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A new genus and five new species of Astieae (Araneae: Salticidae) from Australia, with remarks on distribution

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Abstract

Parahelpis, a new genus of Astieae, is described for *Helpis abnormis* (Żabka, 2002) and *Parahelpis smithae* **spec. nov.**, the former being designated the type species. *Adoxotoma embolica* **spec. nov.**, *A. nitida* **spec. nov.**, *A. sexmaculata* **spec. nov.**, and *Helpis longipalpis* **spec. nov.** are described. *Astia nodosa* L. Koch, 1879 is transferred to *Adoxotoma*. Diagnoses and lists of species for *Adoxotoma* and *Helpis* are provided and remarks on their distribution are given.

Key words: Australia, New Guinea, New Zealand, phylogeny, biogeography

Introduction

Over the last decade morphology-based salticid taxonomy has been refined with molecular data (Hedin & Maddison 2001; Maddison & Hedin 2003; Maddison *et al*. 2007, 2008). This has put a new light, not only on taxonomy, but also on the biogeographical history of taxa and faunas. The new approach has included information on a number of Australian/Australasian clades, the Astioida being one of them. Unexpectedly, it comprises genera such as *Sandalodes* Keyserling, *Opisthoncus* L. Koch, *Simaetha* Thorell, *Neon* Simon, *Myrmarachne* MacLeay and many others, previously classified in other subfamilies (Maddison *et al.* 2008).

The Astieae clade itself is less controversial and its generic composition proposed by Wanless (1988) has largely been confirmed by the molecular results. Three genera of Astieae: *Adoxotoma*, *Helpis* and *Parahelpis* **gen. nov.** are treated here, the others will be included in separate papers (Żabka *et al.* in prep.).

Material and methods

The material comes from the collections of the Australian Museum, Sydney (AMS) and the Western Australian Museum, Perth (WAMP). Methods of specimen examination are as described earlier (Żabka 1991a). The photographs were taken using a Canon A620 camera and Nikon 800 stereomicroscope and processed with ZoomBrowser and HeliconFocus software.

The maps of actual and predicted distributions for *Adoxotoma* and *Helpis* were generated on the basis of their bioclimatic envelope, using the boxcar version of BIOCLIM (Richardson *et al*. 2006) available in BioLink (Shattuck & Fitzsimmons 2000).

Abbreviations used: AEW = anterior eyes width, ag = accessory gland, AL = abdomen length, AW = abdomen width, cf = cymbial flange, CH = cephalothorax height, CL = cephalothorax length, co = copulatory opening, CW = cephalothorax width, e = embolus, EFL = eye field length, id = insemination duct, LI–IV: legs lengths (femur-tarsus), p = protuberance, PEW = posterior eyes width, ps = prolateral spur, rta = retrolateral tibial apophysis, s = spermatheca, tl = tegular lobe.

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Taxonomy

Astieae Simon, 1901

The group was proposed by Simon (1901), revised by Wanless (1988) and subsequently studied by Gardzińska (1996), Żabka (1991b, 1995, 2001, 2002), Patoleta & Żabka (1999) and Żabka & Pollard (2002). Including the taxa treated here, it comprises 9 genera and 55 valid species: *Adoxotoma* Simon, 1909 (10 spp.), *Arasia* Simon, 1901 (3 spp.), *Astia* L. Koch, 1879 (2 spp.), *Helpis* Simon, 1901 (7 spp.), *Jacksonoides* Wanless, 1988 (7 spp.), *Megaloastia* Żabka, 1995 (1 sp.), *Sondra* Wanless, 1988 (15 spp.), *Tauala* Wanless, 1988 (8 spp.) and *Parahelpis* **gen. nov.** (2 spp.). The diagnoses for particular genera are given by Wanless (1988), two of these are updated here.

Astieae group is currently known from Australia, New Guinea, New Zealand and adjacent islands.

Genus *Adoxotoma* Simon, 1909

Adoxotoma Simon, 1909: 196; Wanless, 1988: 162–166; Davies & Żabka, 1989: 220; Żabka, 1991b: 18; 2001: 323–332; 2004: 591–594.
Type species: *Adoxotoma nigroolivacea* Simon, 1909, subsequently designated by Bonnet (1955).

Current list of species: *Adoxotoma bargo* Żabka, 2001; *Adoxotoma chinopogon* Simon, 1909; *Adoxotoma embolica* **sp. nov.**; *Adoxotoma forsteri* Żabka, 2004 (to be confirmed); *Adoxotoma hannae* Żabka, 2001; *Adoxotoma justyniae* Żabka, 2001; *Adoxotoma nigroolivacea* Simon, 1909; *Adoxotoma nitida* **sp. nov.**; *Adoxotoma nodosa* (L. Koch, 1879) **comb. nov.**; *Adoxotoma sexmaculata* **sp. nov.**

Diagnosis. In comparison with other genera of Astieae, males with disctinctive abdominal scutum and anterolateral process on each maxilla. Chelicerae fissidentate or (rarely) pluridentate. Embolus rather massive, retrolaterally curved, dagger- or sabre-like. Tegulum with protuberance. Both sexes with five and two pairs of ventrolateral spines on tibiae and metatarsi, respectively.

Description. Spiders 3–6 mm long. Cephalothorax in males strongly textured (papillate), rather low, with gentle posterior slope, fovea behind PLE. Maxillae elongate, in males with anterolateral process. Male abdomen with dorsal shiny scutum and visible apodemes. Spinnerets not distinctive. First legs much stronger than others, spiny. In some species coxae and trochanters elongate. Legs formula in males: I–IV–II–III or I–IV–II=III and in females: IV–I–III–II. Clypeus narrow. Sternum cordate, venter not distinctive. Tegulum of male palpal organ bag-like, with protuberance. Palpal tibia short, retrolateral apophysis hooked, dagger-like or bifurcate. Epigyne from short and wide to elongate, usually with a pocket of varying location, size and orientation. In *A. forsteri* (New Zealand) epigyne with distinctive posterior lobe. Insemination ducts with or without loops, accompanied with accessory glands.

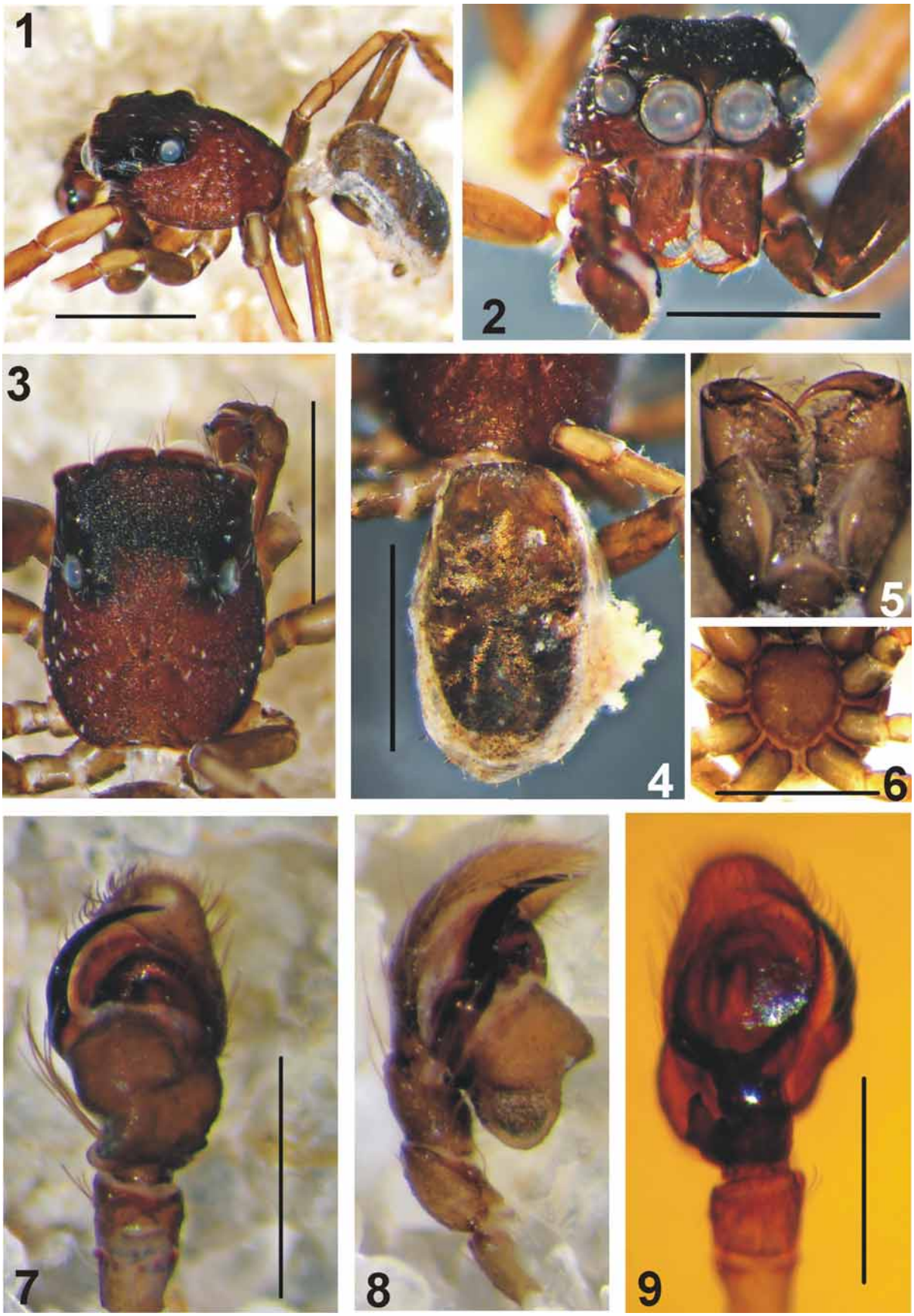
Adoxotoma embolica new species
(Figs 1–12)

