

**Leucosiidae of the *Albatross* expedition to the Philippines,
1907–1910 (Crustacea: Brachyura: Decapoda)**

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A report of the Leucosiidae collected during the *Albatross* Philippines expedition 1907–1910 is given. A total of 36 species in 17 genera are treated, with one genus (*Heterolithadia*) and nine species (*Alox rugosum*, *Arcania elongata*, *Arcania globata*, *Heterolithadia fallax*, *Myra acutidens*, *Leucosia craniolaris*, *L. galantua*, *L. perlata* and *Nucia tuberculosa*) being new records for the Philippines and one species being new. This brings the total number of species known from the Philippines to 64, in 22 genera. A complete list of Philippine Leucosiidae is provided.

KEYWORDS: Leucosiidae, *Albatross* Philippines Expedition, Philippines, new species.

Introduction

During the period 28 November 1907–21 January 1910, the US Fisheries Steamer *Albatross* collected in the waters of Philippines and Indonesia (Chace, 1983:1 for historical background). A large number of brachyuran species, including members of the family Leucosiidae, were obtained from Philippine waters by this expedition. This paper gives an account of these hitherto unreported leucosiids.

Here, diagnoses of 36 species from 17 genera of Leucosiidae collected by the *Albatross* Philippine Expedition are given. Of these, one is described as new and nine species, namely *Alox rugosum* (Stimpson, 1858), *Arcania elongata* Yokoya, 1933, *Arcania globata* Stimpson, 1858, *Heterolithadia fallax* (Henderson, 1893), *Myra acutidens* Ihle, 1918, *Leucosia craniolaris* (Linnaeus, 1758), *L. galantua* Ovaere, 1988, *L. perlata* de Haan, 1841 and *Nucia tuberculosa* A. Milne Edwards, 1874, are listed as new records for Philippine waters.

An updated list of Philippine leucosiids is provided, based on a report by Chen (1989) and on the species presently encountered in the Smithsonian Institution, National Museum of Natural History, Washington DC. The latter collection includes Philippine specimens in the Smithsonian collection not collected by the *Albatross* (marked with ‘+’) which are also treated here for completeness. The species in Chen’s list (1989) not found in the course of this study are marked with an asterisk, ‘*’. This brings the total number of species known from Philippines waters to 64, in 22 genera. Only references to original descriptions are provided.

Measurements are given in millimetres (mm) and are of the greatest carapace length and breadth respectively. For genera like *Arcania*, which have both lateral and posterior

spines on the carapace, two sets of measurements are given; one denoting dimensions inclusive of spines and the other excluding spines. Where one set of measurements is provided, it is of carapace length and width exclusive of spines. For *Ixa* and *Ixoides*, measurements are given for carapace length (excluding posterior lobes), carapace width excluding lateral projections, and carapace width including lateral projections respectively. In the case of genera like *Myra* and *Myrodes* which do not have lateral spines, measurements are given of length from tip of frontal lobes to base of posterior median spine, widest breadth, and length from tip of frontal lobes to tip of posterior median spine respectively.

Where a large number of specimens from one species have been examined, measurements are given only for a few, usually of the largest and the smallest specimen. The following abbreviations are used in the text APE—Albatross Philippines Expedition, G1 and G2—the 1st and 2nd gonopods of the male respectively, Pt—Point, and Lt.—Lighthouse. The specimens are deposited in the collection of the Division of Crustacea, Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington D.C., U.S.A. (USNM).

List of Leucosiidae from the Philippines

(*—from Chen (1989), † —species in the Smithsonian Institution NOT collected by the *Albatross*)

Alox ornatum (Ihle, 1918)*

Alox rugosum (Stimpson, 1858)

Arcania brevifrons Chen, 1989*

Arcania elongata Yokoya, 1933

Arcania globata Stimpson, 1858

Arcania novemspinosa (Adams and White, 1858)

Arcania quinquespinosa Alcock and Anderson, 1894

Arcania septemspinosa (Fabricius, 1787)

Arcania undecimspinosa de Haan, 1841*

Cateios frontalis (Miers, 1884)*

Drachiella aglypha aglypha (Laurie, 1906)*

Drachiella morum (Alcock, 1896)*

Ebalia dimorphoides Sakai, 1963*

Ebalia glans (Alcock, 1896)*

Ebalia philippinensis Chen, 1989*

Ebalia scabriuscula Ortmann, 1892*

Ebalia serenei Chen, 1989*

Heterolithadia fallax (Henderson, 1893)

Heteronucia laminata (Doflein, 1904)

Heteronucia perlata (Sakai, 1963)*

Iphiclus spongiosus Adams and White, 1848*

Ixa edwardsii Lucas, 1858

Ixa pulcherrima (Haswell, 1880)

