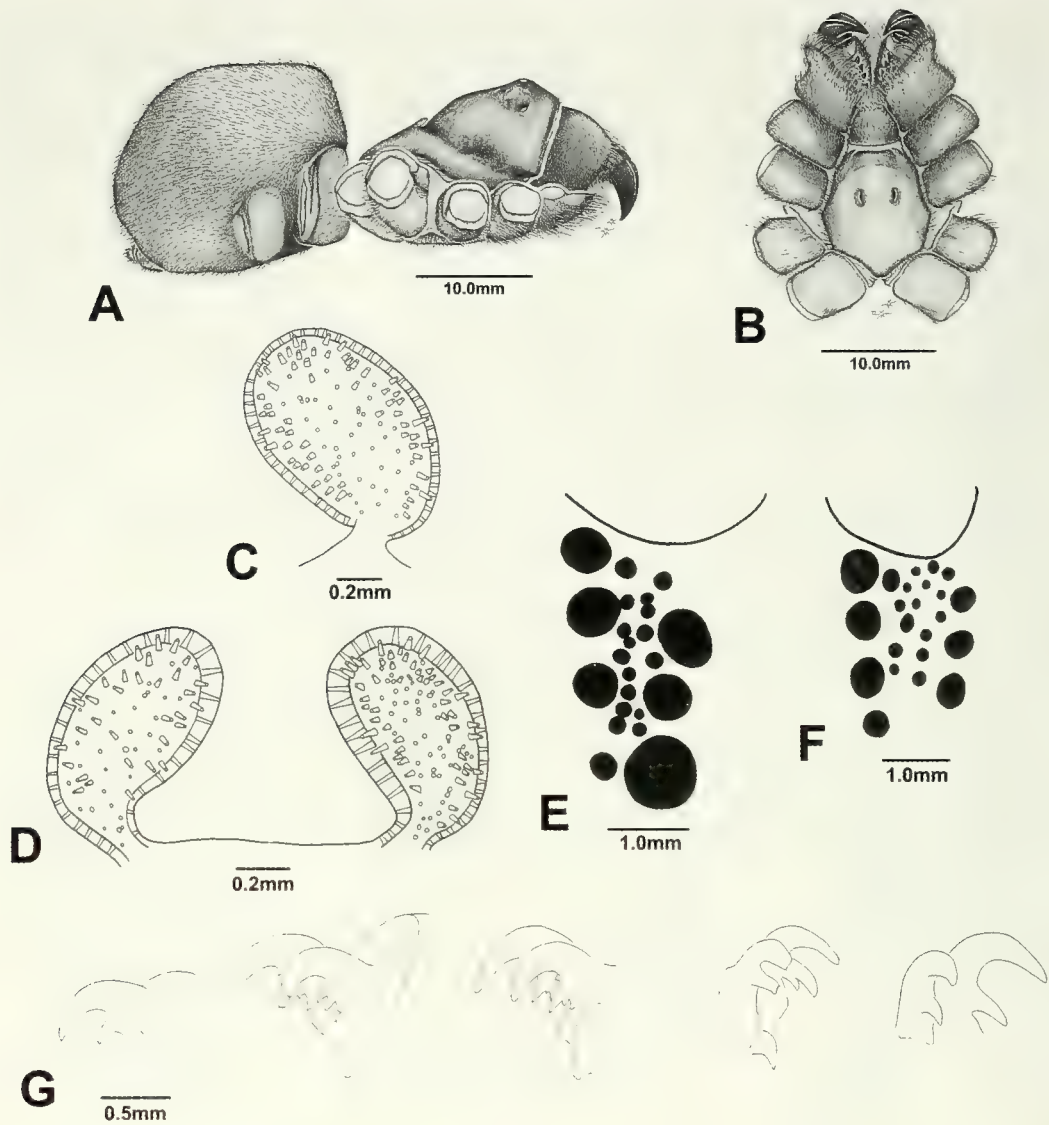


FIGURE 58. *Thyropoeus mirandus*, female. A–C, E. Holotype female. D, F, G. Ft. Dauphin, Madagascar. A. Lateral. B. Cephalothorax, ventral. C. Left spermatheca, dorsal. D. Spermathecae, dorsal. E, F. Dentition of right chelicera. G. Left tarsal claws: pedipalp, leg I retrolateral, leg II retrolateral, leg III prolateral, leg IV prolateral. Illustrations A, B by JS, C–F by JL, G by CG.