Type material. Holotype: male, Australia: Western Australia: Jarrahdale (Alcoa), Mine Area, 31°16'S, 116°06'E, April 1998, wet pitfall traps, K.E.C. Brennan (WAMP T49411).

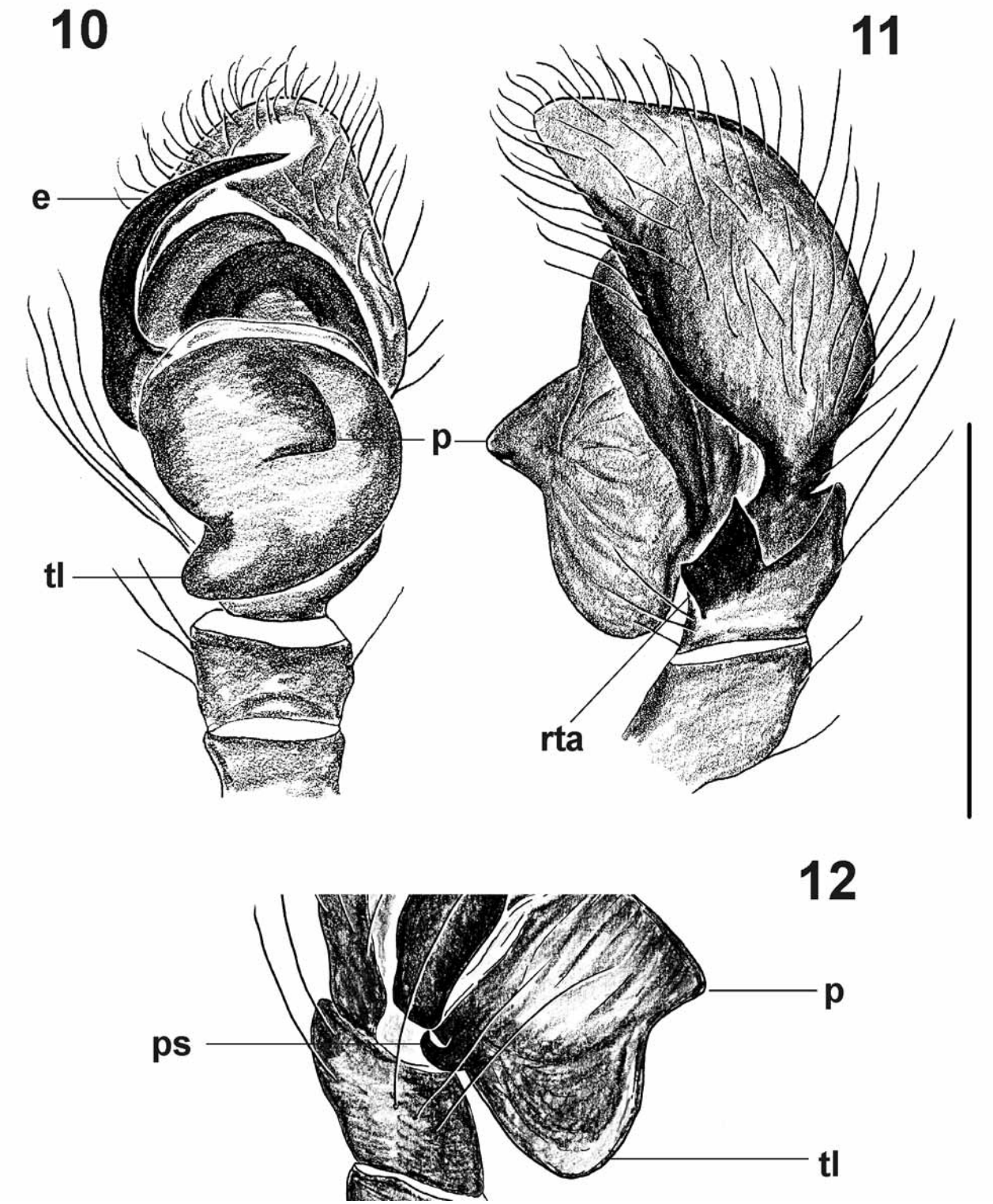
Etymology. Derived from elongate embolus, adjective.

Diagnosis. Distinctive by the following combination of characters: embolus elongate, sabre-like, arising prolaterally; tegulum with prolateral lobe, protuberance and with small prolateral spur; retrolateral tibial apophysis broad, spade-like and distally curved towards cymbium.

Description. **Male** (holotype, Figs 1–12): Eye field dark brown, eye surroundings black. Thorax brown; all with scattered scale-like light hairs and with longer brown bristles anteriorly. Abdomen with shiny, greyish-brown scutum, sides greyish. Clypeus narrow, brown, with three central brown bristles and with long,



FIGURES 1–9. *Adoxotoma embolica* new species, male holotype. 1 side view; 2–3 cephalothorax (2 frontal, 3 dorsal); 4 dorsal abdomen; 5 chelicerae, maxillae and labium; 6 sternum; 7–9 palpal organ (7 ventral, 8 prolateral, 9 dorsal, cleared in clove oil). Scale bars: 1–4 & 6 = 1 mm; 7 & 9 = 0.5 mm.



FIGURES 10–12. *Adoxotoma embolica* new species, male holotype. Palpal organ (10 ventral, 11 retrolateral, 12 prolateral). Scale bar = 0.5 mm.

rather fine whitish hairs overhanging towards chelicerae. The latter orange-brown, with scattered fine, brown hairs, promargin with two single teeth and retromargin with one fissidentate tooth. Maxillae and labium orange-brown with paler chewing margins. Sternum orange with darker margin. Venter and spinnerets grey. Legs with orange and brown markings, darker proximally and on sides, first pair more robust and darker than others. Tibiae I and metatarsi I with five and two pairs of ventrolateral spines, respectively. Leg formula: I–IV–II=III.

Palpal organ as illustrated in Figs 7–12.

Dimensions: CL 1.45; CW 1.15; AEW 1.05; PEW 0.93; EFL 0.65; CH 0.68; AL 1.55; AW 0.90; LI 3.75 (1.15+0.70+1.00+0.55+0.35); LII 2.70 (0.85+0.45+0.60+0.45+0.35), LIII 2.70 (0.75+0.45+0.60+0.55+0.35), LIV 3.53 (1.05+0.45+1.00+0.63+0.40).

