

The Indo-West Pacific species of *Neaxiopsis* and *Neaxius* (Crustacea: Axiidea: Strahlaxiidae)

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Abstract

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The synonymy of *Axius* (*Neaxius*) *gundlachi* var. *orientalis* De Man, 1925, with *Axius* (*Neaxius*?) *euryrhynchus* De Man, 1905, now *Neaxiopsis euryrhynchus* (De Man, 1905), is confirmed. The synonymy of *Axia acantha* (A. Milne Edwards, 1879), *Eiconaxius taliliensis* Borradaile, 1900, and *Axius acanthus mauritianus* Bouvier, 1914, is confirmed; they are a single species, *Neaxius acanthus*. They and a second species from the Indo-West Pacific, *Neaxius trondlei* Ngoc-Ho, 2005, are not synonyms of *Neaxius glyptocercus* (von Martens, 1868), as was proposed in Sakai's (2011) family synthesis. Instead, a second species (from southern Queensland, Australia, Fiji and French Polynesia) close to *Neaxius glyptocercus* from north-eastern Australia is diagnosed as *Neaxius capricornicus* sp. nov.

Keywords

Crustacea, Strahlaxiidae, *Neaxiopsis*, *Neaxius*, taxonomy

Introduction

Attempts to identify specimens of Strahlaxiidae, one from the western Indian Ocean and others from throughout the Indo-West Pacific, led us into a web of confused names and errors in the most recent catalogue and review of the family (Sakai, 2011). Here, this confusion is resolved after examination of a wide range of material from across the Indo-West Pacific.

We test the assumption that *N. acanthus* (A. Milne Edwards, 1879) is widespread by reviewing collections from a wide geographic range, and re-diagnose the three known Indo-West Pacific species: *N. acanthus*, *N. glyptocercus* (von Martens, 1868) and *N. trondlei* Ngoc-Ho, 2005. In the process, a fourth undescribed species is uncovered.

Species are differentiated, in part, by the number of spines along certain margins. These can vary between individuals, and between left and right sides. Here, for each character we provide median numbers of spines followed by a range or outlying value in parentheses.

The bulk of the material is lodged in the Muséum nationale d'Histoire naturelle, Paris (MNHN) (IU-prefixes; former registration numbers with Th prefix). Others are from the collections of the Australian Museum, Sydney (AM); Museums Victoria, Melbourne (NMV); Naturhistorisches Museum, Vienna (NHMW);

National Museum of the Philippines, Manila (NMCR); University Museum of Zoology, Cambridge (UMZC); Zoologisches Museum, Berlin (ZMB); Zoological Museum, Hamburg (ZMH); and the Zoological Reference Collection, Lee Kong Chian Natural History Museum (previously known as Raffles Museum of Biodiversity Research), National University of Singapore (ZRC). Size of specimens is given as carapace length (cl) unless otherwise stated (total length, tl).

Strahlaxiidae Poore, 1994

Strahlaxiidae Poore, 1994: 100.—Sakai, 2011: 319–320.

Remarks. The diagnosis of the family stands. It was elaborated by Sakai (2011) without providing any more diagnostic characters. Poore (1994) and Sakai (2011) both provided keys to the three genera.

Neaxiopsis Sakai and de Saint Laurent, 1989

Neaxiopsis Sakai and de Saint Laurent, 1989: 32.—Poore, 1994: 100.—Sakai, 2011: 320.

Remarks. The genus is recognisable from the broad plate-like rostrum with an apical notch. Sakai (2011) provided a key to distinguish the two species but confused their synonymies.

***Neaxiopsis euryrhynchus* (De Man, 1905)**

Axius (*Neaxius*?) *euryrhynchus* De Man, 1905: 590.—De Man, 1925c: 3, 12, 31, pl. 1 fig. 2.

Axius (*Neaxius*) *gundlachi* var. *orientalis* De Man, 1925b: 122–125, fig. 2, 2b.—De Man, 1925c: 4, 12, 31 (type locality: Matupi [now Matupit I.] near Rabaul, New Britain, Papua New Guinea).

Axius (*Neaxius*) *euryrhynchus*.—Miyake, 1982: 90, 192 (list), pl. 30 fig. 5.

Neaxiopsis euryrhynchus.—Sakai and de Saint Laurent, 1989: 33.

Neaxiopsis euryrhyncha.—Sakai, 2011: 321–323, fig. 60.

Material examined. Réunion. Off Sainte Anne, 21° 00.6' S, 55° 43.8' E, 45 m (Expedition MD32 stn DR154), MNHN IU-2016-8079 (male, 3.5 mm).

Type locality. Anchorage off Dongala, Palos-bay, Sulawesi, Indonesia, 36 m (*Siboga* stn 86).

Distribution. Japan; Indonesia, Sulawesi; Papua New Guinea, New Britain; Réunion; to 36 m depth.

Remarks. De Man (1925c) believed that the syntypes of *Axius* (*Neaxius*?) *euryrhynchus* are “a very young stage” of *Axius* (*Neaxius*) *gundlachi orientalis*, both described by him from the south-western Pacific. He synonymised the two names. Sakai (2011) argued first (p. 321) that *Neaxiopsis euryrhynchus* and *N. gundlachi* von Martens, 1872, a species from the Caribbean, are distinct species but then argued (pp. 323–324) for the synonymy of “*N. orientalis*” and *N. gundlachi*. He said both share a row of tubercles along the carina of the pereopod 1 palm but did not explain the state of this character in *N. euryrhynchus*. On purely biogeographic criteria, De Man’s synonymy is the more probable.

Miyake (1982) recorded a female with total length of 69 mm from Japan. Sakai and de Saint Laurent (1989) doubted this was the same species on the basis of its size. The syntypes of *A. (N.?) euryrhynchus* are 11 mm long juveniles, while the syntypes of *A. (N.) gundlachi orientalis* range in length from 48 to 74 mm. Miyake’s (1982) specimen is within this range.

The specimen from Réunion is very small but shares the characteristic rostrum, cheliped dentition and tail fan. Assuming cryptic species are not involved, the record extends the species’ range throughout the Indo West-Pacific.

The specific name is a noun and does not follow the gender of the genus name.

Neaxius Borradaile, 1903

Axius (*Neaxius*) Borradaile, 1903: 537.—De Man, 1925c: 12.

Neaxius.—Sakai and de Saint Laurent, 1989: 29.—Poore, 1994: 100.—Sakai, 1994: 176.—Sakai, 2011: 324–325.

Type species. *Axia acantha* A. Milne-Edwards, 1879, by original designation.