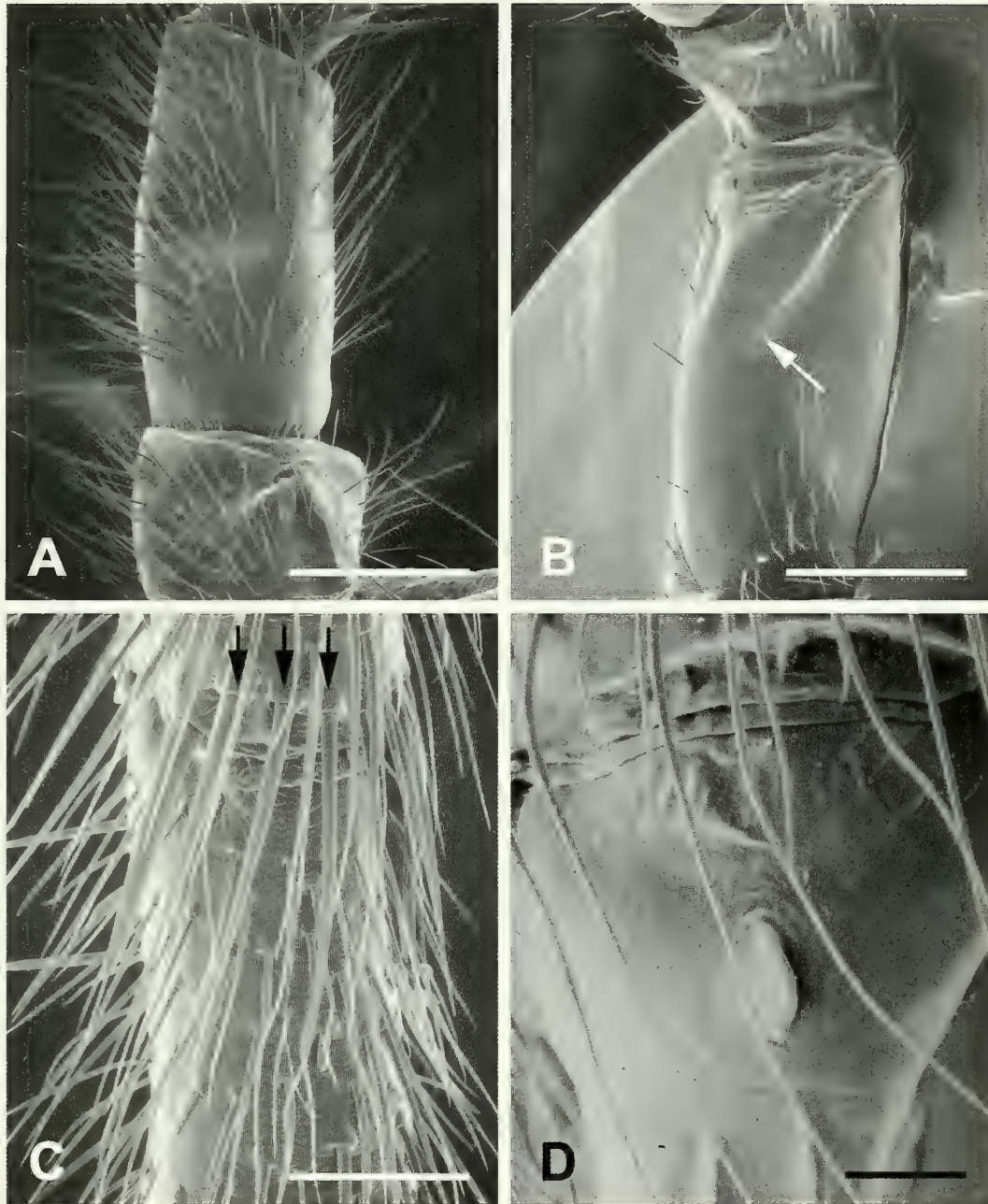


FIGURE 59. Morphology of Miginae. A–C. *Migas gatenbyi*, female from Wellington, New Zealand. D. *Poecilomigas abrahami*, female from Grahamstown, South Africa. A. Patella-tibia III, prolateral. B. Leg III ventral, showing membrane, arrow to proximal extent. C. Metatarsus-tarsus IV junction, showing widely spaced comb setae (arrows). D. Fang base showing tooth. Scale bars: A = 600 μm , B = 750 μm , C = 200 μm , D = 190 μm .

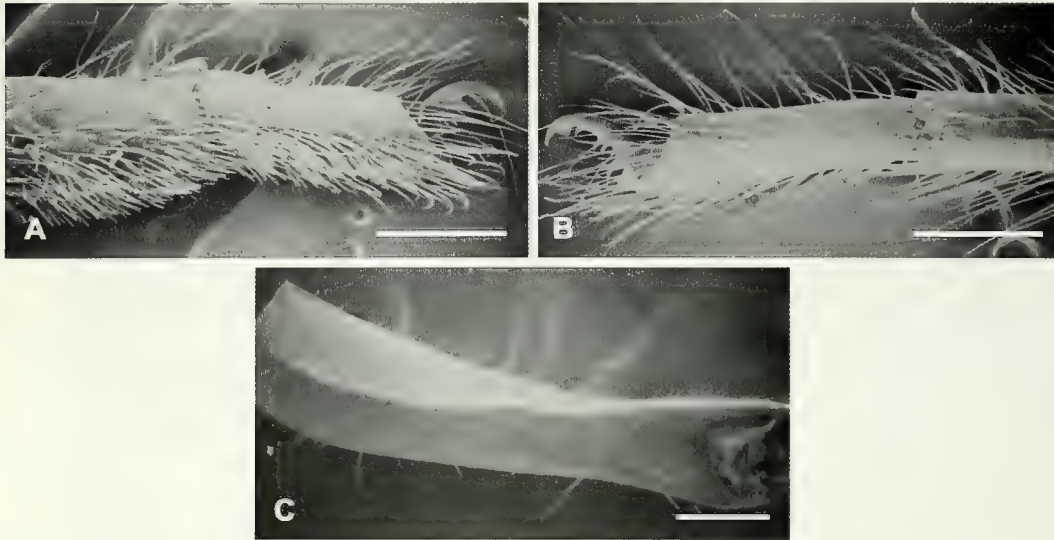


FIGURE 60 Morphology of male Migidae. A. *Poecilomigas abrahami*, from Town Bush, Pietermaritzburg, South Africa, metatarsus-tarsus IV showing ventral scopula. B. *Migas* sp., from Tauranga, New Zealand, metatarsus-tarsus IV showing lack of ventral scopula. C. *Moggridgea pseudocrudeni*, from Alicedale, South Africa, femur I ventral showing carina. Scale bars: = 500 μ m.