Female: unknown.

Distribution. Known from type locality.

***Adoxotoma nitida* new species**
(Figs 13–24)

Type material. Holotype: male, Australia: Western Australia: Jarrahdale (Alcoa), Mine Area, 31°16'S, 116°06'E, April 1998, wet pitfall traps, K.E.C. Brennan, L. Ashby (WAMP T49409). **Paratype:** 1 male, same data, April 1999, M.L. Moir (WAMP T49412).

Etymology. Derived from abdominal scutum: *nitidus* (Lat.) = shiny, adjective.

Diagnosis. In comparison with the closest species, *Adoxotoma chinopogon*, chelicerae papillate, retrolateral tibial apophysis of palpal organ hook-like.

Description. Male (holotype, Figs 13–24): Carapace dark brown, eye field darker, eye surroundings black. Whole surface with sparse brown bristles and scale-like light hairs. Abdomen with shiny, dark scutum and greyish sides. Clypeus narrow, light brown, with three brown protruding central bristles and with long pale hairs overhanging towards chelicerae; the latter orange, papillate, with scattered fine, brown hairs and with two promarginal teeth and single 3-cuspidate (fissidentate) retromarginal tooth. Maxillae and labium orange-brown. Sternum orange, with brown margins and scattered brown hairs. Venter grey, spinnerets greyish. Leg femora, proximal patellae, lateral tibiae and metatarsi dark brown, the rest yellow. First legs more robust and darker than others, their tibiae and metatarsi with five and two pairs of ventrolateral spines, respectively. Leg formula: I–IV–II–III or I–IV–II=III. Pedipalps dark brown.

Palpal organ (Figs 19–24): tegulum with retrolateral lobe, embolus dagger-like.

Dimensions: CL 1.95; CW 1.50; AEW 1.25; PEW 1.15; EFL 0.75; CH 0.85; AL 2.20; AW 1.35; LI 5.13 (1.60+1.10+1.25+0.75+0.43); LII 3.48 (1.13+0.65+0.75+0.60+0.35), LIII 3.36 (1.00+0.53+0.75+0.73+0.35), LIV 4.45 (1.20+0.60+1.15+1.10+0.40).

Female: unknown.

Distribution. Known from type locality.

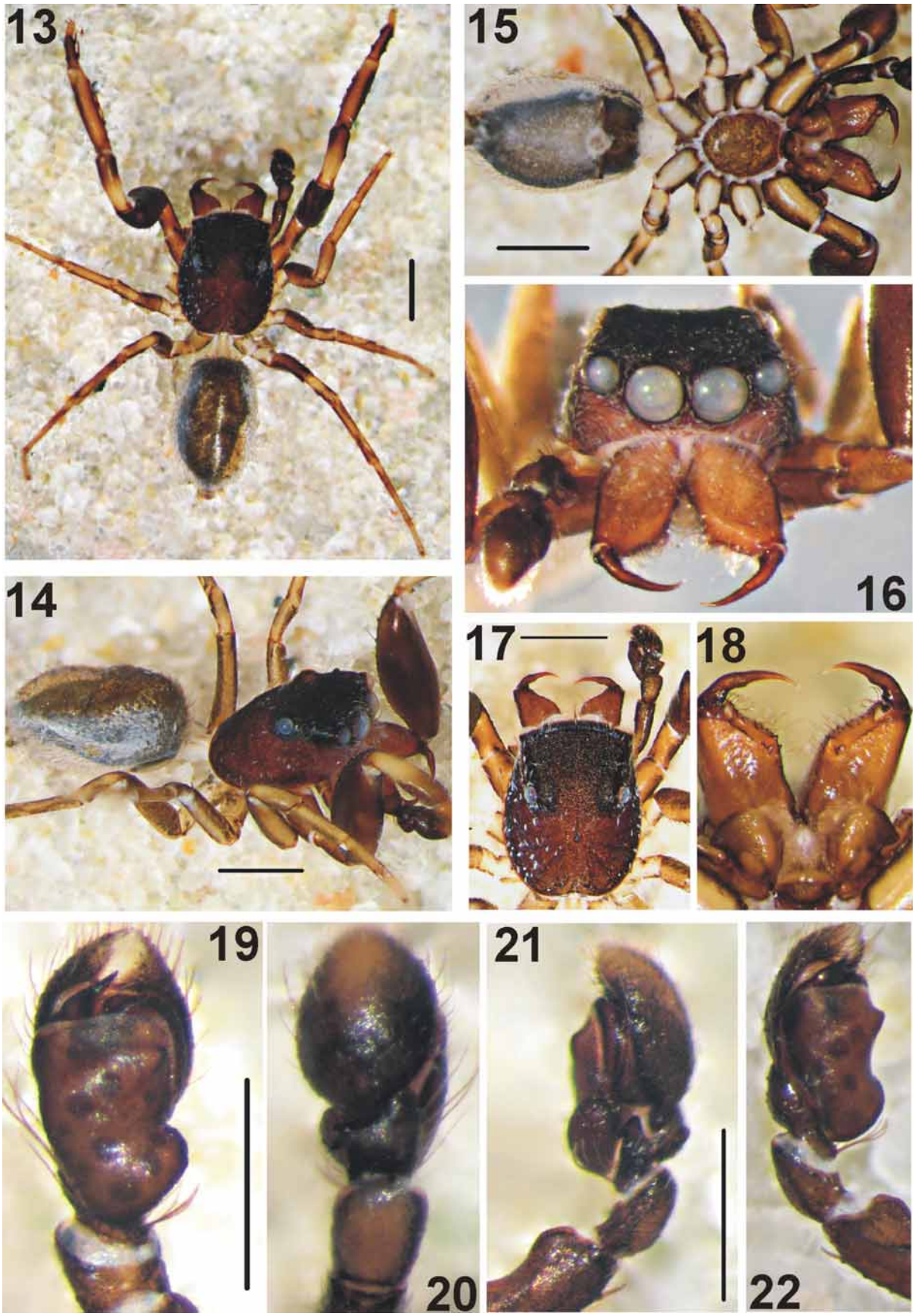
***Adoxotoma sexmaculata* new species**
(Figs 25–32)

Type material. Holotype: female, Australia: Western Australia: 15 km NE of Augusta, 34°12'S, 115°13'E, Jarrah/mari woodland, heathland on grey sand, 6 June 1989, G. Harold (WAMP 93/1677).

