

## THE GENUS *ANAGARYPUS* (PSEUDOSCORPIONIDA: GARYPIDAE)

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*Abstract.* The genus *Anagarypus* is redefined based on study of the type-species, *Anagarypus oceanusindicus*, and of 2 new species, *A. australianus* and *A. heatwolei*, from Australia.

The genus *Anagarypus* Chamberlin was erected in 1930 on the basis of specimens from the Chagos Archipelago and Aldabra Islands in the western Pacific Ocean. No additional material of the type-species, *Anagarypus oceanusindicus*, has been reported, and until recently no other species were known. Extensive collecting on the islands off Australia by H. Heatwole, of the University of New England, has resulted in the discovery of 2 new species undoubtedly belonging to this genus but with an important difference in trichobothriotaxy.

### Genus *Anagarypus* Chamberlin

*Anagarypus* Chamberlin, 1930: 609, 615.—Beier, 1932: 225.—Chamberlin, 1943: 488.—Hoff, 1947: 45.

Type-species: *Anagarypus oceanusindicus* Chamberlin, by original designation.

*Diagnosis (revised).* With the characters of the family Garypidae Hansen and subfamily Garypinae E. Simon: diplotarsate (at least in adults); movable cheliceral finger not dentate, but with a small subapical lobe; carapace distinctly triangular as viewed from above; abdomen broader than carapace; coxal area distinctly widened posteriorly; and venom apparatus well developed in both fingers of palpal chela. Body and appendages with a distinct pseudoderm; vestitural setae small, curved, acuminate; pleural membranes bearing setae; anal area ventral, entirely surrounded by 11th sternite; cheliceral flagellum of 3 subequal setae; fixed finger of chela with 7 trichobothria and movable finger with 1 or 2, the trichobothria relatively short and heavy; leg I with basifemur and telofemur about equal in length; pedal arolia longer than claws; nymphs with tarsus barely or not at all divided into 2 segments.

*Remarks.* As Chamberlin (1930) noted, *Anagarypus* is easily separable from other garypids by the possession of curved, acuminate vestitural setae and by the presence of only 7 trichobothria on the fixed finger of the palpal chela. While the type-species, *A. oceanusindicus* from the west Indian Ocean, has only a single trichobothrium on the movable chelal finger, both of the Australian species described below bear 2 trichobothria on that finger. Also characteristic of both sexes of *Anagarypus* is the possession of setae on the abdominal pleural membranes, a feature found also in some other garypids. While the adults of *Anagarypus* are distinctly diplotarsate, nymphs are more or less monotarsate.

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### **Anagarypus oceanusindicus** Chamberlin

*Anagarypus oceanusindicus* Chamberlin, 1930: 609, 615, Fig. 1A,G,L,Q,R,Y,FF,2E,I,P,MM,NN,3K,L; 1931: Fig. 15P,37T,U,V,47V,52D.—Beier, 1932: 225.

The original description by Chamberlin (1930) is rather brief, but is supplemented by numerous figures in that paper and in his monograph (1931). As a result, only a little needs to be added, based upon examination of 8 paratypes.

*Supplemental description.* In order to compare this species with the new species described below, the following characters must be noted. Pleural membranes of abdomen bear small, typical setae in 1 or 2 sparse longitudinal rows. Anal area, consisting of the anal plates (12th tergite and sternite), ventrally situated and entirely surrounded by the 11th sternite. All setae of cheliceral flagellum usually bear lateral spinules, not just distalmost one as suggested by Chamberlin (1932: Fig. 15P). Chamberlin (1930: 609) suggested that trichobothrium *t* is absent from the fixed chelal finger; however, he later indicated that it is *ist* that is absent (1931: Fig. 37V); I believe that the latter interpretation is correct. Trichobothria shorter and heavier than in most other pseudoscorpions. For paratypes studied, palpal femur 3.5–3.85×, tibia 2.8–3.3×, and chela 2.8–3.1× as long as broad; hand 1.7–2.0× as long as deep; movable finger 0.73–0.76 as long as hand. Fingers of chela with about 40 marginal teeth, only distal 10–15 cusped. Leg I with telofemur as long as or slightly longer than basifemur. Leg IV with entire femur 3.9–4.15× and tibia 4.2–4.4× as long as deep. All legs of adults diplotarsate; nymphs with tarsi more or less undivided, only occasionally showing a distinct separation into 2 parts.