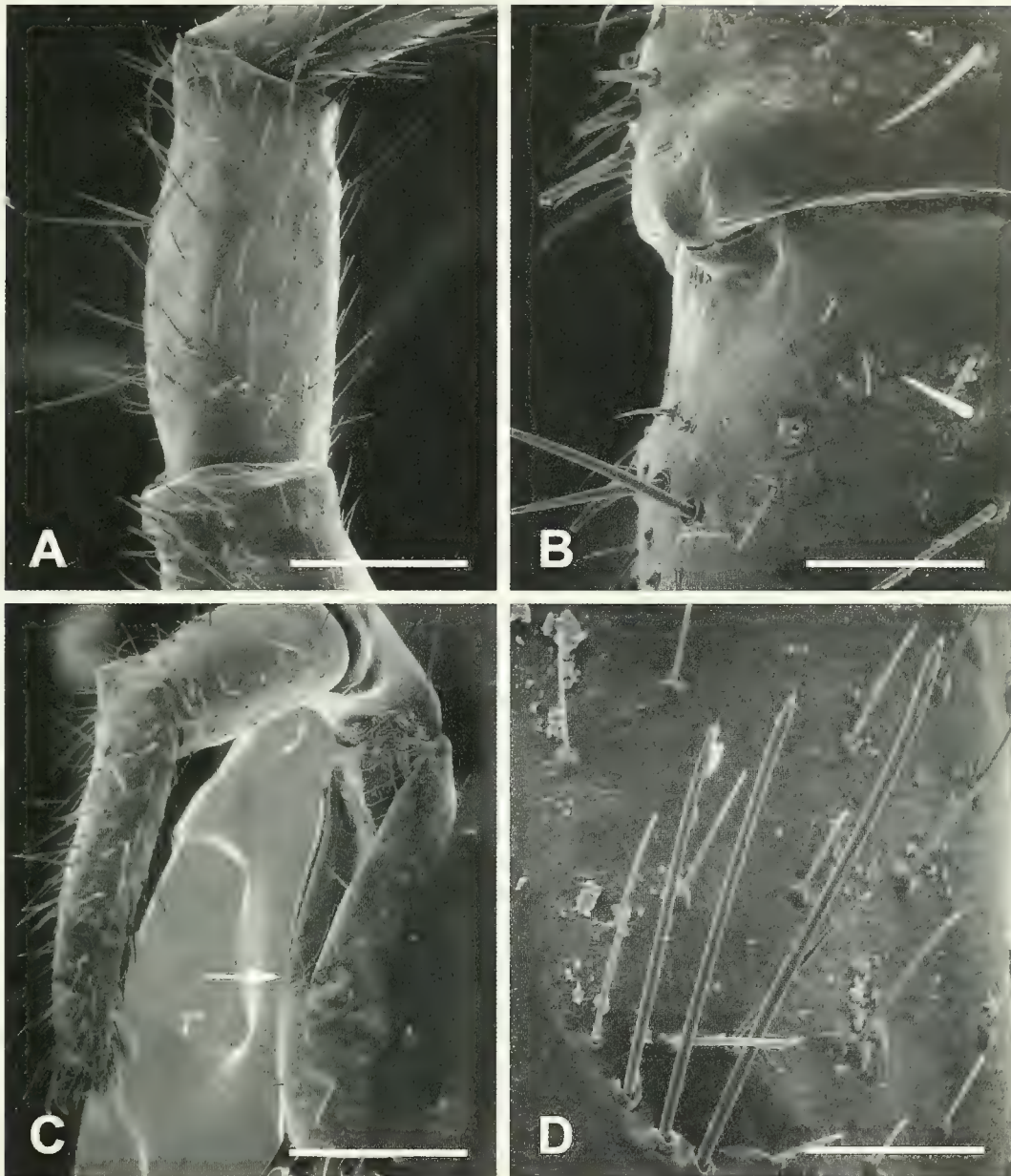


FIGURE 61. *Moggridgea intermedia*, female from Diepwalle, South Africa. A. Patella-tibia III, prolatateral. B. Patella-tibia III junction. C. Leg III ventral showing membrane (arrow to proximal extent of membrane). D. Lamellate setae beneath patella IV. Scale bars: A = 600 μm , B = 250 μm , C = 1000 μm , D = 150 μm .