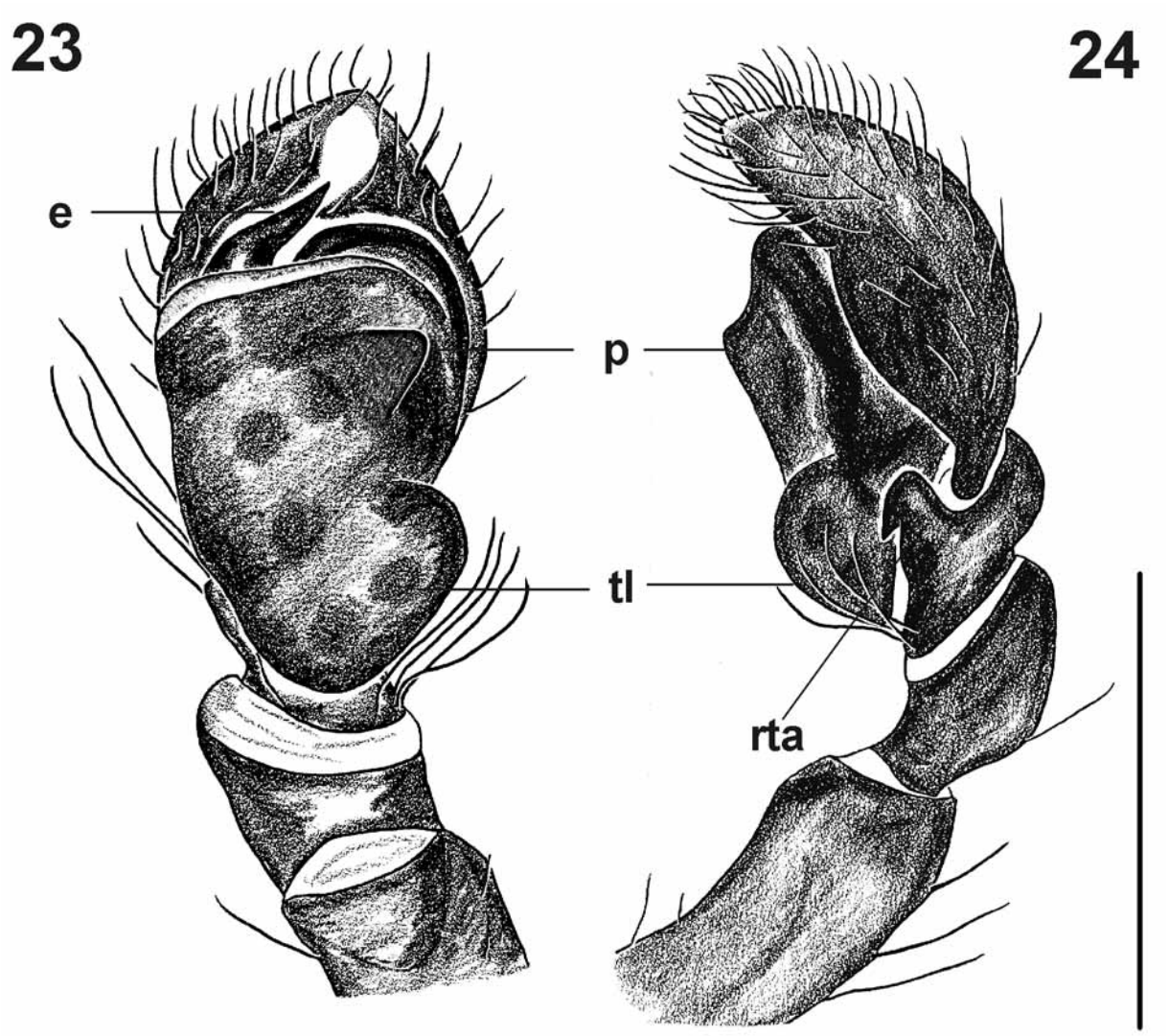
Etymology. Derived from six pale spots on dorsal surface of abdomen: *sex* (Lat.) = six, *macula* (Lat.) = dot, spot, adjective.

Diagnosis. May be distinguished from other species by abdominal pattern of light patches and details of epigyne: anterior depression semicircular, copulatory openings oriented anteriorly, insemination ducts moderately long, distally close to each other.

Description. Female (holotype, Figs 25–32): Carapace brown, with short scattered, scale-like, pale hairs, surroundings of eyes dark brown. Whole surface with scattered brown bristles and fine, pale hairs. Abdomen with light patches on brownish grey background. Spinnerets greyish-yellow. Clypeus very narrow, dark brown, with three central, brown bristles and sparse, very fine light hairs. Chelicerae orange-brown, with scattered, fine, brown hairs and bristles, promargin with two single teeth, retromargin with a fissidentate tooth. Maxillae and labium brown, chewing margins yellow. Sternum greyish-brown, thinly clothed in very fine,



FIGURES 13–22. *Adoxotoma nitida* new species, male holotype. 13 dorsal view; 14 side view; 15 ventral view; 16–17: cephalothorax (16 frontal, 17 dorsal); 18 chelicerae, maxillae and labium; 19–22 palpal organ (19 ventral, 20 dorsal, 21 retrolateral, 22 prolateral-ventral). Scale bars: 13–15 & 17 = 1 mm; 19 & 21 = 0.5 mm.



FIGURES 23–24. *Adoxotoma nitida* new species, male holotype. Palpal organ (23 ventral, 24 retrolateral). Scale bar = 0.5 mm.

pallid hairs. Venter yellowish, greyish-brown on sides. Pedipalps pale brown, with contrasting light patella and tibia. Legs with yellow-grey-brown markings. First pair robust, longer and darker than others, their tibiae with five and metatarsi with two pairs of ventrolateral spines. Leg formula: IV–I–III–II.

Epigyne strongly sclerotized, with semicircular anterior depression, its structure shown in Figs 31–32.

Dimensions: CL 2.10; CW 1.75; AEW 1.55; PEW 1.40; EFL 1.25; CH 1.00; AL 2.50; AW 1.90; LI 5.15 (1.60+1.00+1.30+0.75+0.50); LII 4.20 (1.35+0.70+1.00+0.70+0.45), LIII 4.30 (1.25+0.60+1.10+0.90+0.45), LIV 5.55 (1.40+0.70+1.60+1.30+0.55).

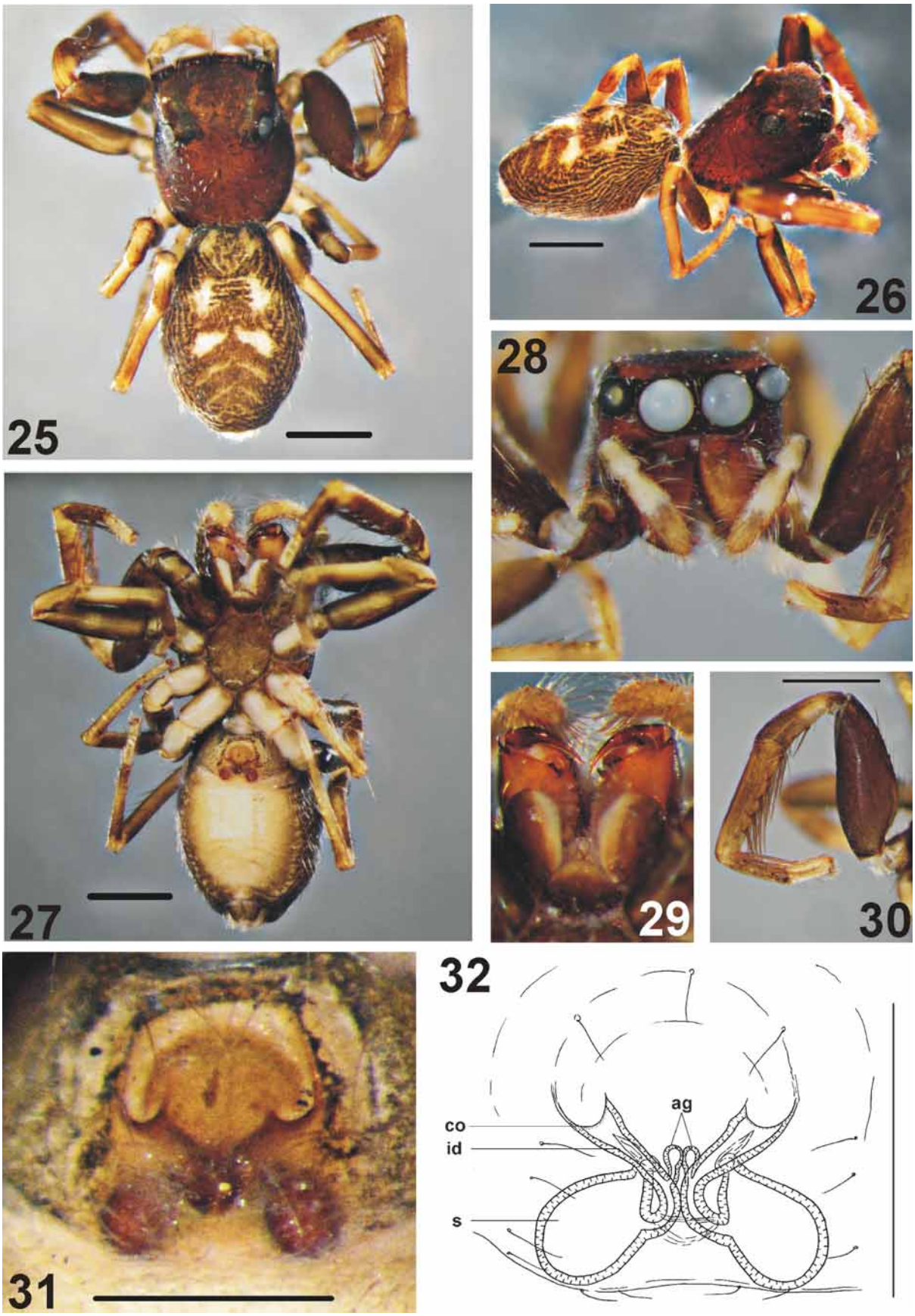
Male: unknown.