Remarks. Specimens of the type species, now *N. acanthus* (A. Milne-Edwards, 1879) from the type locality, New Caledonia, have never been illustrated, and Milne-Edwards’ (1879) description is too general to be certain of the species’ identity: he described the antenna as having four or five lateral spines, the anterior carapace margin with four or five spines, the cervical groove with three or four spines, and the scaphocerite with one mesial and four lower spines. This description applies to many

specimens throughout the Indo West-Pacific and the species has been assumed to be widespread. The standard reference for details of this species is De Man’s (1898) description and illustrations of specimens from Sulawesi, Indonesia, not those from the type locality. Sakai and de Saint Laurent (1989) were the first to include type material in their appraisal of *N. acanthus*.

Borradaile (1903) synonymised without comment *Eiconaxius taliliensis* Borradaile, 1900, with *N. acanthus*. *Axius acanthus* var. *mauritanica* Bouvier, 1914, has also long been thought to be a junior synonym. This synonymy was accepted by Ngoc-Ho (2006) who tabulated differences between the six accepted species of *Neaxius*, three from the Indo-West Pacific and three from the Atlantic Ocean.

Sakai (2011: 329–330, figs 61, 62) took a different view and treated all nominal Indo-West Pacific species and subspecies – *Axia acantha* (type locality: New Caledonia), *Eiconaxius taliliensis* (New Britain), *Neaxius trondlei* Ngoc-Ho, 2005 (Marquesas Islands) and *Axius acanthus* var. *mauritanica* (Mauritius) – as synonyms of *Axius glyptocercus* von Martens, 1868 (Cape York, Qld, Australia), which he believed to be a variable species. He described and figured the antenna, carapace spination and scaphocerite of specimens from Fiji, Tahiti, Palau, Sulawesi and Ryuku, Japan, to justify that only one species, *Neaxius glyptocercus*, was distributed widely in the Indo-West Pacific. He argued that the variability in a population of *N. acanthus* from Motupore, Papua New Guinea, studied by Mukai and Sakai (1992) (5–7 spines on the cervical groove, 1 or 2 mesial and 3–6 lateral spines on the second antenna article, spinose merus on pereopod 2) supports his view, but in reality, they confirm the opposite. This population differs consistently from *N. glyptocercus* in having the cervical groove, antenna article and pereopod 2 unarmed as in all Australian specimens examined by Poore and Griffin (1979) and in more recently examined examples (AM, NMV, NHMW, ZMH). To these characters can be added differences in the shape and ornamentation of the telson. The telson of *N. glyptocercus* is c. 1.3 times as wide as long, moderately tapering, with 1 or 2 small spines along the lateral margin, with the anterior transverse ridge reaching the lateral margins, and the posterior concave face without ornamentation. The telson of *N. acanthus* is 1.5 times as wide as long, strongly tapering, with 1–6 tubercles above each posterolateral margin, with the second transverse ridge one-third of the way between the first and the posterior margin, and with a third short obsolete transverse ridge and longitudinal lateral buttresses emerging from the ends of the second transverse ridge.

This separation is, however, confused by the discovery that southern and Pacific representatives of “*N. glyptocercus*” are morphologically distinct and warrant description of another species, *Neaxius capricornicus* sp. nov. This confusion has led to errors in the identification of species for which sequences are registered in Genbank at the National Center for Biotechnology Information (<https://www.ncbi.nlm.nih.gov/nucleotide/neaxius>) (Table 1).

Tsang et al. (2008) showed on the basis of three rRNA sequences that *N. acanthus* from Taiwan differs from *N. capricornicus* from Australia (wrongly identified as *N. glyptocercus*) with 100% probability.

Table 1. Present identifications of species of *Neaxius* recorded in Genbank (National Center for Biotechnology Information)

Accession no.	Sequences	Citation	Locality/voucher number	Identification
EF585463.1 EF585474.1 EF585452.1	18S, 28S, 16S subunits ribosomal RNA	Tsang et al., 2008 (as <i>N. acanthus</i>)	Taiwan/NTOU A00421	<i>N. acanthus</i>
NC_019609 JN897379.1	mitochondrion, complete genome	Lin et al., 2012 (as <i>N. glyptocercus</i>) Kensley et al., 2000 (as <i>N. acanthus</i>)	Kenting, Taiwan/NTOU	<i>N. acanthus</i>
KC107821.1	mitochondrion, partial genome	Shen et al., 2013 (as <i>N. acanthus</i>)	Indonesia, Sulawesi/ no voucher	<i>N. acanthus</i>
EU874994.1 EU874944.1	18S, 16S subunits ribosomal RNA	Tudge and Cunningham, 2002; Tsang et al., 2008; Robles et al., 2009 (as <i>N. glyptocercus</i>)	Australia, S Qld/ NMV J39643	<i>N. capricornicus</i>

Anker et al. (2015) illustrated in colour specimens of what are clearly *N. acanthus* from Lombok, Indonesia, as *N. glyptocercus*, but expressed confusion over Sakai's synonymy. Sakai (2017) repeated his incorrect diagnosis of "*N. glyptocercus*" and figured a cheliped from Japan clearly of the *N. acanthus* form.

The four Indo-West Pacific species of *Neaxius* are here diagnosed with the same character suite. Major diagnostic characters of *N. acanthus*, *N. capricornicus* sp. nov. and *N. glyptocercus* are compared in fig. 8. The distributions of all species in the Indo-West Pacific are shown in fig. 9.

Neaxius acanthus (A. Milne Edwards, 1879)

Figures 1–5, 8a–f

Axia acantha A. Milne-Edwards, 1879: 110.

Eiconaxius acanthus.—De Man, 1896: 491–497.—De Man, 1898: 700, pl. 34 fig. 57 (West-Celebes = Indonesia, Sulawesi).

Eiconaxius taliliensis Borradaile, 1900: 420–421, fig. 15a–c.

Axius acanthus.—Borradaile, 1903: 537 (listed as type species of *Neaxius*).

Axius taliliensis.—Borradaile, 1903: 537 (as synonym of *Axius (Neaxius) acanthus* A. Milne-Edwards, 1879).

Axius acanthus var. *mauritianus* Bouvier, 1914: 704.

Axius (Neaxius) acanthus var. *mauritanus*.—Bouvier, 1915: 196–198, fig. 7.—Fourmanoir, 1955 31, fig. 4.—De Man, 1925c: 3, 10, 14.

Axius (Neaxius) acanthus.—De Man, 1925a: 50–55.—De Man, 1925c: 3, 14 (part).—Poore and Griffin, 1979: 235–236, fig. 7 (Qld, Australia).—Tirmizi, 1983: 85–88, figs 1, 2 (Maluku, Indonesia).—Holthuis, 1953: 51 (Marianas Is, Saipan).—Miyake, 1982: 93 (Japan).—Sakai, 1987: 303, 304 (Japan).