*Measurements* (mm). Ranges for 5 adult paratypes. Body length 3.2–3.9. Carapace length 0.90–0.97. Palpal femur 1.04–1.12 by 0.29–0.31; tibia 0.94–0.98 by 0.30–0.33; chela (without pedicel) 1.41–1.49 by 0.46–0.53; hand (without pedicel) 0.86–0.90 by 0.43–0.52; pedicel ca. 0.15 long; movable finger 0.65–0.68 long. Leg I: basifemur 0.27–0.30 long; telofemur 0.28–0.30 long. Leg IV: entire femur 0.74–0.83 by 0.19–0.20; tibia 0.53–0.57 by 0.12–0.13; metatarsus 0.24–0.27 long; telotarsus 0.17–0.19 long.

*Specimens examined.* Paratypes (8): 1♂, 3♀, CHAGOS ARCH.: Takamaka I; 1♂, 3N, ALDABRA IS: Il Esprit (J.C. Chamberlin Collection).

### **Anagarypus australianus** Muchmore, new species

Fig. 1–6

*Diagnosis.* Much like *A. oceanusindicus*, but with 2 trichobothria on the movable chelal finger rather than 1.

*Description of adults.* ♂ and ♀ similar; specimens quite varied in size but ♀ usually larger than ♂. Body heavily sclerotized and with a distinct pseudoderm, as noted by Chamberlin for *A. oceanusindicus* (1943: 489); pseudoderm, especially of the palps, often with adhering particles of dirt. *Carapace* dark brown anteriorly, laterally and medially; most tergites with 4 conspicuous dark brown spots, equally spaced across them; palps dark brown; legs light brown. Most vestitural setae small, curved and acuminate; many, on both body and appendages, are not round in cross section but are flattened parallel to the surface from which they arise (Fig. 1). Carapace much narrowed anteriorly and with anterior margin smoothly depressed; surface reticulate above, becoming granulate laterally; with 75–80 setae, about 4 at anterior margin and 10 at posterior; 4 large corneate eyes, situated very close together. *Abdomen* broad ovoid; tergites 3–10 and sternites 4–10 divided; anal area on ventral side, entirely surrounded by 11th sternite; surfaces reticulate; pleural membranes longitudinally rugose, with 1 or 2 sparse, longitudinal rows of small setae. Tergal chaetotaxy of ♂ holotype 8:9:16:16:18:17:19:17:17:19:16:2; others similar but varied. Sternal chaetotaxy of ♂ holotype 14:[2-2]:(0)6(0):(0)9(0):10:8:9:11:13:16:13:2;