Distribution. Known from type locality.

Remarks. The species shows a combination of characters of *Adoxotoma* (body form, robust legs and spines, fissidentate cheliceral dentition) and *Helpis* (epigyne and internal genitalia). The finding of the male will solve the species' generic status.

Adoxotoma nodosa (L. Koch, 1879) new combination

Astia nodosa Koch, 1879: 1156; Wanless 1988: 91, as incertae sedis.



FIGURES 25–32. *Adoxotoma sexmaculata* new species, female holotype. 25 dorsal view; 26 side view; 27 ventral view; 28 frontal view; 29 chelicerae, maxillae and labium; 30 leg I; 31 epigyne, ventral view; 32 vulva, dorsal view. Scale bars: 25–27 & 30 = 1 mm; 31–32 = 0.5 mm.

Judging from the description and illustrations given by Wanless (1988), the species belongs to the genus *Adoxotoma*. Its fissidentate cheliceral dentition, palpal organ structure, long coxae and trochanters and spiny tibiae and metatarsi of the first legs are typical for the genus.

Distribution. Known only from type locality: Gayndah in Queensland.

Genus *Helpis* Simon, 1901

Astia [part] Koch, 1880: 1160, 1163.
Helpis Simon, 1901: 432, 436–438; Wanless, 1988: 81–84, 94–102; Davies & Żabka, 1989: 206, 212; Gardzińska, 1996: 299–304; Żabka, 2002: 259–261; Żabka & Pollard, 2002: 75; Maddison *et al*., 2008: 53–59.
Type species: *Astia minitabunda* Koch, 1880, by subsequent designation.

Current list of species: *Helpis gracilis* Gardzińska, 1996; *Helpis kenilworthi* Żabka, 2002; *Helpis longipalpis* **sp. nov.**; *Helpis minitabunda* (L. Koch, 1880); *Helpis occidentalis* Simon, 1909; *Helpis risdonica* Żabka, 2002; *Helpis tasmanica* Żabka, 2002.

Diagnosis. The genus can be distinguished by the following combination of characters: legs long and slender, palpal tegulum ovoid with posterior lobe, embolus short, arising anteriorly; epigyne with large posterior pocket, copulatory openings located anteriorly, insemination ducts straight or wavy. Unlike in *Adoxotoma* leg spination not distinctive.

Description. Pluridentate spiders, 4–8 mm long. Transverse ocular fringe in males present (*H. minitabunda* and *H. occidentalis*, see Wanless 1988), indistinct or missing (other species). Cephalothorax with gentle posterior slope and fovea located just behind PLE. Abdomen either elongate or ovoid, without scutum, with a mosaic of light and dark markings and translucent guanine, sometimes with stripes of pale hairs. Legs rather long and slender, in males first pair the longest and more hairy than in females, sometimes with femoral-patellar fringes. Tibia I with 3–7 proventrolateral and 3–6 retroventrolateral spines, metatarsus I with 2–4 pairs of ventrolateral ones. Leg formula in males: I–IV–II–III or I–IV–III–II, in females: IV–I–II–III or IV–I–III–II. Genitalia as described by Wanless (1988).

Helpis longipalpis new species
(Figs 33–44)

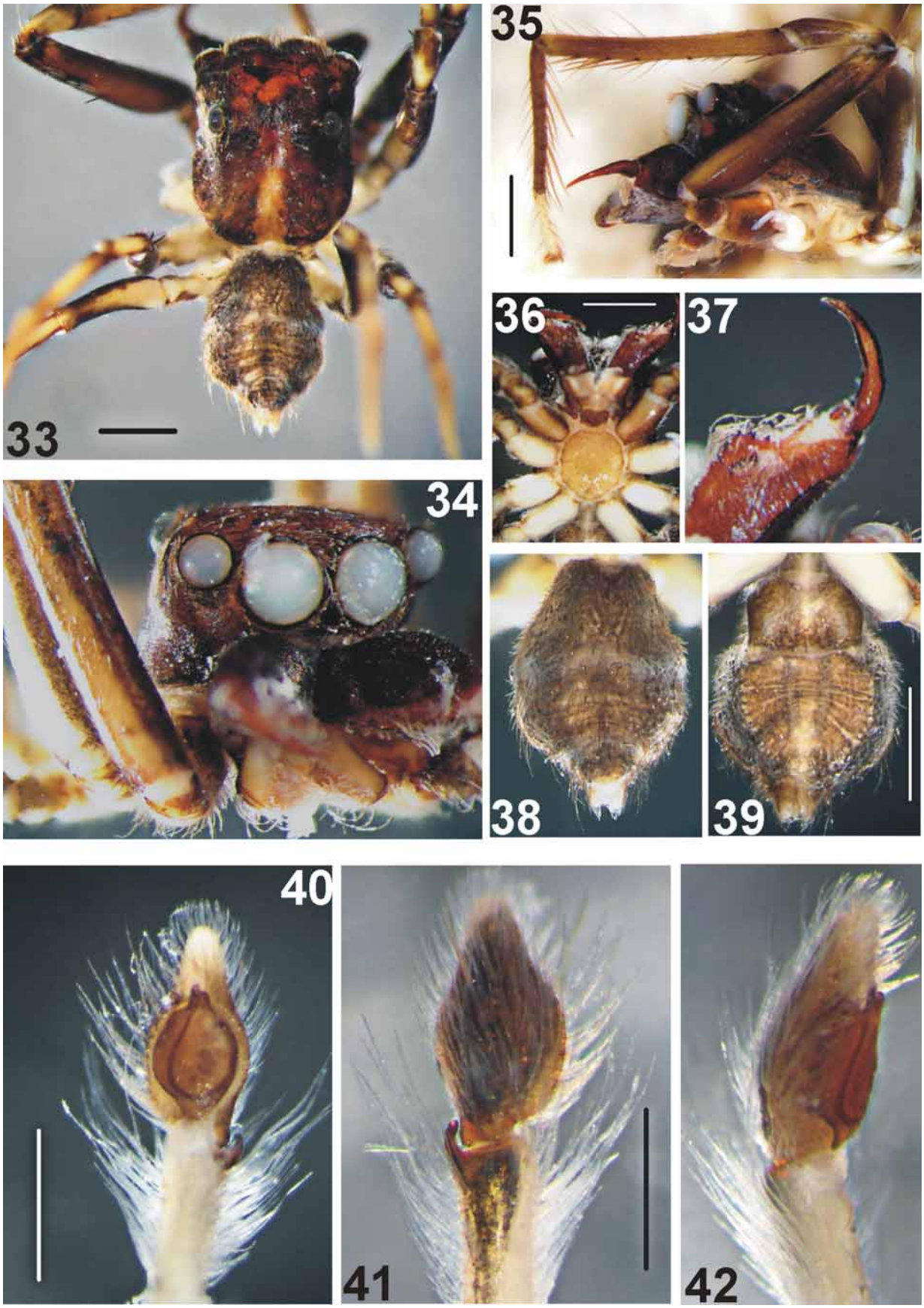
Type material. Holotype: male, Australia: Western Australia: Theda Pass Campsite, 14°47'S 126°38'E, under rocks, 14 June 1992, M.S. Harvey & J.M. Waldock (WAMP 93/1694).

Etymology. Derived from elongate palpal organ, adjective.