Neaxius acanthus.—Sakai and de Saint Laurent, 1989: 30–31.—Mukai and Sakai, 1992: 47–52, fig. 1 (Papua New Guinea).—Sakai, 1994: 200.—Kensley et al., 2000: 212, figs 5, 7F (Taiwan).—Kensley, 2003: 383 (Guam).—Kneer, 2006; Kneer, Asmus, Ahnelt and Vonk, 2008; Kneer, Asmus and Vonk, 2008 (Bone Batang I., S Sulawesi, Indonesia).—Sakai and Sawada, 2006: 1357 (Japan).—Tsang et al., 2008: 218–219 (Taiwan).—Tan et al., 2017: 5 (comment on name).

Neaxius glyptocercus.—Sakai, 2011: 326–331 (part) figs 61B, 62C, D (not figs 61A, C–E, 62A, B, E, F [interchanged with 61B]), = *N. glyptocercus* (von Martens, 1868.—Lin et al., 2012: 2–9 (Taiwan, misidentification).—Anker et al., 2015: 335, figs 25, 26.—Sakai, 2017: 188, fig. 3A.

Type material examined. Lectotype of *Axia acantha*. New Caledonia. MNHN IU-2014-11315 (Th812) (female, tl 72 mm, dry). Paralectotype, MNHN IU-2014-11316 (Th190) (male, cl 27 mm) (Fig. 1).

Syntypes of *Axius acanthus mauritianus*. Mauritius. Le Chaland, MNHN IU-2014-11317 (Th191), ovigerous female, tl 69 mm (Bouvier, 1915, listed 2 specimens from this locality). Port Louis, MNHN IU-2014-11318 (Th192), 1 male, tl 58 mm; 2 ovigerous females, tl 67, 62 mm (as listed by Bouvier, 1915) (Fig. 2).

Syntypes of *Eiconaxius taliliensis*. Papua New Guinea, New Britain, Talili Bay, UMZC I.57590 (male, 22.3 mm; ovigerous female, 19.4 mm) (Fig. 3).

Other material examined. Specimens marked * were listed by Sakai and de Saint Laurent (1989).

Tanzania. Mombasa, Levin Reef, MNHN IU-2016-8073 (Th780*) (1 individual).

Madagascar. Nosy Iranja, IU-2014-22792 (Th454*) (1 individual). Nosy Bé, IU-2014-22793 (Th456*) (2 individuals); IU-2016-8071 (Th455*) (3 individuals); NHMW 19385 (male, 26.3 mm, broken); NHMW 19386 (1 male, 24.5 mm, telson damaged); NHMW 19387 (fragments of 2 specimens); NHMW 24999 (female, 23.7 mm + exuvia). Nosy Bé, Palm Beach Hotel Bay, sand between coral rubble, 3 m. Sainte Luce, W of Ilot Babet, 24° 46.2' S, 47° 12.4' E, 1–10 m (ATIMO VATAE stn TA63) IU-2010-4331 (1 damaged individual).

Glorieuse Is, Grande Glorieuse I., IU-2016-8072 (Th451*) (1 individual).

Mayotte. IU-2014-22789 (Th1565) (1 individual); IU-2014-22790 (Th1564) (1 individual).

Indonesia. Sulawesi, Bone Batang I., NHMW 25859 (male, 10.3 mm). Bali, Nusa Dua, intertidal seagrass, NHMW 25854–25858 (male 15.3 mm; 4 juveniles, 7.1–11.1 mm).

Papua New Guinea. Central Province, Motupore I., 09° 32' S, 147° 17' E, NMV J17235 (3 males, 21.9–27.5 mm; 2 ovigerous females, 20.3, 27.5 mm). Madang Province, Jais Aben Resort, Riwo, seagrass,

05° 09' S, 145° 48.2' E, 1–3 m (PAPUA NIUGINI stn PR195-A), MNHN not registered (photo only seen).

Malaysia. Sipadan, IU-2016-8070 (1 individual).

Palau. ZMH K8411 (female, 17.1 mm).

Philippines. Bohol, Panglao I., Balicasag I., NMCR 39107 (25.8 mm); NHMW 25860 (male, 25.7 mm); ZRC 2017.0415 (male, 15.5 mm); ZRC 2017.0416 (male, 17.4 mm); MNHN-2016-3495 (male, 20 mm); NMCR 39108 (female, 20.6 mm). Momo Beach, 9° 36.1' N, 123° 45.2' E, NHMW 25861 (male, 20 mm); NHMW 25862 (male, 25.8 mm). Looc, sand and seagrass with coral patches, 9° 35.7' N, 123° 44.4' E, 4 m, NHMW 25863 (male, 19.5 mm).

Taiwan. Pingtung County, Banna Bay, 10 m, NHMW 25919 (male, 10.4 mm), NHMW 25923 (juvenile, 7.1 mm).

Japan. Ryuku Is., Ishigakaki I., IU-2016-8078 (Th865*) (9 individuals); IU-2016-8075 – 8077 (3 dry individuals).

New Caledonia. IU-2016-8080 (Th511*) (13 individuals). Bourail, IU-2016-8074 (Th1488) (1 individual). Ouano Plage, IU-2014-22791 (Th1486) (1 individual).

Diagnosis. Carapace supra-antennal margin without anteriorly directed spine; anterolateral margin with 6 (4, 5) prominent spines, dorsalmost anteriorly directed; branchiostegite anterior margin unarmed; cervical groove with 4 (0–7) sharp spines along posterior margin. Telson 1.3–1.5 times as wide as long; tapering strongly from widest point to posterior margin, posterior margin about half greatest width; anterior transverse ridge straight, curving laterally but not reaching lateral margin at its widest point; posterior transverse ridge situated at 0.35–0.4 distance between anterior ridge and posterior margin; posterolateral margin with 2–6 obsolete submarginal tubercles; posterior face concave, with obsolete third transverse ridge, with pair of sublateral longitudinal ridges subtended from ends of second transverse ridge, each with 2 (1–3) rounded tubercles, sometimes obsolete. Antenna article 2 with 1 (2) upper-mesial spine, 3 (0–6) lateral spines; scaphocerite with 1 (2) mesial sharp spine, 5 (2–6) sharp ventral spines;