Ixoides cornutus MacGilchrist, 1905

Leucosia craniolaris (Linnaeus, 1758)

Leucosia foresti Chen, 1989*

Leucosia formosensis Sakai, 1937⁺

Leucosia galantua Ovaere, 1988

Leucosia longibrachia Shen and Chen, 1978*

Leucosia margaritata A. Milne Edwards, 1874*

Leucosia perlata de Haan, 1841

Leucosia rhomboidalis de Haan, 1850

Leucosia vittata Stimpson, 1858

Leucosia whitei Bell, 1855

Myra acutidens Ihle, 1918

Myra affinis Bell, 1855

Myra biconica Ihle, 1918*

Myra elegans Bell, 1855

Myra fugax (Fabricius, 1798)

Myrodes eudactylus Bell, 1855

Nucia speciosa Dana, 1852*

Nucia tuberculosa A. Milne Edwards, 1874

Nursilia dentata Bell, 1855

Nursilia tonsor Alcock 1896

Oreotlos speciosus Chen, 1989*

Parialia major Sakai, 1961

Parialia ovata Chen, 1984

Pariphiculus agariciferus Ihle, 1918*

Pariphiculus coronatus (Alcock and Anderson, 1894)

Pariphiculus mariannae (Herklots, 1852)

Philyra pisum de Haan, 1841[†]

Philyra platychira de Haan, 1841

Philyra verrucosa Henderson, 1893[‡]

Praebebalia dondonae Chen, 1989*

Praebebalia semblatae Chen, 1989*

Praebebalia septemspinosa Sakai, 1983

Pseudophilyra sp.

Randallia sp.n.

Randallia eburnea Alcock, 1896*

Randallia lanata Alcock, 1896

Randallia pustuloides Sakai, 1961

Randallia pustulosa Wood-Mason and Alcock, 1891

Randallia speciosa Chen, 1989*

Randallia trituberculata Sakai, 1961*

SystematicsFamily **Leucosiidae** Samouelle, 1819Genus **Alox** Tan and N, 1995**Alox rugosum** (Stimpson, 1858)

(Fig. 1A)

Oreophorus rugosus Stimpson, 1858: 161.

Material examined. **Philippines.** Negros, Guijulugan, shore, coll. USBF, APE, 2.iv.1908, 1 ♂ (6.3 × 7.8). Stn. 5159, coll. USBF, APE, 1 ♀ (10.1 × 14.6).

Diagnosis. Carapace broader than long, dorsal surface covered with mushroom-shape granules, groove parallel to border of carapace present, sub hepatic region raised to form large angular projection; front bilobed, lobes pointed, produced and upturned. Chelipeds stout, immovable finger massive. Male abdomen with segments 1, 2, 6, 7 free; G1 with distal portion setose, tip narrow. Female abdomen with groove on either side of median line, terminal segment elongate triangular.

Remarks. A revision of *Oreophorus* Rüppell, 1830 [*s. lat.*], was carried out by Tan and Ng (1995). The group was divided into several genera, including *Alox*. *Alox* presently consists of two species, *A. rugosum* (Stimpson, 1858) and *A. somphos* Tan and Ng, 1995. This is a new record for the Philippines.

Distribution. Japan (type locality), Philippines (present record).

Arcania Leach, 1817**Arcania elongata** Yokoya, 1933

(Figs 2k–o, 1B)

Arcania elongata Yokoya, 1933: 133–134.

Material examined. **Philippines.** Stn 5309, coll. USBF, APE, 4 September 1908, 1 ♂ (21.7 × 18.5, 24.1 × 22.0). Stn 5210, 17 April 1908, coll. USBF, APE, 1 ♀ (30.8 × 24.2, 32.9 × 30.5). Malavatuan, vic. South Luzon, Stn 5276, 32.9 m, 17 July 1908, 1 young ♂ (badly damaged) (USNM 65346). West Luzon, South Fernando Pt Lt., Stn 5442, 11 May 1909, coll. USBF, APE, 1 ♂ (25.4 × 21.7, 26.7 × 24.8) (USNM 65427), 1 ♀ (30.1 × 27.8, 32.2 × 30.5).

Diagnosis. Carapace ovoid, covered with small, sharp granules with curved tips, one spine each on sub hepatic region, anterolateral margin, junction of antero- and posterolateral margins, and posterolateral margin; spine on anterolateral margin represented by tubercle, intestinal region with conical spine, posterior margin with two dorso-ventrally flattened spines; front bidentate, margin with coarse granules. Inner border of merus of 3rd maxillipeds smoother than rest of merus, demarcated from rest of merus by line of hair. Fingers of chelipeds slightly longer than palm; dactylus with fringe of hairs on the anterior edge. Male G1 2.6 × longer than G2, slender, distal end curved, with funnel-shaped tip, base of tip with long setae.