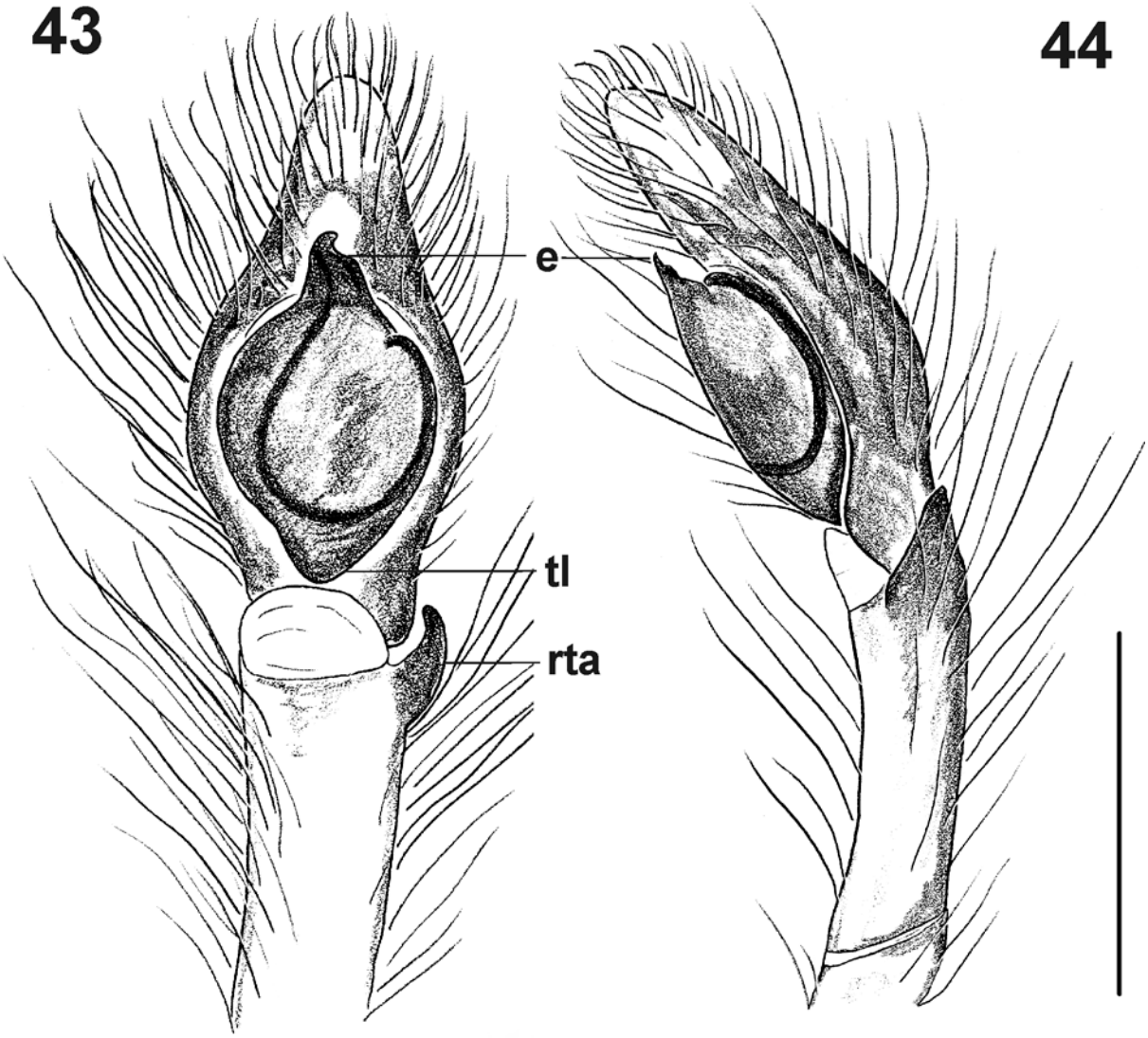
Diagnosis. In comparison with closely related *H. minitabunda* and *H. occidentalis*, abdomen much shorter, palpal tibia as long as cymbium, embolus shorter, its base with a kind of "step".

Description. Male (holotype, Figs 33–44): Carapace brown with paler median thoracic stripe, eye surroundings dark brown. Whole surface with scattered fine, pale brown and whitish hairs, the latter more numerous in fovea region. Light brown bristles around ALE and AME, PME and PLE surroundings with short, brown chairs. Abdomen ovoid, dark grey, with light and dark dots and two transverse stripes of whitish hairs. Clypeus very narrow, dark brown, fringed with whitish hairs, more dense and lanceolate below AME. Chelicerae dark brown, with sparse light brown hairs, longer and thicker on pro- and retromargins. Promargin with five, retromargin with four teeth. Maxillae and labium pale brown, chewing margins yellow. Sternum orange, with fine, pale hairs. Venter with mosaic of grey dots and lines. Spinnerets yellow-grey. Legs long and slender, with yellow and brown markings, the first the longest and darker than the others. Tibia I with seven proventrolateral and six retroventrolateral spines, metatarsus with four pairs of ventrolateral spines. Leg formula: I–IV–III–II.

Palpal patella and tibia whitish, the latter dorsally brown, both with very long, dense, flattened, white hairs. Cymbium brown, with lighter tip. Palpal structure as illustrated in Figs 40–44.



FIGURES 33–42. *Helpis longipalpis* new species, male holotype. 33 dorsal view; 34 frontal view; 35 side view; 36 ventral view; 37 chelicera; 38–39 abdomen (38 dorsal, 39 ventral); 40–42 palpal organ (40 ventral, 41 dorsal, 42 prolateral). Scale bars: 33, 35–36 & 39 = 1 mm; 40-41 = 0.5 mm.



FIGURES 43–44. *Helpis longipalpis* new species, male holotype. Palpal organ (43 ventral, 44 retrolateral). Scale bar = 0.5 mm.

Dimensions: CL 2.45, CW 2.00, AEW 2.05, PEW 1.68, EFL 1.25, CH 1.40, AL 2.05, AW 1.55, LI 9.90 (2.95+1.40+2.95+1.85+0.75), LII 7.65 (2.45+0.95+2.05+1.45+0.75), LIII 7.75 (2.25+0.95+2.05+1.75+0.75), LIV 8.60 (2.40+0.95+2.40+2.10+0.75).

Female: unknown.

Distribution. Known from type locality.