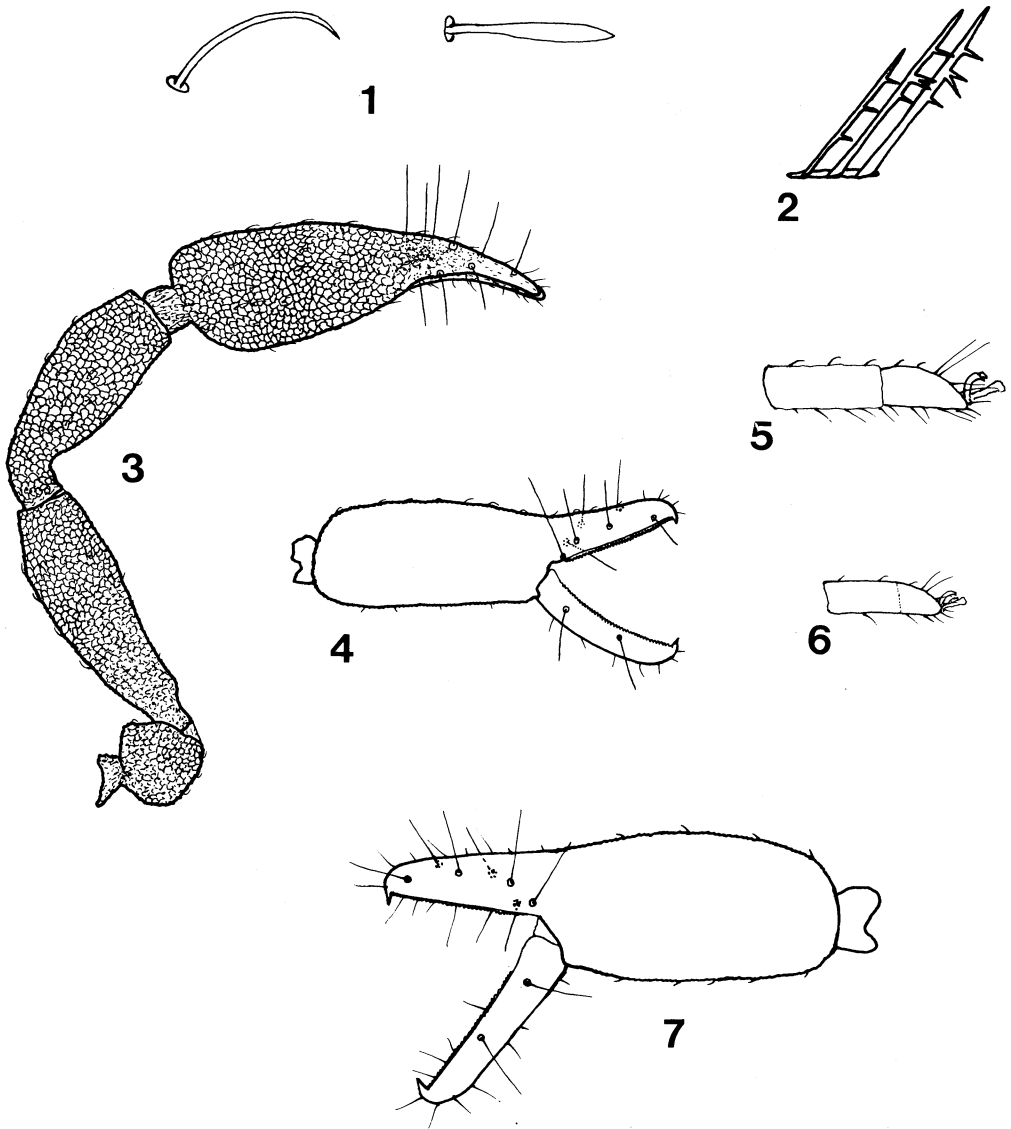


FIG. 1-7. 1-6. *Anagarypus australianus*: 1, vestitural setae, from side and from above; 2, cheliceral flagellum; 3, left palp, dorsal view; 4, right chela, lateral view; 5, tarsus of leg IV of adult; 6, tarsus of leg IV of tritonymph. 7. *Anagarypus heatwolei*: left chela, lateral view.

other ♂ similar but varied. Sternal chaetotaxy of ♀ paratype 7:(0)4(0):(0)8(0):16:17:15:16:14:16:12:2; others similar but varied; in ♀, sternites 5 and 6, and occasionally 7 and 8, have up to 8 setae in a row situated anteriorly and medially. Internal genitalia much as shown for *A. oceanusindicus*: ♂ (Chamberlin 1930: Fig. 1A), ♀ (Chamberlin 1931: Fig. 52D). *Chelicera* small, about  $\frac{1}{3}$  as long as carapace; hand with 5 acuminate setae, *b* and *sb* shorter than others; flagellum of 3 subequal setae, all with a few prominent lateral spinules (Fig. 2);