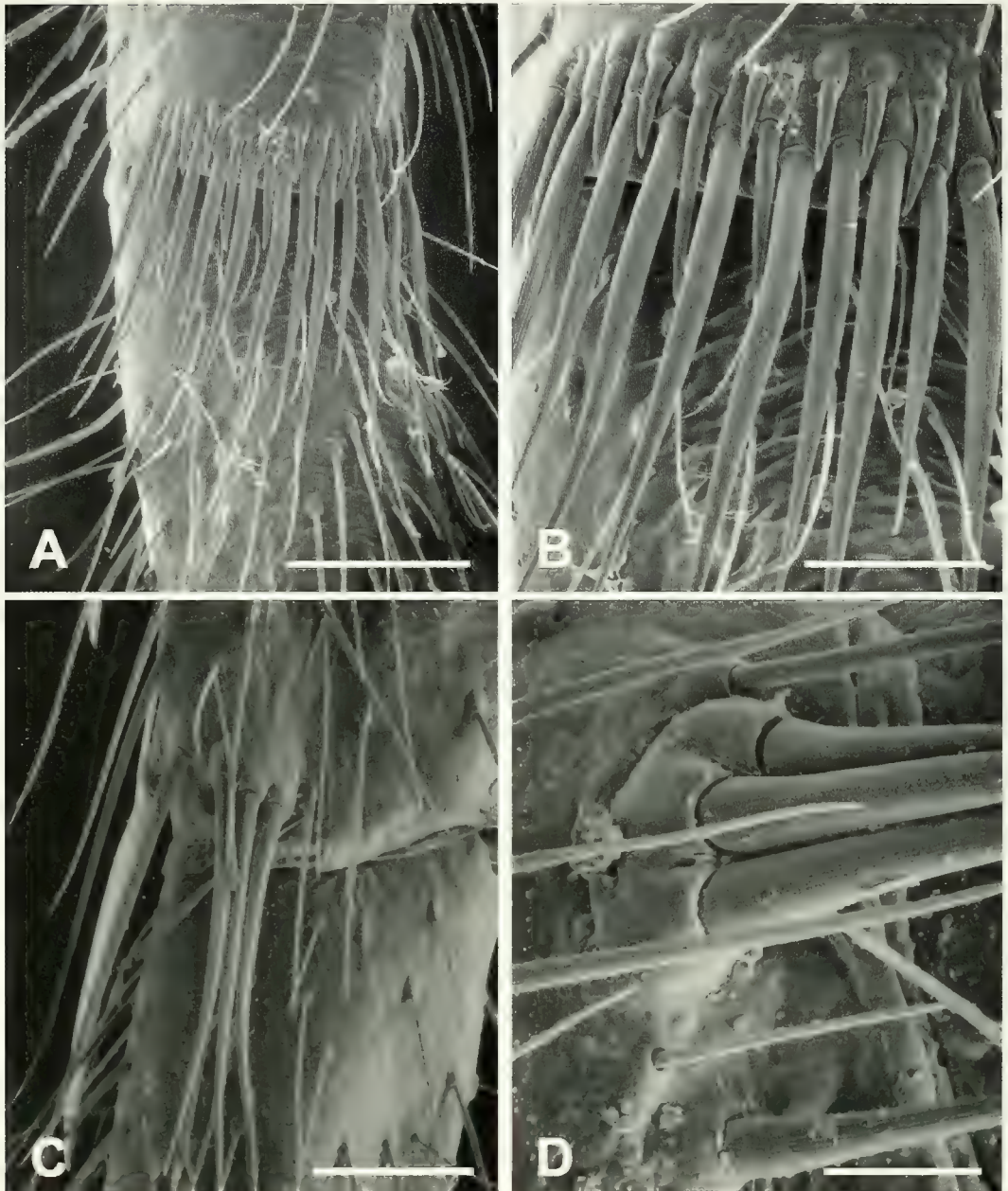


FIGURE 62. Metatarsus IV combs of Migidae. A, B. *Calathotarsus coronatus*, female from El Canelo, Chile, metatarsus IV apical comb, retroventral. C. *Moggridgea crudeni*, female from Alicedale, South Africa, metatarsus IV comb. D. *Moggridgea dyeri*, female from Uitenhage, South Africa, metatarsus IV preening comb base. Scale bars: A = 200 μ m, B = 100 μ m, C = 200 μ m, D = 25 μ m.