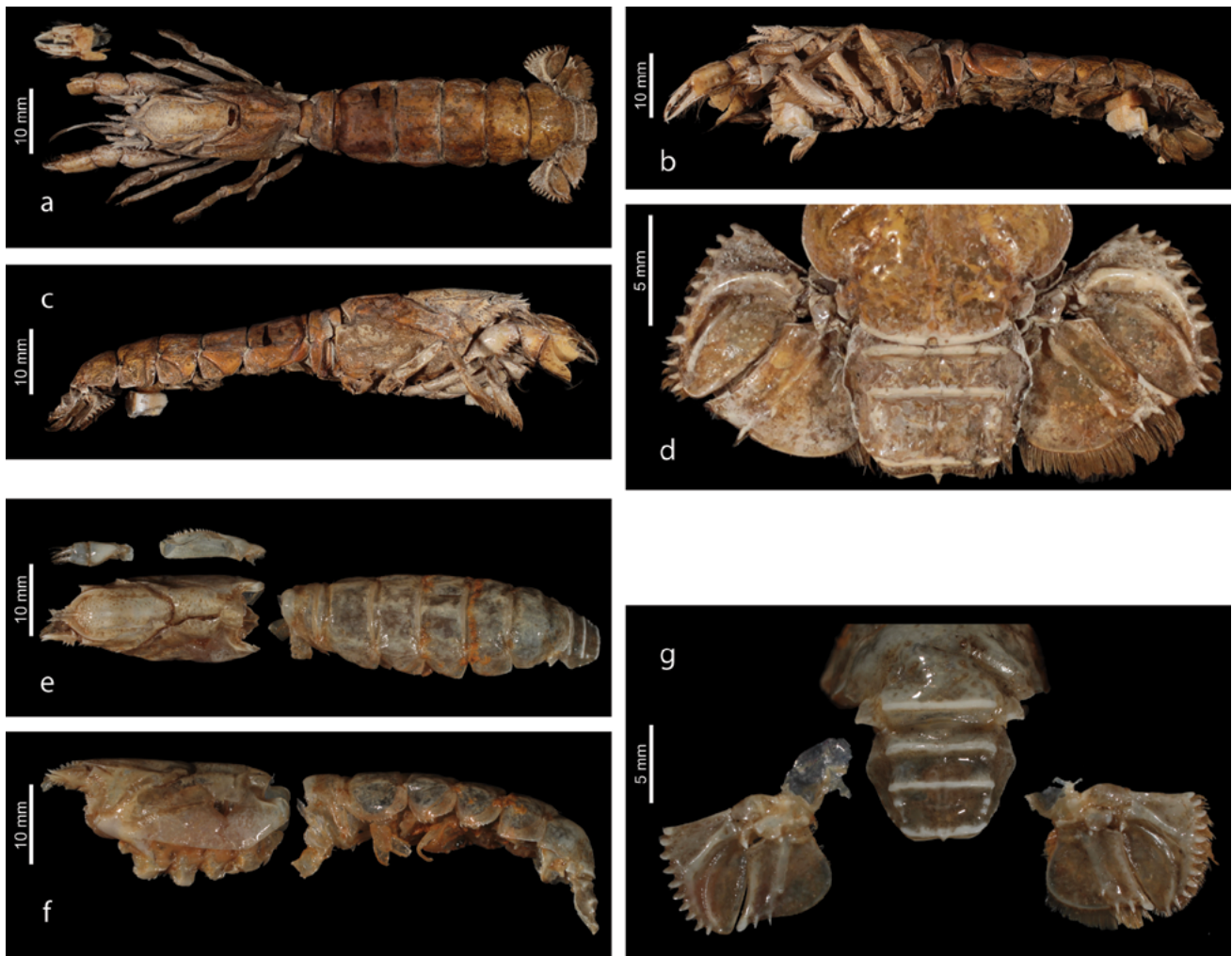


Figure 1. *Axia acantha* A. Milne-Edwards, 1879, lectotype, MNHN IU-2014-11315: a, dorsal view; b, lateral left view; c, lateral right view; d, telson and uropods. Paralectotype, MNHN IU-2014-11316: e, dorsal view; f, lateral left view; g, telson and uropods.

article 4 lower margin with 3 (0–5) sharp spines. Cheliped merus, lower margin with 4 (2–5) spines, lateral face with curved row of 8 (5–10) spines. Pereopod 2 merus, lower margin with row of 10 (8–17) spines. Pereopod 3 merus, lower margin without row of spines.

Remarks. A. Milne-Edwards (1879) did not specify how many specimens he had. Two remain in MNHN, one of which Sakai and de Saint Laurent (1989) called the type. This was an effective lectotype designation. This and many more from New Caledonia were examined.



Figure 2. *Axius acanthus mauritiana* Bouvier, 1914, syntype, MNHN IU-2014-11317: a, dorsal view; b, lateral left view; c, telson and uropods. Syntypes, MNHN IU-2014-11318: d, dorsal views; e, lateral views, f, telsons and uropods.

Bouvier (1914, 1915) distinguished his variety from Mauritius, *Axius acanthus mauritianus*, on differences in the denticulation of the median rostral ridge, the number and nature of the spines on the anterolateral margin of the carapace and cervical groove, spination of the merus of the cheliped, and ornamentation of the pleonal epimera. Fourmanoir (1955) recorded the variety from the Comores. Consistent differences from material from New Caledonia could not be detected during our examination of numerous

specimens from the western Indian Ocean. Spines on the carapace and antenna varied in number and strength, even within a small geographic range. Spination along the ventral margins of pleonal epimera 2–4 ranged from non-existent to prominent, as it does in other populations. The longitudinal ridges extending from the second transverse ridge usually carried one or two small tubercles. In some specimens from Japan a single large tubercle dominated but not in others from the same location.