galea of ♂ short, truncate, with 1 or 2 tiny terminal spinules, that of ♀ longer and with 3 curved terminal rami; serrula exterior with about 22 blades. *Palp* rather heavy for a garypid (Fig. 3); femur 3.1–3.65×, tibia 2.7–3.2×, and chela 2.8–3.3× as long as broad; hand 1.95–2.3× as long as deep; movable finger 0.65–0.78 as long as hand. Surfaces strongly reticulate, except smooth on chelal fingers. Fixed chelal finger with 7, and movable finger with 2, trichobothria, as shown in Fig. 4; trichobothria distinctly shorter and heavier than those of most other pseudoscorpions. Chelal fingers with 40–45 contiguous marginal teeth; each finger with conspicuous venedens; venom duct present in each finger but nodus ramosus difficult to see because of opacity of derm. *Legs* moderately slender; leg IV with entire femur about 4.0× and tibia 4.5× as long as deep. Leg I with telofemur slightly shorter than basifemur. All legs distinctly diplotarsate (Fig. 5). Surfaces reticulate; setae small, curved, except long, stout and straight on ventral sides of tibia and tarsi; no tactile setae present; subterminal setae long, straight, acuminate; arolia longer than claws.

*Nymphs*. Like adults, nymphs are quite variable in size and proportions. Four, which appear to be tritonymphs, have 2 trichobothria on movable chelal finger, but only 6 on fixed finger, apparently *esb* of adult complement missing. While all legs of adults are diplotarsate, all nymphs have tarsi more or less completely fused (Fig. 6); surface of tarsus does not show a depression at joint even though a slight transverse division can often be seen.

*Measurements* (mm). Figures given first for holotype ♂, followed in parentheses by ranges for adult paratypes. Body length 2.75(2.85–4.05). Carapace length 0.83(0.87–1.035). Chelicera length 0.295(0.295–0.35). Palpal femur 0.96(1.0–1.24) by 0.28(0.295–0.37); tibia 0.87(0.91–1.11) by 0.295(0.30–0.37); chela (without pedicel) 1.27(1.40–1.70) by 0.42(0.43–0.56); hand (without pedicel) 0.769(0.84–1.06) by 0.37(0.39–0.51); pedicel 0.11–0.13 long; movable finger 0.56(0.59–0.70) long. Leg I: basifemur 0.27(0.27–0.37) long; telofemur 0.26(0.26–0.35). Leg IV: entire femur 0.70(0.74–0.98) by 0.185(0.19–0.235); tibia 0.48(0.53–0.67) by 0.12(0.125–0.14); metatarsus 0.23(0.25–0.32) long; telotarsus 0.18(0.18–0.21) long.

*Type data*. Holotype ♂ (BPBM 12,593), 1♂, 2♀, 1N paratypes, AUSTRALIA: Great Barrier Reef: Nymph I, 23.IX.1967, under stones; 2♂, 9♀, 4N paratypes, Booby I, Hannibal I, Palfrey I, Penrith I, Restoration Rock, and Rocky Islet, VI–VIII.1969. All collections by H. Heatwole. Holotype and most paratypes in Bishop Museum, Honolulu, some paratypes in Florida State Collection of Arthropods, Gainesville.

*Other records*. AUSTRALIA: Northern Territory: Maria I, 1♂, 3♀, 1N (no date). These are considered conspecific despite being a little larger than the Great Barrier Reef specimens. In South Australian Museum, Adelaide.

*Etymology*. The species is named *australianus* after the country in which it is found.

*Remarks*. This species is apparently widespread on islands along the E coast of Australia, and probably northward as well. It is quite variable in size and proportions, perhaps as a result of long isolation on islands. The numbers of specimens from individual islands are not large enough to establish whether real differences exist among the separate populations.

### **Anagarypus heatwolei** Muchmore, new species

Fig. 7

*Diagnosis*. Similar in most respects to *A. australianus*, but larger (palpal femur 1.4 mm or longer) and with fewer setae on carapace and tergites.

*Description of adults*. As described above for *A. australianus*, but with the following particulars. Surface of *carapace* strongly reticulate and pseudoderm with many attached foreign particles.