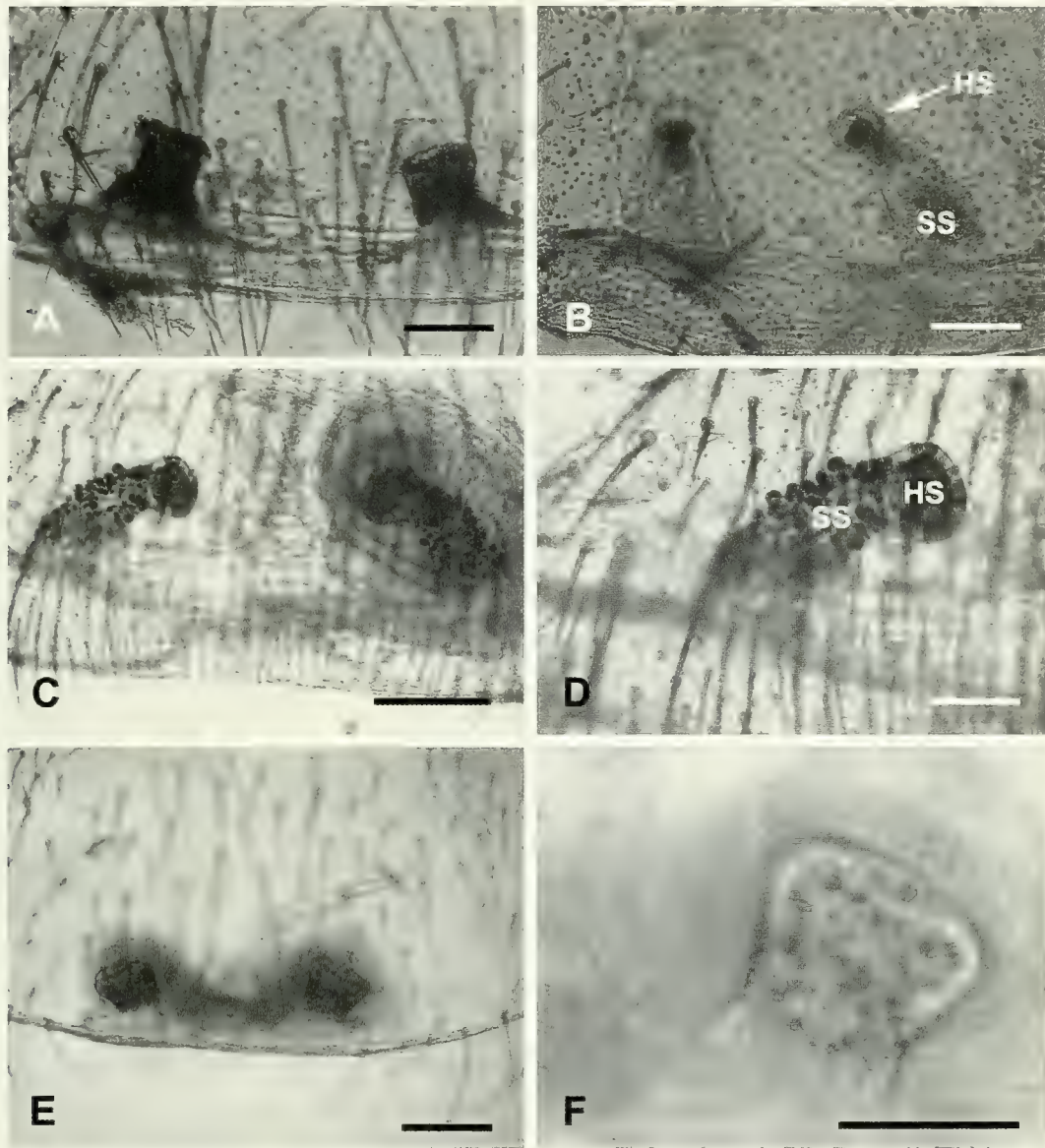


FIGURE 63. Spermathecae of Migidae, dorsal. A. *Calathotarsus simoni*, Sierra de la Ventana, Argentina. B. *Heteromigas dovei*, Patersonia, Tasmania. C, D. *Mallecomigas schlingeri*, holotype. D. Close up of left spermatheca. E, F. *Goloboffia velardi*, Guanaqueros, Chile. F. Close up of left spermatheca. HS - spermathecal head, SS - spermathecal stalk. Scale bars A, B, D, E = 0.2 mm, C = 0.4 mm, F = 0.1 mm.

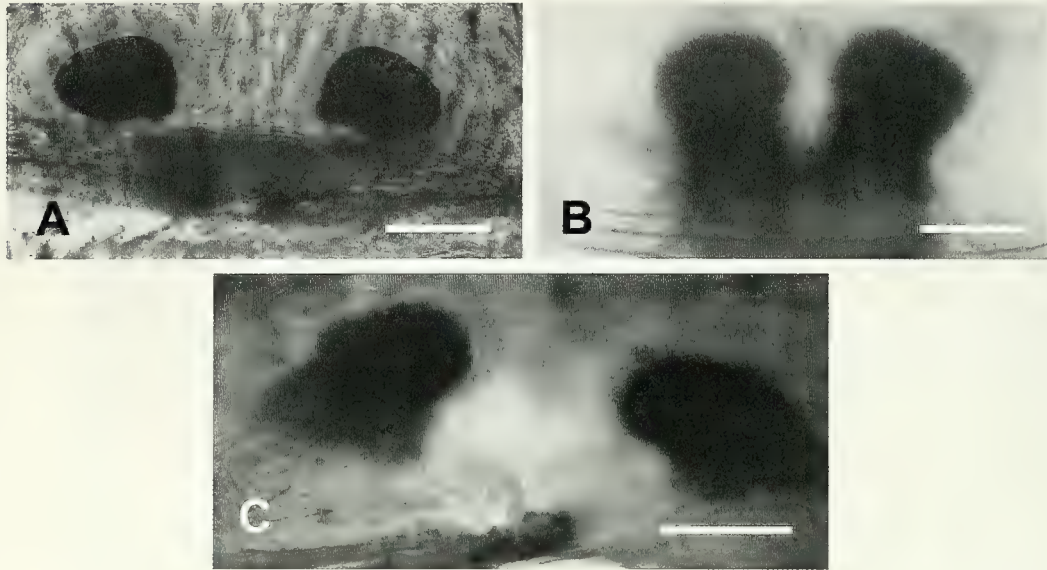


FIGURE 64. Spermathecae of migid outgroups, dorsal. A. *Idiops* sp., Pietermaritzburg, South Africa. B. *Actinopus* sp., Lomalinda, Colombia. C. *Bothriocyrtum californicum*, Eagle Rock, California, USA. Scale bars A, B = 0.2 mm, C = 0.4 mm.