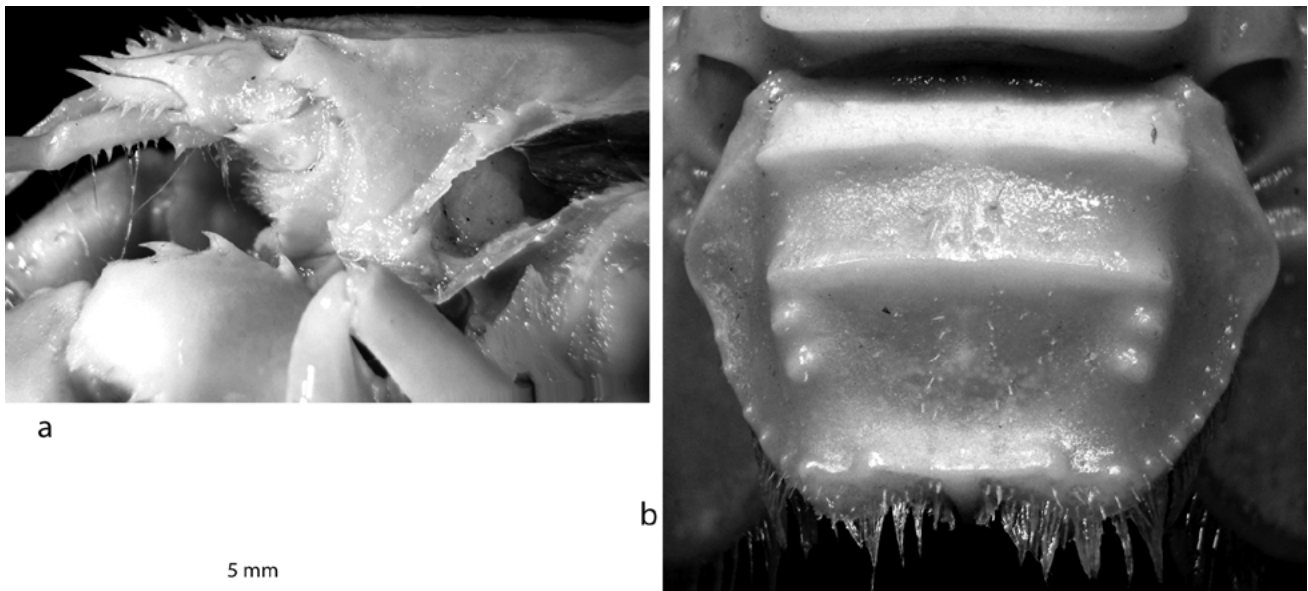


Figure 3. *Eiconaxius taliliensis* Borradaile, 1900, syntype, male, UMZC I.57590: a, lateral view; b, telson.



Figure 4. *Neaxius acanthus* (A. Milne-Edwards, 1879): a, b, Papua New Guinea (PAPUA NIUGINI stn PR195-A), MNHN unregistered, photos, A. Anker; c, d, Philippines, Looc, NHMW 25863, photos, T.-Y. Chan.

De Man (1896) was the first to apply the name *acanthus* to specimens of *Neaxius* from Sulawesi, Indonesia (as Celebes) and later from New Britain, Papua New Guinea (as Nouvelle Poméranie) (De Man, 1898, 1925a). Borradaile (1900) introduced *Eiconaxius taliliensis* for representatives from this region but soon synonymised it with *A. acanthus* (Borradaile, 1903). We examined the syntypes of *E. taliliensis* and several specimens from nearby but could not detect consistent differences between them, nor could we detect differences from individuals from Malaysia, Palau, Philippines, Taiwan or Japan. Similarly, the syntypes of *Axius acanthus mauritiana* resembled others from the western Indian Ocean no more than they did those from the western Pacific. The numbers of spines on the carapace and cheliped varied over a small range between individuals and from one side of an individual to the other, as did the expression of spines, some individuals having more prominent spines than others (see figs 1–4 and especially 5). This variability was not correlated with locality.

Sakai (2011) listed *Axius acanthus mauritianus*, *Eiconaxius taliliensis* and *Neaxius trondlei* Ngoc-Ho, 2005 in the synonymy of *N. glyptocercus*. While the synonymy of

Axius acanthus mauritianus and *Eiconaxius taliliensis* with *N. acanthus* is supported on morphological grounds, *N. acanthus* differs from *N. glyptocercus* in the many ways tabulated by Ngoc-Ho (2005). *Neaxius trondlei* from French Polynesia differs in spination from *N. glyptocercus* and *N. acanthus* for the reasons given by Ngoc-Ho (2005) (see diagnosis below).

Colour photos of live specimens indicate that the species is generally orange with stronger pigmentation on the chelipeds, anterior carapace and tailfan (Fig. 4; Anker et al., 2015: fig. 25).

***Neaxius capricornicus* sp. nov.**

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Figures 6, 8g–l

Axius (Neaxius) glyptocercus.—Poore and Griffin, 1979: 236–238 (partim), figs 8g–i.

Neaxius glyptocercus.—Tudge and Cunningham, 2002: 841.—Tsang et al., 2008: 218–219.—Robles et al., 2009: 316.—Sakai, 2011: 326–331 (partim) figs 62A, B, E.