Carapace with about 60 setae, 2 at anterior and 6–8 at posterior margins. *Abdomen* typical, pleural membranes bearing a few setae. Tergal chaetotaxy of holotype 9:9:7:7:8:10:14:13:15:14:15:2; sternal chaetotaxy of same 8:(0)4(0):(0)9(0):12:13:12:11:10:11:12:2; others similar but with a few more setae; sternites 5–8 variably with up to 9 setae anteriorly and medially. *Cheliceral* flagellum of 3 subequal setae, each with a few small spinules. *Palp* like that of *A. australianus* but with chelal hand more rounded, especially on dorsal side (Fig. 7). Palpal femur 3.45–3.8×, tibia 2.95–3.25×, and chela 3.0–3.25× as long as broad; hand 1.95–2.15× as long as deep; movable finger 0.67–0.71 as long as hand. Fixed chelal finger with 7 and movable finger with 2 trichobothria, as shown in Fig. 7; trichobothria short and heavy. Chelal fingers with 40–45 marginal teeth; each finger with well-developed venedens. *Legs* typical: leg I with telofemur slightly longer than basifemur; leg IV with entire femur 4.4–4.8× and tibia 5.4–5.9× as long as deep. All legs distinctly diplotarsate. No tactile setae present.

*Nymph*. The single nymph present has 1 trichobothrium on the movable chelal finger and 3 on the fixed finger. It probably is a protonymph, though larger than I would have expected for that stage. All legs monotarsate, without any indication of a division into metatarsus and telotarsus.

*Measurements* (mm). Figures given first for holotype, followed in parentheses by those for 2 paratypes. Body length 4.86(4.75, 4.85). Carapace length 1.27(1.20, 1.26). Chelicera length 0.415(0.415, 0.42). Palpal femur 1.44(1.46, 1.49) by 0.42(0.385, 0.415); tibia 1.27(1.295, 1.325) by 0.43(0.40, 0.42); chela (without pedicel) 1.81(1.79, 1.84) by 0.605(0.55, 0.60); hand (without pedicel) 1.11(1.13, 1.125) by 0.57(0.525, ?); pedicel about 0.15 long; movable finger 0.79(0.76, 0.785) long. Leg I: basifemur 0.415(0.43, 0.42) long; telofemur 0.43(0.445, 0.43) long. Leg IV: entire femur 1.19(1.205, 1.21) by 0.27(0.25, 0.265); tibia 0.83(0.84, 0.91) by 0.155(0.15, 0.155); metatarsus 0.35(0.36, 0.39) long; telotarsus 0.23(0.22, 0.245) long.

*Type data*. Holotype ♀ (BPBM 12,594), 2♀, 1N paratypes, AUSTRALIA: Western Australia: Barrow I, 11.II.1977, "under stones on a bare rocky headland," H. Heatwole. Types in Bishop Museum, Honolulu.

*Etymology*. The species is named for Harold Heatwole, who collected these specimens, as well as many other pseudoscorpions.

*Acknowledgments*. I am greatly indebted to H. Heatwole for sending me these and many other pseudoscorpions. I thank E. M. Benedict and D. C. Lee for allowing me to examine specimens from the J. C. Chamberlin Collection and the South Australian Museum, respectively. The figures were prepared by C. H. Alteri.

## LITERATURE CITED

- Beier, M.** 1932. Pseudoscorpionidea I. Subord. Chthoniinea et Neobisiinea. *Das Tierreich* **57**: 1–258.
- Chamberlin, J. C.** 1930. A synoptic classification of the false scorpions or chela-spinners, with a report on a cosmopolitan collection of the same. Part II.—The Diplosphyronida (Arachnida-Chelonethida). *Ann. Mag. Nat. Hist.* ser. 10, **5**: 1–48, 585–620.
1931. The arachnid order Chelonethida. *Stanford Univ. Publ. Biol. Sci.* **7**(1): 1–284.
1943. The taxonomy of the false scorpion genus *Synsphyronus* with remarks on the sporadic loss of stability in generally constant morphological characters (Arachnida: Chelonethida). *Ann. Entomol. Soc. Am.* **36**: 486–500.
- Hoff, C. C.** 1947. New species of diplosphyronid pseudoscorpions from Australia. *Psyche* **54**: 36–56.