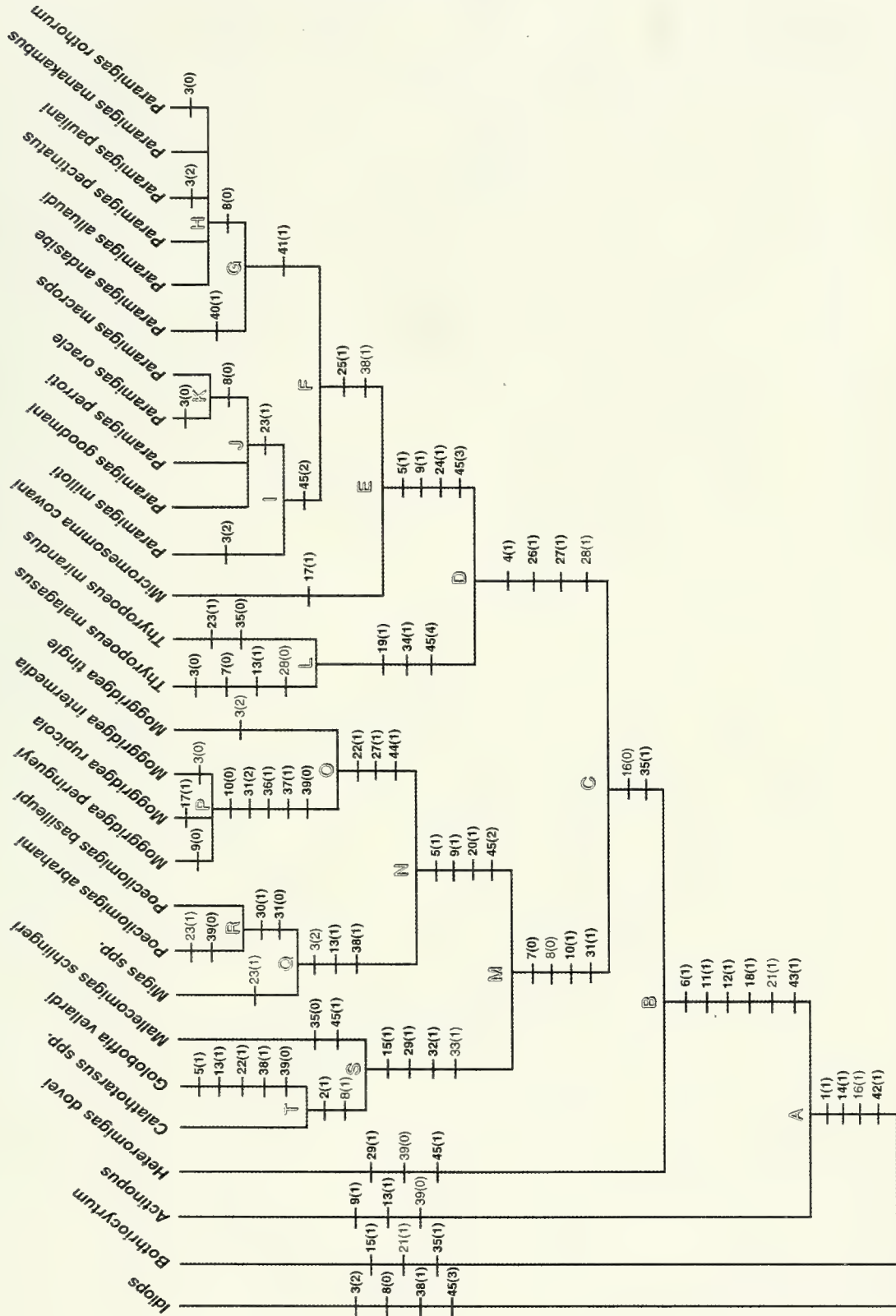


FIGURE 65. Preferred cladogram for Migidae, 96 steps, c.i. = 0.52, r.i. = 0.76. Character changes are marked on branches [character (state)]; those in bold represent unambiguous optimizations. Bremer support (decay indices) for the nodes are A (2), B (3), C (1), D (4), E (5), F (1), G—K (0), L (4), M (2), N (>5), O (4), P (4), Q (3), R (1), S (2) and T (1).

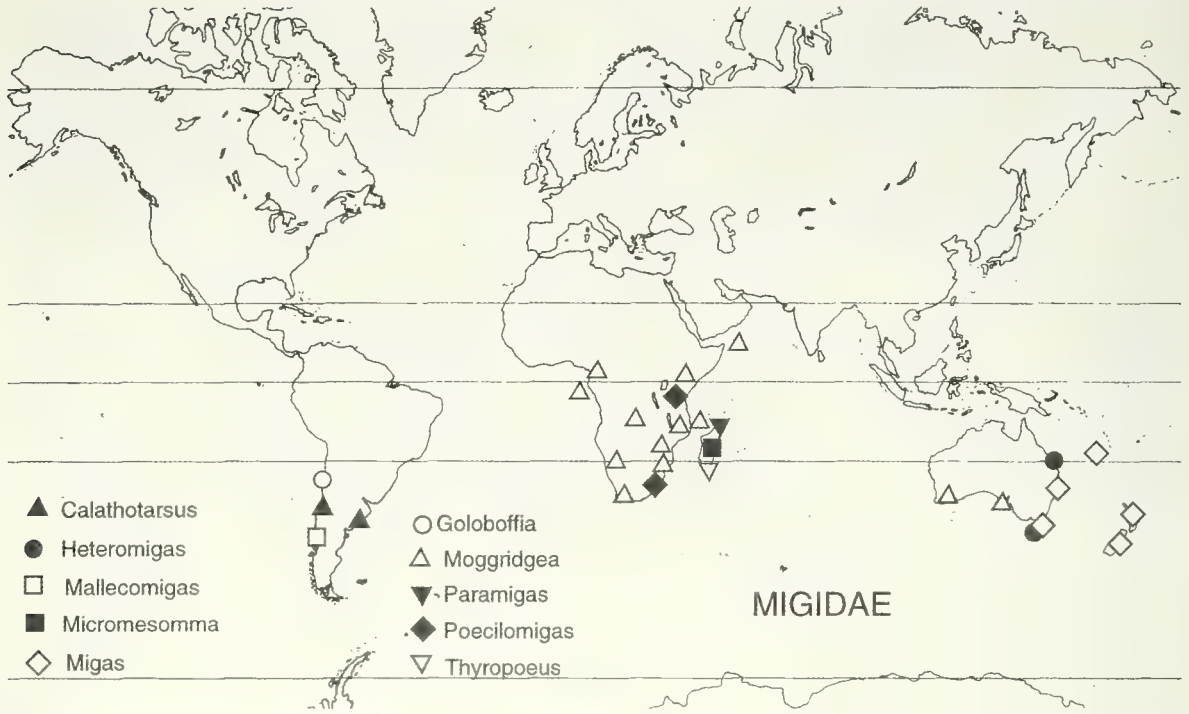


FIGURE 66. Map showing world distribution of migid genera.