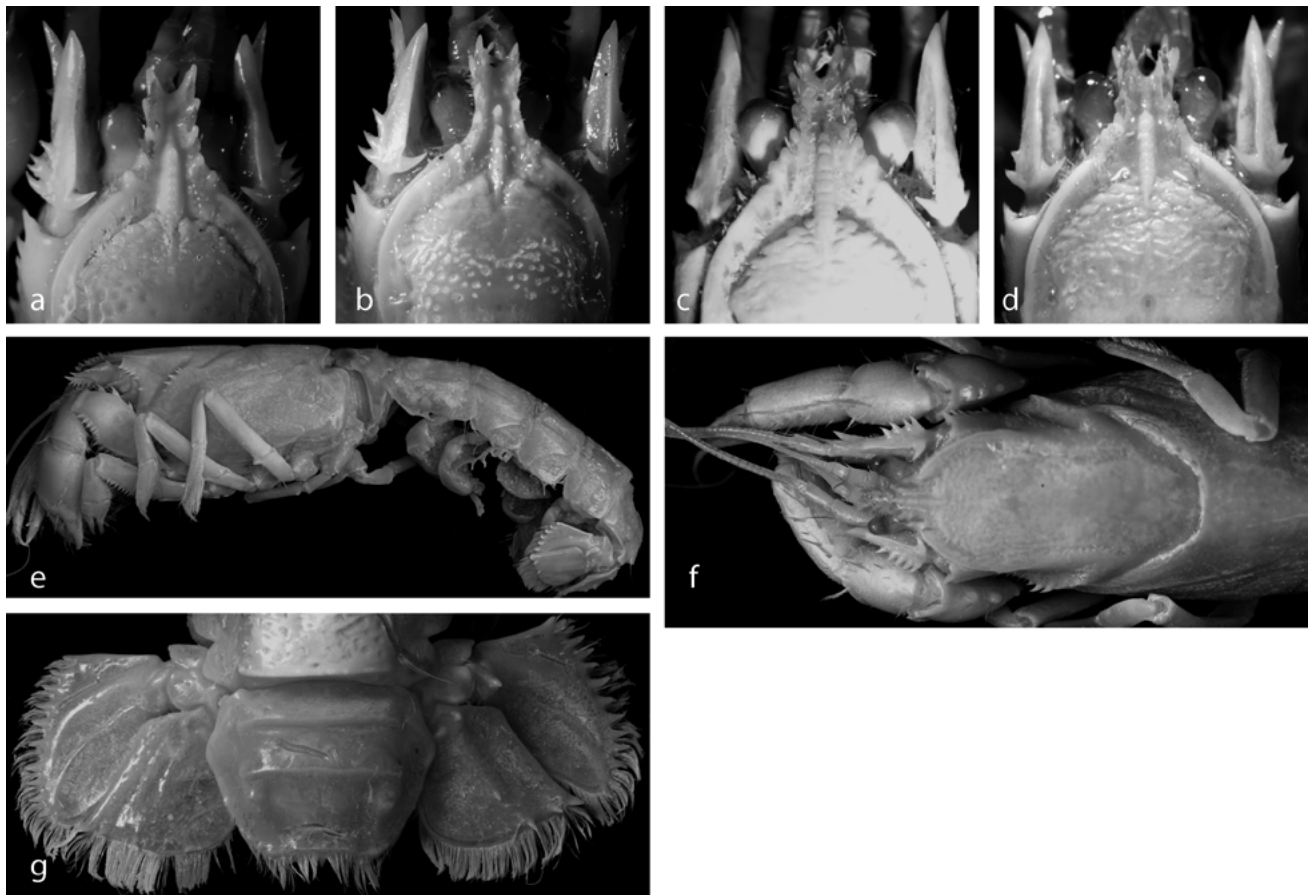


Figure 5. *Neaxius acanthus* (A. Milne-Edwards, 1879), anterior carapace: a, New Caledonia, IU 2014-22791; b, Madagascar, IU 2014-22792; c, Japan, IU 2016-8076; d, Tanzania, IU 2016-8073. Papua New Guinea, NMV J17235; e, habitus; f, dorsal carapace; g, telson and uropods. Various scales.

Material examined. Holotype. Australia, Qld, North Stradbroke I., Deanbilla Bay, Dunwich, 27° 30' S, 153° 24' E, NMV J39643 (female, 26 mm; see Tudge and Cunningham [2002]),

Paratypes. Collected with holotype. NMV J71641 (female, 23 mm); NMV J40714 (2 females, 26 mm; male, 21 mm).

Australia, Qld, North Stradbroke I., Dunwich, 27° 30' S, 153° 24' E, AM P.13723 (male, 27 mm). Capricorn Group, North West

I., 23° 18' S, 151° 42' E, AM P.10060 (female, 38 mm), AM P.11829 (female, 30 mm).

Other material. Fiji, Viti Levu, ZMH K8392 (Godeffroy No. 7430) (Sakai, 2011: fig. 62A, E) (male, 14.3 mm).

French Polynesia, Tahiti. ZMH 41226 (Sakai, 2011: fig. 62B) (male, 27 mm).

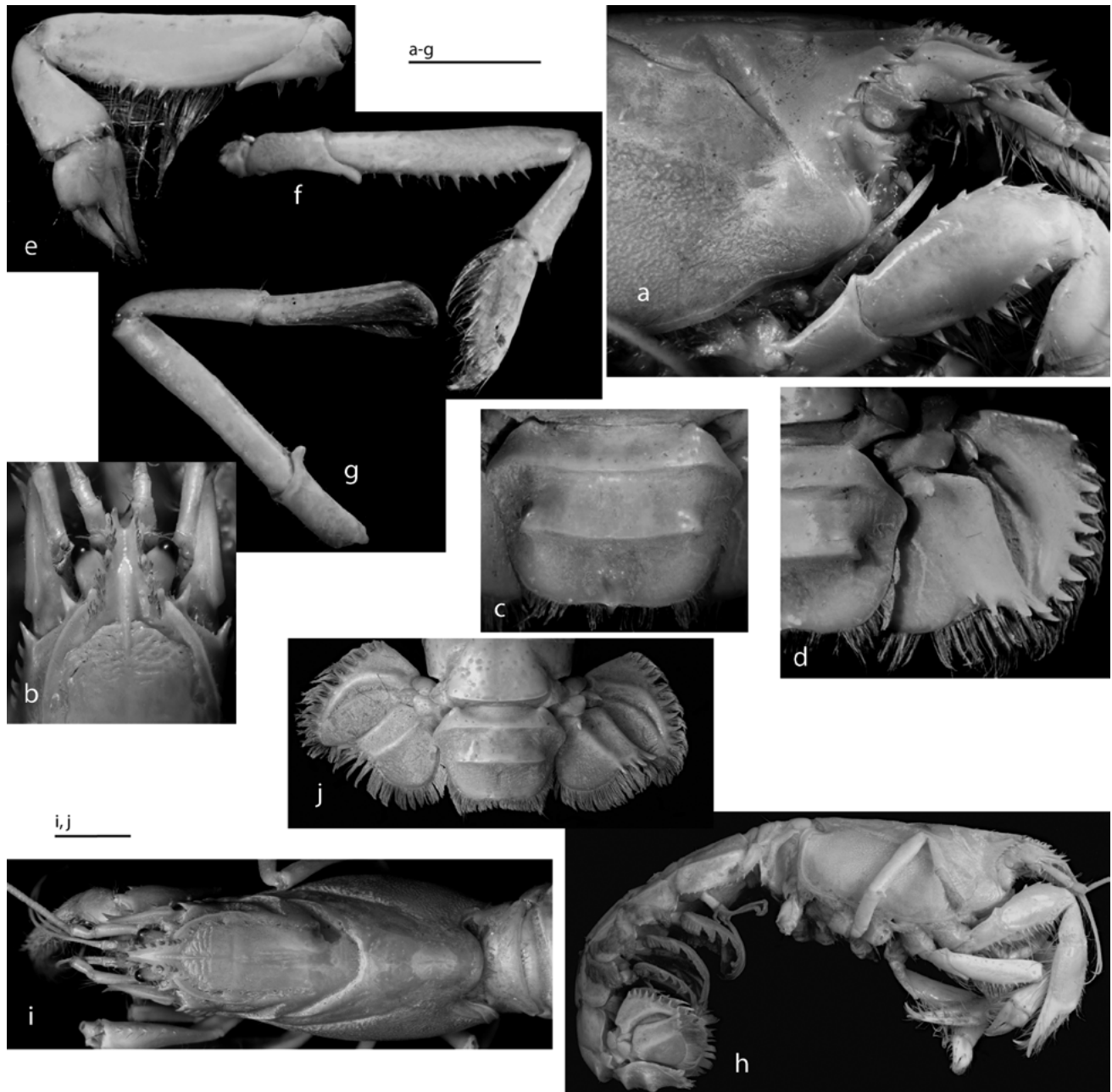


Figure 6. *Neaxius capricornicus* sp. nov., holotype, NMV J39643: a, lateral carapace, merus of cheliped; b, anterior carapace; c, telson; d, telson, right uropod; e, f, pereopods 2, 3. Paratype, NMV J71643: g, pereopod 4; h, habitus lateral; i, dorsal carapace j, telson and uropods. All pereopods, lateral faces. Scale bars = 5 mm.