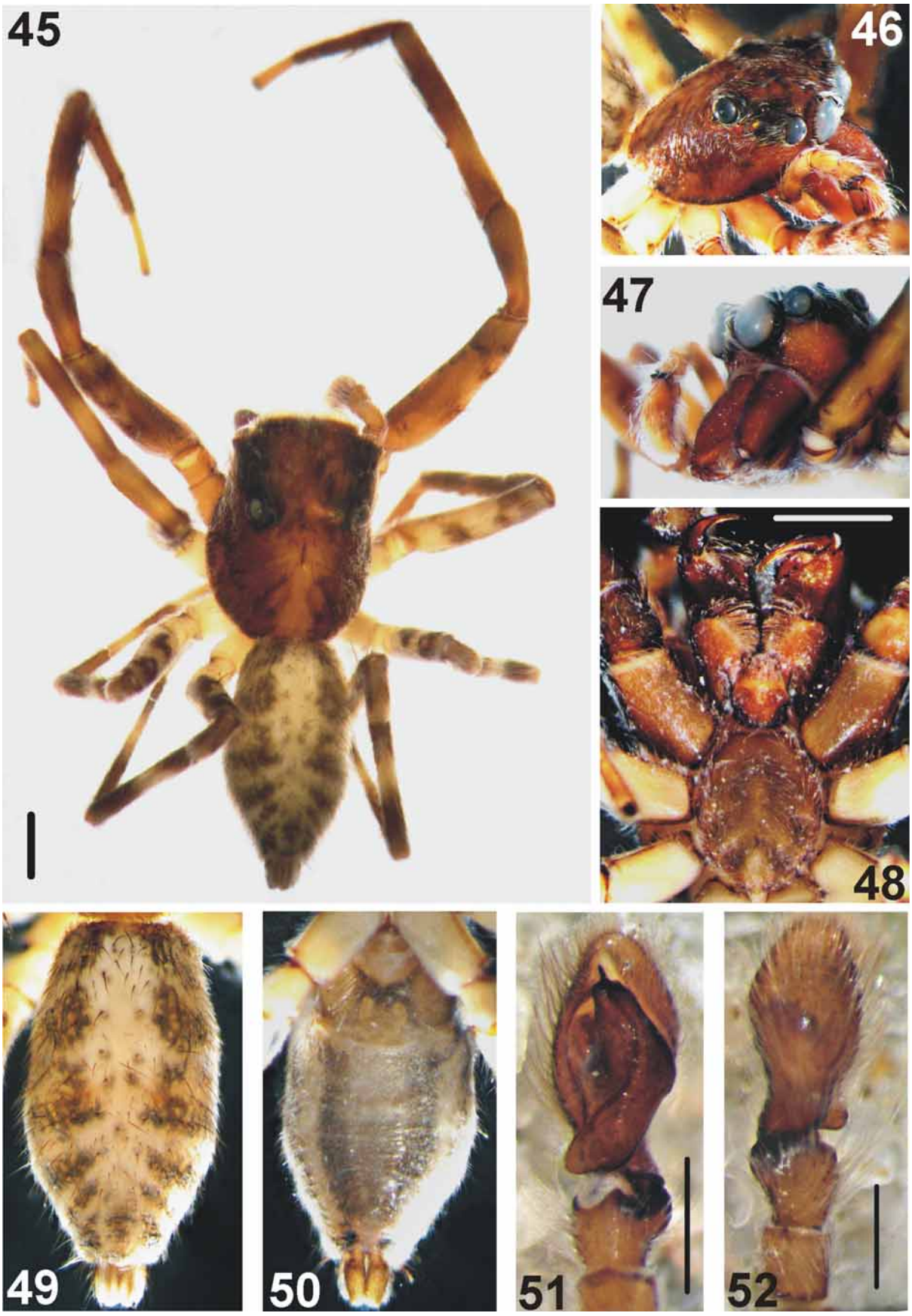
Parahelpis new genus

Type species: *Helpis abnormis* Żabka, 2002, designated here.

Etymology. Derived from *Helpis* – the possible relative.

Current list of species: *Parahelpis abnormis* (Żabka, 2002) **comb. nov.**, *Parahelpis_smithae* **sp. nov.**.

Diagnosis. General appearance similar to *Helpis*. In comparison with other Astieae genera, tegulum strongly elongated, prolaterally bent and looking "mirror-reversed"-like. Posterior lobe large, retrolateral tibial apophysis broad and bifurcate.



FIGURES 45–52. *Parahelpis smithae* new species, male holotype. 45 dorsal view; 46–47 cephalothorax; 48 ventral view; 49–50 abdomen (49 dorsal, 50 ventral); 51–52 palpal organ (51 ventral, 52 dorsal). Scale bars: 45 & 48 = 1 mm; 51–52 = 0.5 mm.

Description. Pluridentate spiders, 5–6 mm long. Cephalothorax with gentle thoracic slope and clusters of pale, scale-like hairs. Fovea located just behind PLE. Abdomen elongate, without scutum, with pattern of dark markings on pale background. Clypeus narrow. Chelicerae long, pluridentate. Sternum scutiform. Legs long and slender, in both known species with 4 and 2 pairs of ventrolateral spines, respectively. Seminal reservoir runs along tegulum in its median part.

Females unknown.

Parahelpis abnormis (Żabka, 2002) new combination

(Figs 55–58)

Helpis abnormis Żabka, 2002: 259.

The original species name suggests its doubtful status. Now we designate it the generic type of a new genus on the basis of the structure of legs and the male palpal organ.

Parahelpis smithae new species

(Figs 45–54)

Type material. Holotype: male, Australia: New South Wales: Warrumbungles N.P., 14 km E of western park entrance, 31°16'31"S, 148°57'47"E, under rocks, 11 November 2001, M. Gray, G. Milledge & H. Smith (AMS KS 75235).

Etymology. For Dr Helen Smith (Australian Museum, Sydney), one of the collectors of type material studied, noun (name) in genitive case.

Diagnosis. In comparison with *P. abnormis*, embolic base wider (step-like), posterior tegular lobe more angular, tibial apophysis shorter, cymbium with distinctive flange.

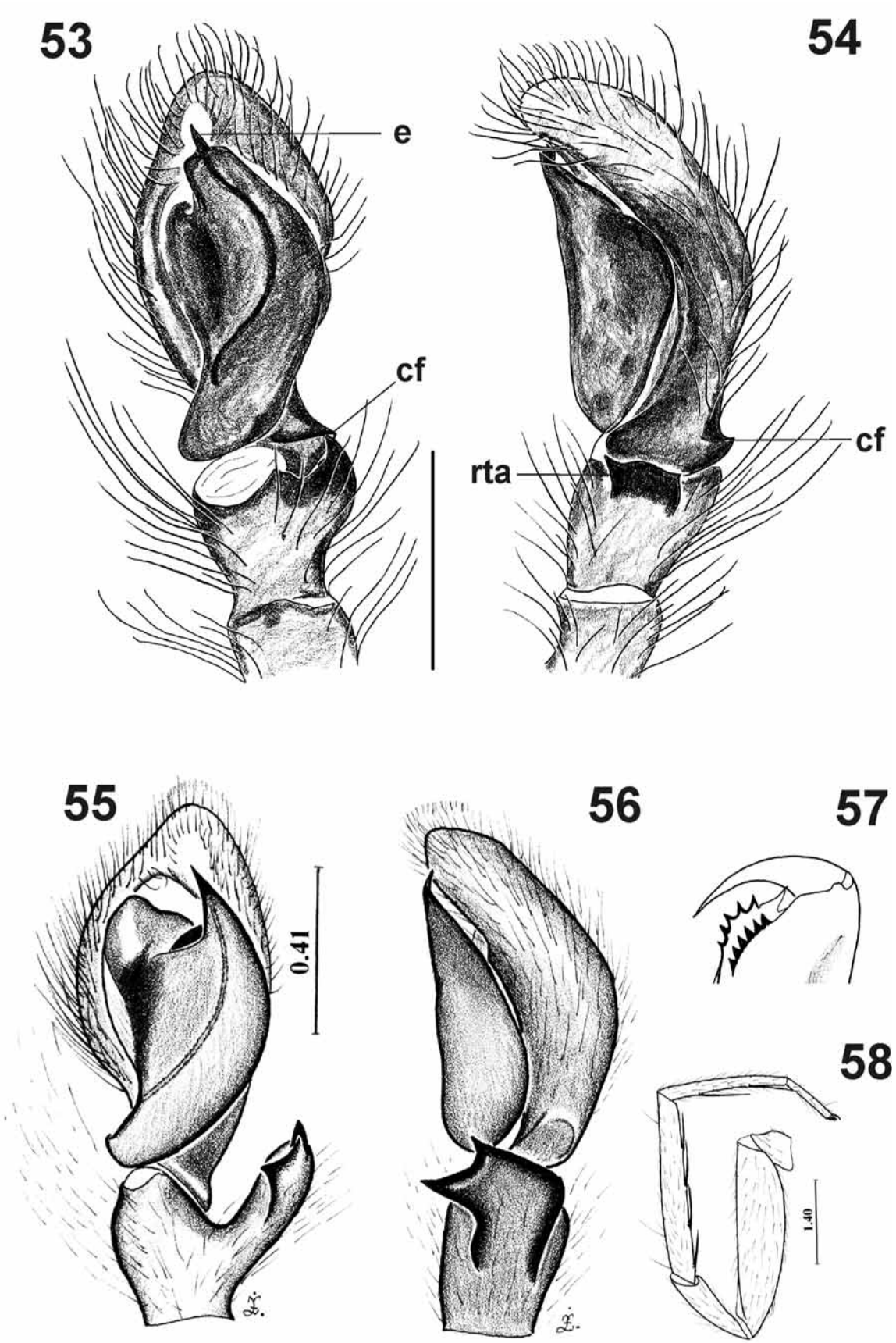
Description. Male (holotype, Figs 45–54): Carapace orange-brown with light thoracic stripe. Eye surroundings black, lighter around AME's. Whole surface with scale-like, shiny whitish hairs and scattered brown bristles, the former more numerous on eye field and on sides. Around anterior eyes whitish scale-like hairs present. Cheeks orange. Clypeus brown, fringed with whitish hairs, dense and lanceolate hairs below AME. Chelicerae orange-brown, sparsely clothed in whitish hairs, especially on pro- and retromargins, the latter with four and five teeth, respectively. Maxillae and labium orange-brown with yellow chewing margins. Sternum light brown, thinly clothed in long pale hairs. Abdomen elongate, with mosaic of yellow and brown markings, clothed in very fine pale hairs and with scattered stiff, brown bristles. Venter greyish. Spinnerets yellow-grey. Legs long and slender, yellow to orange, with brown markings. First legs the longest, more robust and darker than others, tibiae with four and metatarsi with two pairs of ventrolateral spines. Leg formula: I–IV–II–III.