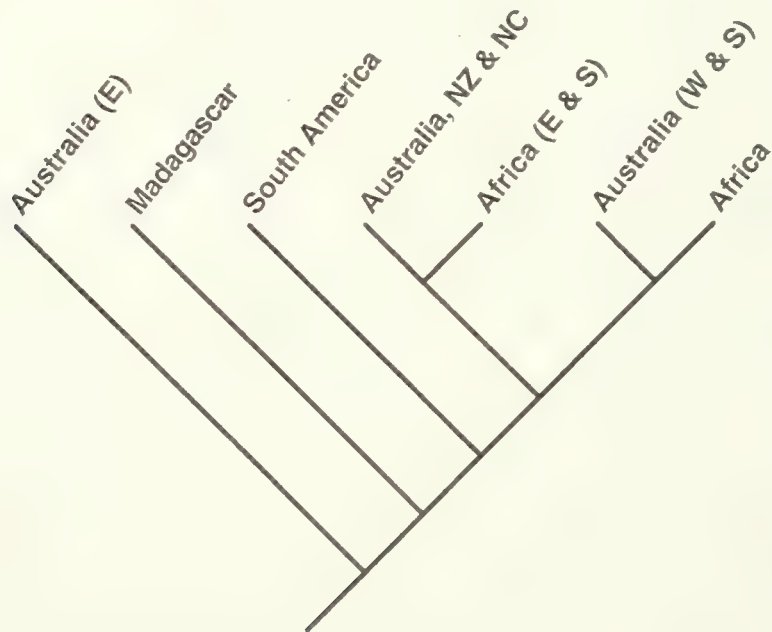


FIGURE 67. Area cladogram implied by preferred migid cladogram. E = eastern, NC = New Caledonia, NZ = New Zealand, S = southern, W = western.

A *Thyropoeus malagasus*

B *Thyropoeus mirandus*

C *Paramigas alluaudi*

D *Paramigas andasibe*

E *Paramigas goodmani*

F *Paramigas macrops*

G *Paramigas manakambus*

H *Paramigas milloti*

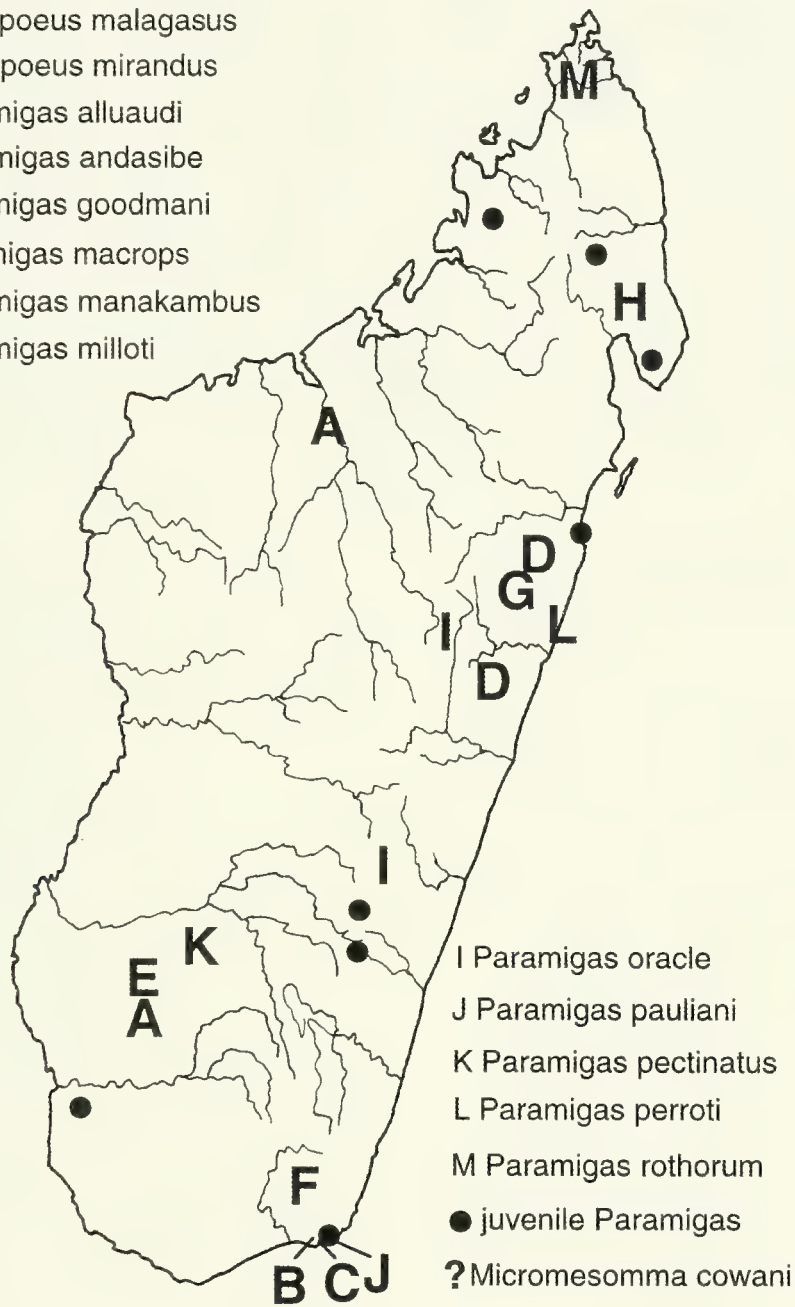


FIGURE 68. Map of Madagascar showing records of Migidae. Locality data for juvenile *Paramigas* are listed in Table 1.