Diagnosis. Carapace supra-antennal margin with anteriorly directed spine; anterolateral margin with 6 (5–7) spines, dorsalmost anterolaterally directed; branchiostegite anterior margin with 1 spine; cervical groove without spines along posterior margin. Telson 1.3–1.5 times as wide as long; tapering from widest point to posterior margin; anterior transverse ridge straight, curving laterally to reach lateral margin at its widest point; posterior transverse ridge situated at 0.5 distance between first transverse ridge and posterior margin, ends sharply rounded, almost overhanging; lateral margin with 0–2 marginal teeth; posterior face concave, with shallow median groove, smooth sublaterally. Antenna article 2 without upper-mesial spine, without lateral spine; scaphocerite with 1 mesial sharp spine, 2 (1–4) sharp ventral spines; article 4 lower margin without spines. Cheliped merus, lower margin with 5 (4–6) spines, distolateral face with row of 4 (3–5) spines. Pereopod 2 merus, lower margin with 6 (3–11) spines. Pereopod 3 merus, lower margin with 8 (4–12) spines.

Supplementary description of holotype. Rostrum with 5 pairs of erect blunt spines; sharp hiatus before smooth lateral carina; median carina with 5 tubercles; anterior gastric region rugose; cervical groove defined posteriorly by sharp carina; branchiostegal groove separating smooth cardiac region from punctate branchiostegal region. Anterolateral margin with 6 spines on right, 5 on left, first flaring laterally, longer gap between third and fourth, between fifth and sixth; anterior branchiostegal margin with 1 short spine. Pleomere 1 pleuron with 3 tubercles; pleomere 2 with 7 tubercles. Telson 1.35 times as wide as long; widest at prominent lateral

lobes, at c. 0.4 of length; tapering sharply then gradually from widest point to posterior margin; posterior margin c. 0.6 times greatest width; anterior transverse ridge at c. 0.25 length, straight, curving laterally to reach lateral margin at its widest point; posterior transverse ridge situated at 0.5 distance between first transverse ridge and posterior margin, ends sharply rounded, almost overhanging; lateral margin without marginal teeth; posterior face concave, with shallow median groove, smooth sublaterally. Antenna article 2 without mesial spine, without lateral spine; scaphocerite with 1 mesial sharp spine, 3 sharp ventral spines; article 4 lower margin without spines. Maxilliped 3 merus with 1 short, 2 longer distal spines. Cheliped coxa with 2 spines; basis with 1 spine; ischium with 3 spines; merus, lower margin with 4 spines on right, 5 on left, distolateral face with row of 3 spines, upper margin with 4 spines; carpus lower margin with 1 distal spine. Pereopod 2 coxa with 2 spines; basis with 2 spines; ischium with 3 spines; merus, lower margin with 7 spines on right, 6 on left, more proximal one minute. Pereopod 3 coxa with 2 spines; basis with 2 spines; ischium without spines; merus, lower margin spines in 2 rows: 6 spines mesially, last 3 minute, 6 laterally, last minute. Pereopods 4 and 5 without spines.

Etymology. For the Tropic of Capricorn, which marks the species' northern limit in Queensland, Australia. The name is a noun in apposition.

Distribution. Australia, Queensland, 23°S–27° 30' S; Fiji; French Polynesia.



Figure 7. *Neaxius glyptocercus* (von Martens, 1868), ovigerous female, AM P.18842: a, lateral carapace, merus of cheliped; b, anterior carapace; c, pereopod 2. Female, AM P.16177: d, e, pereopods 3, 4; f, telson. All pereopods, lateral faces. Scale bar = 10 mm.

Remarks. *Neaxius capricornicus* and *N. glyptocercus* are immediately differentiated from *N. acanthus* in having a prominent supra-antennal spine on the anterior margin of the carapace, and both the cervical groove and second antenna article unarmed. *Neaxius capricornicus* differs from *N. glyptocercus* in having: 2–4 spines on the lower margin of the scaphocerite (vs. usually none, rarely 1 or 2 in *N. glyptocercus*), 3–5 spines along the distolateral ridge of the merus of the cheliped (vs. usually none, rarely one), 3–11 spines on the lower margin of the merus of pereopod 2 (vs. none), 8–12 (rarely fewer) spines on the lower margin of the merus of pereopod 3 (vs. none), one spine on the anterior margin of the branchiostegite (vs. 2 or 3) and the dorsalmost spine of the anterolateral carapace margin directed anterolaterally (vs. anteriorly).

The two species were confused by Poore and Griffin (1979) who illustrated both in their fig. 8.

Specimens from Fiji (ZMH K8392; Sakai, 2011: fig. 62A, E) and Tahiti (ZMH K41226; Sakai, fig. 62B) have 2 spines on the lower margin of the scaphocerite, 4 and 3 spines respectively along the distolateral ridge of pereopod 1 merus, 4 and 10 spines respectively on the lower margin of pereopod 2, 8 and 10 spines respectively on the lower border of pereopod 3 merus and 1 spine on the anterior margin of the branchiostegite, within the range of the Australian material.

Neaxius glyptocercus (von Martens, 1868)

Figures 7, 8m–r

Axius glyptocercus von Martens, 1868: 613–614.—Haswell, 1882: 165–166.

?*Axius* (*Neaxius*) *glyptocercus*.—Borradaile, 1903: 537.

Axius (*Neaxius*) *glyptocercus*.—De Man, 1925a: 50–56, fig. 1.—De Man, 1925c: 4, 13.—Poore and Griffin, 1979: 236–238 (partim), figs 8a–f, k.

Neaxius glyptocercus.—Sakai, 1994: 200.—Sakai, 2011: 326–331 (partim), figs 61A, C–E, fig. 62F (pereopod 2 of holotype, mislabelled) (not figs 62A, B, E = *N. capricornicus*; not fig. 61B [interchanged with 62F] = *N. acanthus*; not figs 62C, D = *N. acanthus*).

Material examined. Holotype. Australia, Qld, Cape York, ZMB 2973 (described and anterior carapace figured by De Man (1925c: 50–56, fig. 1); rostrum, antenna, pereopods 2, 4, 5, pleopod 2 figured by Sakai (2011: 326–331, figs 61A, C–E, 62A, B, F).

Other material. Australia, Qld, Cape York, Fly Point, 10° 45' S, 142° 37' E, AM P.24813 (2 females, 13, 18 mm; male, 17 mm). Townsville area, 19° 16' S, 146° 49' E, AM P.16176 (male, 20 mm). Mossman, Cooya Beach, 16° 26' S, 145° 24' E, NHMW 19591 (3 females, 13.5–24.7 mm). Cannonvale Beach, near Bowen, 20° 01' S, 148° 15' E, AM P.16177 (female, 22 mm).