Palpal organ as illustrated in Figs 51–54, with distinctive long, thin, whitish hairs on patella, tibia and cymbium.

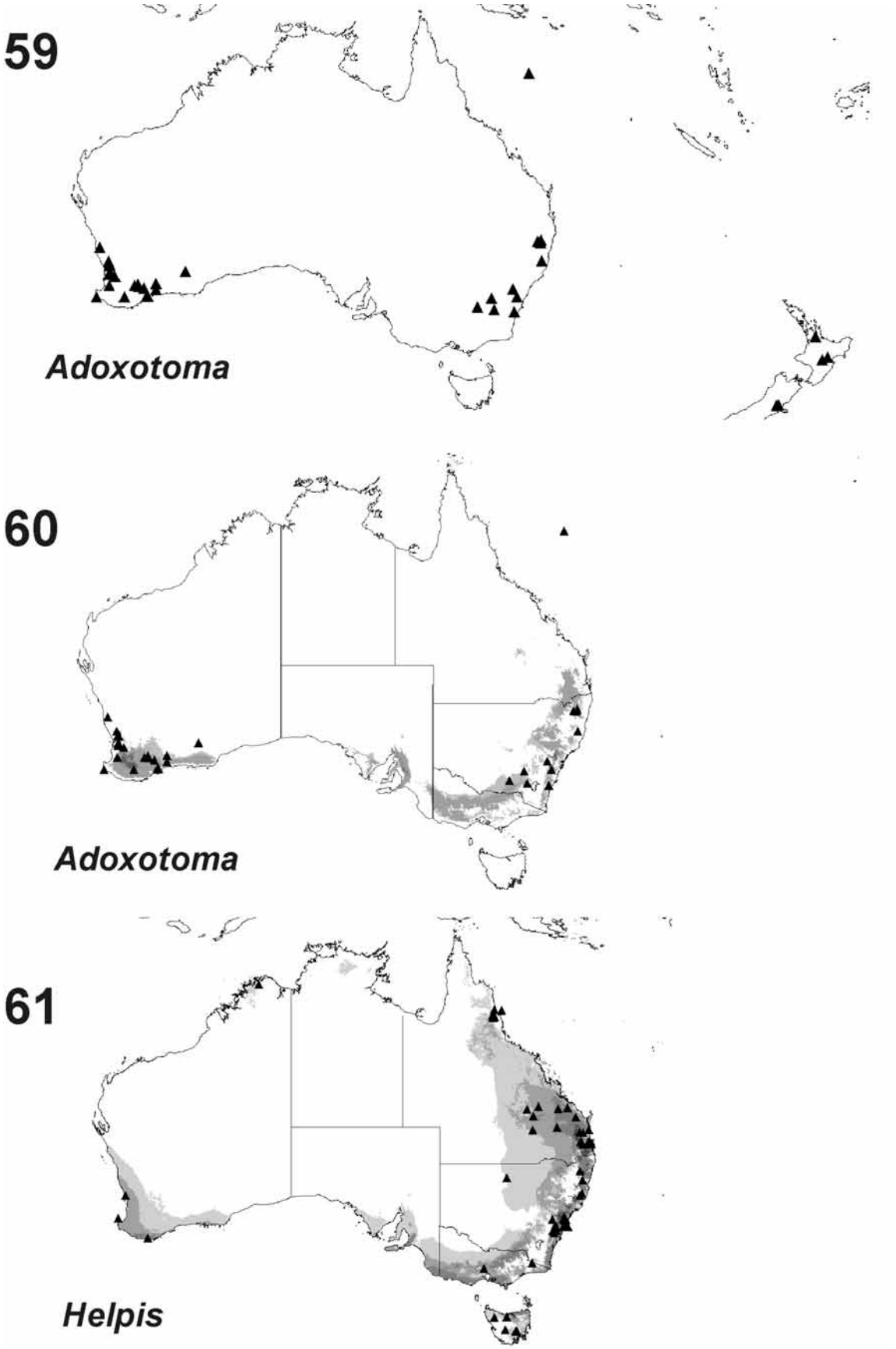
Dimensions: CL 2.75; CW 2.15; AEW 2.00; PEW 1.65; EFL 1.25; CH 1.50; AL 3.05; AW 1.65; LI 10.01 (2.95+1.60+2.75+2.00+0.80); LII 7.90 (2.40+1.20+2.05+1.55+0.70), LIII 7.40 (2.20+0.95+1.75+1.85+0.65), LIV 8.70 (2.45+1.05+2.35+2.10+0.75).

Female: unknown.

Distribution. Known from type locality.



FIGURES 53–58. *P. smithae* new species, male holotype. 53–54 palpal organ (53 ventral, 54 retrolateral). *P. abnormis* (Żabka, 2002) new combination, male holotype. 55–56 palpal organ (55 ventral, 56 retrolateral); 57 chelicera; 58 leg I. Scale bar of 53–54 = 0.5 mm.



FIGURES 59–61. Actual and predicted distributions of *Adoxotoma* and *Helpis*, triangles: actual distribution from field data, and predicted distribution based upon bioclimatic profile for each genus. Growing shade intensity illustrates likelihood of occurrence.

Remarks on distribution of *Adoxotoma* and *Helpis*

Since mid-Tertiary separation of Australia, the continent has experienced major climatic and biotic changes, resulting in turnovers in floristic formations and taxa, as well as the periodic restriction of older faunas to humid refugia (Byrne 2008; Martin 2006). The temperate-humid Gondwanan rainforests that once covered Australia, have suffered most and have been limited to higher altitudes in the southeast part of the Great Dividing Range and to Tasmania. In the northern parts the rainforests have partly survived but their composition has been altered by the influx of Oriental and then New Guinean floras, following the Miocene collision of the Australian and Sunda Plates. This also enabled the exchange of animal taxa (including Salticidae) in both directions (Christopel 1994; Hill 1994; Żabka 1990, 1991c). Elsewhere the Gondwanan flora has been replaced by scleromorphic formations.

All these events must have been a powerful driving force for diversification and the development of endemic faunas—phenomena well illustrated by a number of jumping spider genera (Żabka 1991a, b, 1992, 1994).

The Astieae clade is distributed in Australia, its off shore islands, in New Guinea and in New Zealand. It comprises nine genera and 55 described species. Molecular analyses made for some genera (excl. *Adoxotoma*) (Maddison *et. al*. 2008) suggest post-Gondwanan radiation within the continent.

The genus *Adoxotoma* is distributed in SE coastal and highland areas, and in the SW corner of the continent (Figs 59–60) [the generic status of *A. forsteri* from New Zealand (Żabka 2004) should be confirmed]. The predicted distribution (Fig. 60, shaded) for the entire genus is basically similar. Particular species are found in wet sclerophyll forests and rainforests, dwelling in leaf litter, under rocks and logs and likely indicating the original habitat for ancestral Astieae. If it is the case, the genus should also be expected in Tasmania.

The genus *Helpis* is mostly found in eastern and south-western coastal areas of Australia, extending further into the drier inland and to the tropics (Fig. 61). It prefers dry and wet sclerophyll forests. One species (*H. minitabunda*) is found in human habitations and has been introduced to New Zealand (Forster & Forster 1999; Żabka & Pollard 2002) and to some Great Barrier Reef islands (Patoleta & Żabka 1999). Unlike *Adoxotoma*, most species of *Helpis* are found on the tree trunks and bark of different *Eucalyptus* species—the microhabitat typical for post-Gondwanan Australia.

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