APPENDIX

Character by taxon matrix. Rows represent characters. The first state listed is coded as "0", the second as "1", etc., "?" = unknown, "-" = non-applicable. Columns represent taxa. Character statistics are for our preferred tree (Fig 65, which has length = 96 steps, consistency index = 0.52, retention index = 0.76, total fit [from PeeWee, concavity = 3] = 359.9). The final five columns give the number of steps (St), the consistency index (CI), the retention index (RI), the weight from successive weighting from Hennig86 (Wt) and the fit from Pee-Wee. Taxon abbreviations are (vertically): Id = *Idiops*, Ac = *Actinopus*, Bo = *Bothriocyrtum*, Co = *Calathotarsus* spp., Ma = *Mallecomigas schlingeri*, Ht = *Heteromigas dovei*, Mg = *Migas gatenbyi* female + *Migas taierii* male, Mv = *Goloboffia vellardi*, Mp = *Moggridgea peringueyi*, Mr = *Moggridgea rupicola*, Mi = *Moggridgea intermedia*, Mt = *Moggridgea tingle*, Po = *Poecilomigas abrahami*, Pb = *Poecilomigas basilleupi*, Ta = *Thyropoeus malagasus*, Tm = *Thyropoeus mirandus*, Ms = *Micromesomma cowani*, Av = *Paramigas milloti*, Is = *Paramigas pectinatus*, Pu = *Paramigas alluaudi*, Rm = *Paramigas oracle*, Le = *Paramigas pauliani*, Vb = *Paramigas goodmani*, Md = *Paramigas rothorum*, Mb = *Paramigas manakambus*, Ah = *Paramigas macrops*, Pp = *Paramigas perroti*, An = *Paramigas andasibe*. Character abbreviations are (horizontally): abs = absent, ant. = anterior, apic = apical, aut = autapomorphy, Calath = calathotarsine type, cl = clavate, cusp = cuspules, dist. = distribution, dorsoap. = dorsoapical, F = femur, H = height, H/L = height divided by length, ITC = inferior tarsal claw, L = length, l = long stalk with head, Max. = pedipalpal coxa, med = median, Moggr = *Moggridgea* type, mt = metatarsus, n = head narrower than stalk, ns = narrow stalk, OAW = ocular area width, Pat = patella, palp = pedipalpus, PLS = posterior lateral spinnerets, procumb. = procumbant, prox. = proximal, prs = present, s = short, cylindrical, scler. = sclerotization, segs = segments, SS = sternal sigilla, T = tibia, t = tarsus, vent = ventral, W = width, < = less than, > = greater than, M = male, F = female.

	I	A	B	C	H	M	M	M	M	M	P	P	T	T	M	A	I	P	R	L	V	M	M	A	P	A
Carapace	d	c	o	a	t	g	v	p	r	i	t	b	a	m	s	v	s	u	m	e	b	d	b	h	p	n
1. OAW/ Caput W: < 0.41; > 0.45;	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2. Wide OAW: normal; extra wide;	-	0	-	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. Prefoveal setae: abs; small; enlarged;	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4. Caput setation: extensive; reduced;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5. Caput H/ caput L: arched; low;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Fovea: procurved to straight; recurved;	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7. Recurved Fovea: simple; tripartite;	-	-	-	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.50	0.90	4	7.5																						
Mouthparts	I	A <th>B</th> <th>C</th> <th>H</th> <th>M</th> <th>M</th> <th>M</th> <th>M</th> <th>M</th> <th>P</th> <th>P</th> <th>T</th> <th>T</th> <th>M</th> <th>A</th> <th>I</th> <th>P</th> <th>R</th> <th>L</th> <th>V</th> <th>M</th> <th>M</th> <th>A</th> <th>P</th> <th>A</th>	B	C	H	M	M	M	M	M	P	P	T	T	M	A	I	P	R	L	V	M	M	A	P	A
8. Cheliceral tooth row #: 2; plus denticles;	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9. Intercheliceral basal swellings: abs; prs;	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10. <u>M</u> intercheliceral tumescence: abs; prs;	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11. Rastellum: prs; abs;	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12. Fang shape: round; quadrate & keeled;	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13. Fang basal tooth: abs; prs;	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14. Fang orientation: vertical; diagonal;	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15. <u>F</u> max cusp dist: across max; prox;	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16. <u>F</u> max cusp ant dist: broad; corner only;	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.50	0	0	7.5																						
Legs and sternum	I	A	B	C	H	M	M	M	M	M	P	P	T	T	M	A	I	P	R	L	V	M	M	A	P	A
17. Thorns on coxae II-III: abs; prs;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18. Anterior sternal sigilla: prs; abs;	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
19. Deeply excavate SS: abs; prs;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20. <u>F</u> t I, II spines: prs; abs;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21. <u>F</u> ant. leg shape: round; flattened;	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
22. Pat vent lamellate setae: abs; prs;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. F I-II fine, vent setae: abs; dense, long;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24. <u>F</u> T I, II dorsoap setae: erect; procumb;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25. <u>F</u> Mt I, II dorsoap setae: erect; procumb;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26. <u>F</u> F III vent membrane: short; elongate;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27. <u>F</u> T III basal concavity: abs; prs;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28. <u>F</u> T III anterior ridge: abs; prs;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29. <u>F</u> P-T 3 spination: stout; slender;	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30. T dark maculations: abs; prs;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31. Mt IV preening comb: abs; Calath; Moggr;	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
32. Mt III preening comb: abs; prs;	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33. Preening comb form: narrow; encircling;	-	-	-	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34. Claw III, IV size relative to tooth: >; <;	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35. ITC 3 size: large; small;	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	4	0	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.25	0.25	0	5.0																						

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