NT, Darwin, Lee Point, 12° 20' S, 130° 54' E, AM P.20358 (female, 21 mm). Port Darwin, 12° 27' S, 130° 48' E, AM P.15030 (male, 19 mm). Nightcliff, Darwin, 12° 23' S, 130° 50' E, AM P.18842 (ovigerous female, 28 mm).

Diagnosis. Carapace supra-antennal margin with anteriorly directed spine; anterolateral margin with 4 (5–7) spines, dorsalmost anteriorly directed; branchiostegite anterior margin with 2 or 3 spines cervical groove without spines along posterior margin. Telson about 1.3 times as wide as long; tapering slightly from widest point to posterior margin;

anterior transverse ridge straight, curving laterally to reach lateral margin at its widest point; posterior transverse ridge situated at 0.5 distance between first transverse ridge and posterior margin, ends sharply rounded, almost overhanging; lateral margin with 0–2 marginal teeth; posterior face concave, with shallow median groove, smooth sublaterally. Antenna article 2 without upper-mesial spine, without lateral spine; scaphocerite with 1 mesial sharp spine, 1 (2) sharp ventral spine; article 4 lower margin without spines. Cheliped merus, lower margin with 3 or 4 spines, distolateral face without or rarely with 1 spine. Pereopod 2 merus, lower margin without spines. Pereopod 3 merus, lower margin without spines.

Distribution. Australia: Northern Territory, E of Darwin; Queensland, Cape York to Bowen; 10° 45' S–20° S.

Remarks. Differences between *N. glyptocercus* and *N. capricornicus* were outlined above. The species is confined to north and north-eastern Australia. The holotype was photographed for us by C. Oliver Coleman and we were able to confirm the spination of the pereopods.

Neaxius trondlei Ngoc-Ho, 2005

Neaxius trondlei Ngoc-Ho, 2005: 59–63, figs 6, 7.

Material examined. French Polynesia, Marquesas Is, Ua Huka, Hane Bay (MUSORSTOM 9 stn 19), MNHN Th1419 (holotype male, 29 mm), MNHN Th1427 (paratypes: male, 30 mm; female, 21 mm). W of Haamamao Bay, MNHN Th1428 (paratype female, 13.5 mm).

Diagnosis. Carapace supra-antennal margin without anteriorly directed spine; anterolateral margin with 3 or 4 spines, dorsalmost anterolaterally directed; branchiostegite anterior margin unknown; cervical groove with 2 or 3 spines along posterior margin. Telson 1.5 times as wide as long; tapering strongly from widest point to posterior margin, posterior margin about 0.6 greatest width; anterior transverse ridge straight, curving laterally but not reaching lateral margin at its widest point; posterior transverse ridge situated at half distance between anterior ridge and posterior margin; posterolateral margin without tubercles; posterior face concave, with well-defined third transverse ridge, without pair of sublateral longitudinal ridges subtended from ends of second transverse ridge. Antenna article 2 with 1 or 2 upper-mesial spines, without lateral spines; scaphocerite with 1 mesial sharp spine, 5 sharp ventral spines; article 4 lower margin without spines. Cheliped merus, lower margin with 3 or 4 spines, lateral face without row of spines. Pereopod 2 merus, lower margin without spines. Pereopod 3 merus, lower margin without spines.

Remarks. *Neaxius trondlei* is distinguished by the unique combination of no spines on the lateral margin of the second article of the antenna and no spines on the lateral face of the cheliped or on the lower margins of pereopods 2 and 3. The species and *N. capricornicus* both occur in French Polynesia but c. 1400 km apart. They can be differentiated by the presence of spines along the cervical groove and spines on article 2 of the antenna.



Figure 8. *Neaxius acanthus* (A. Milne-Edwards, 1879), NMV J17235, male, 26 mm: a–f. *Neaxius capricornicus* sp. nov., holotype, NMV J39643: g–k. Paratype, NMV J71641: l. *Neaxius glyptocercus* (von Martens, 1868), AM P.16177: m–r. Note: a, b, g, h, m, n, dorsal and lateral views of anterior carapace; c–f, i–l, o–r, pereopods 1–4. Pereopods 1, 2 in lateral view, pereopods 3, 4 in mesial view. Scale bar = 5 mm.

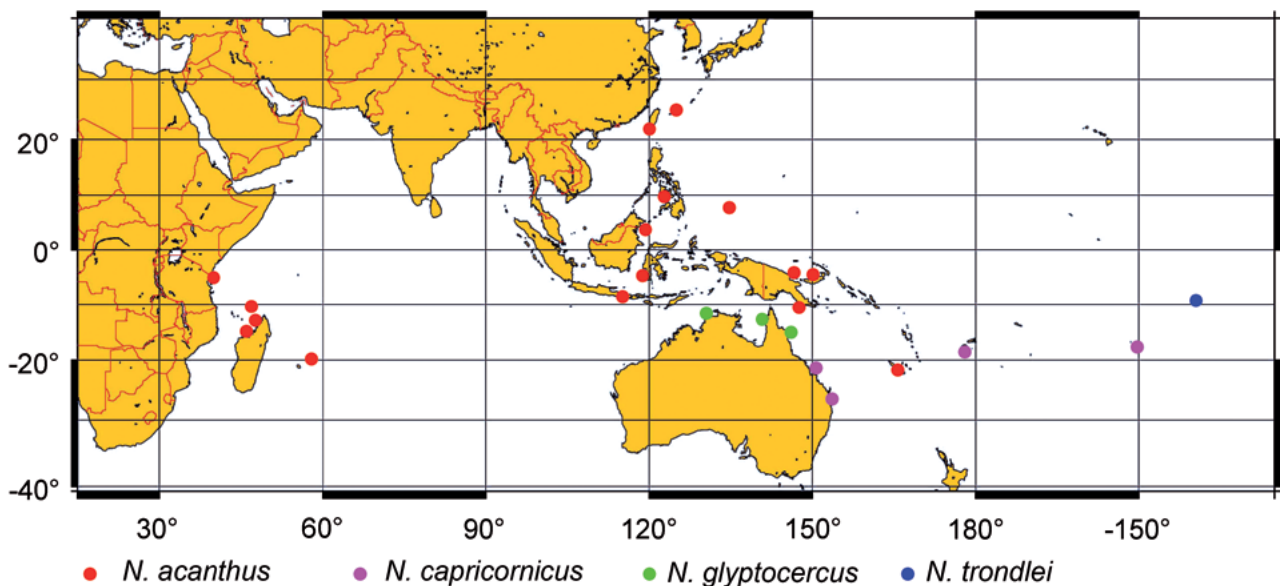


Figure 9. Distribution of four species of *Neaxius* in the Indo-West Pacific (based on material examined).

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