Remarks. The spination on the carapace in *A. elongata* varies with size and sex. The frontal teeth in females are generally sharper as they end in a small spine, whereas in the male, the teeth are somewhat more blunt. The spine on the sub hepatic region also varies from a small denticle to a small conical spine. However, in all specimens

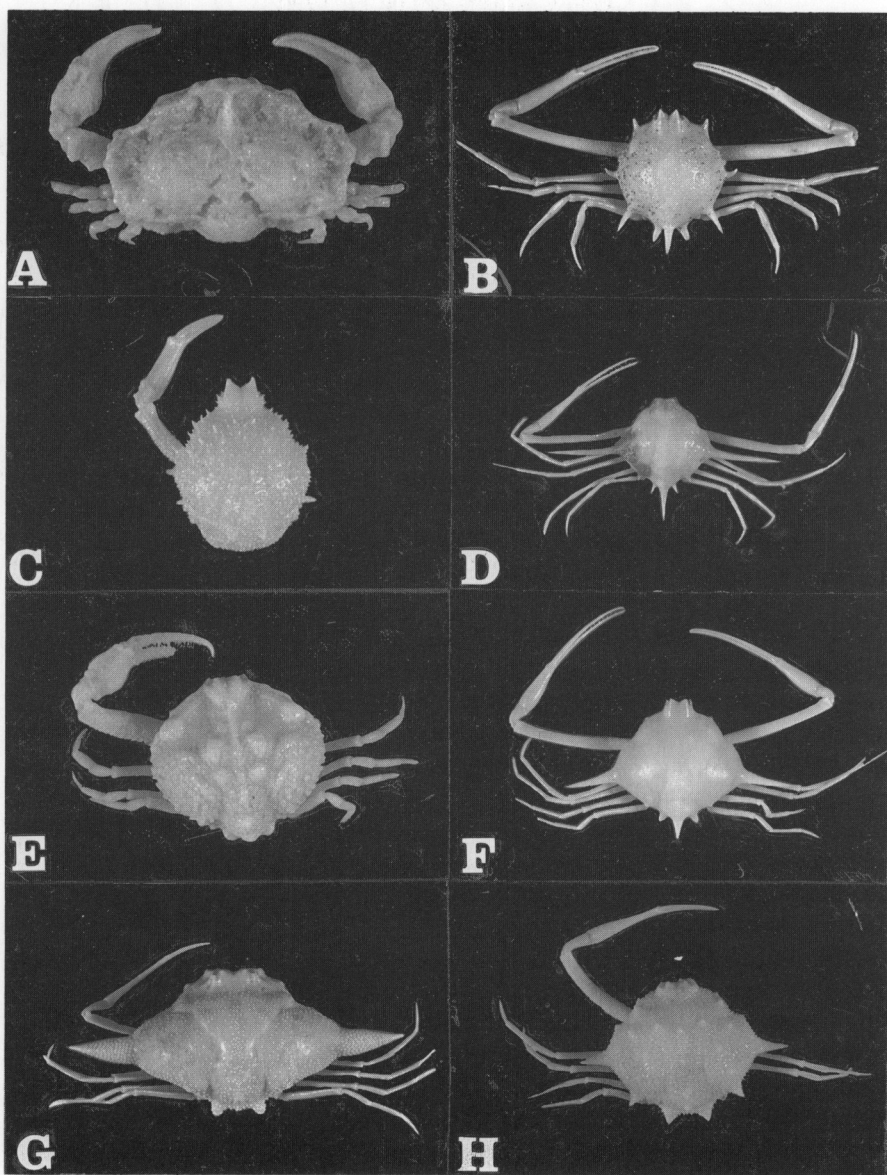


FIG. 1. (A) *Alox rugosum* (Stimpson, 1858), male (6.3×7.8); (B) *Arcania elongata* Yokoya, 1933, male (21.69×18.46); (C) *Arcania globata* Stimpson, 1858, female (10.9×8.8); (D) *Arcania septemspinosa* (Fabricius, 1887), male (17.2×16.3 , 24.0×43.8); (E), *Heterolithadia fallax* (Henderson, 1893), male (12.0×12.4); (F) *Arcania quinquispinosa* Alcock and Anderson, 1894, male (11.1×10.7 , 13.1×20.9); (G) *Ixa edwardsii* Lucas, 1858, female (28.9×40.0 , 67.7); (H) *Ixa pulcherrima* (Haswell, 1880), female (14.8×15.9 , 22.7).

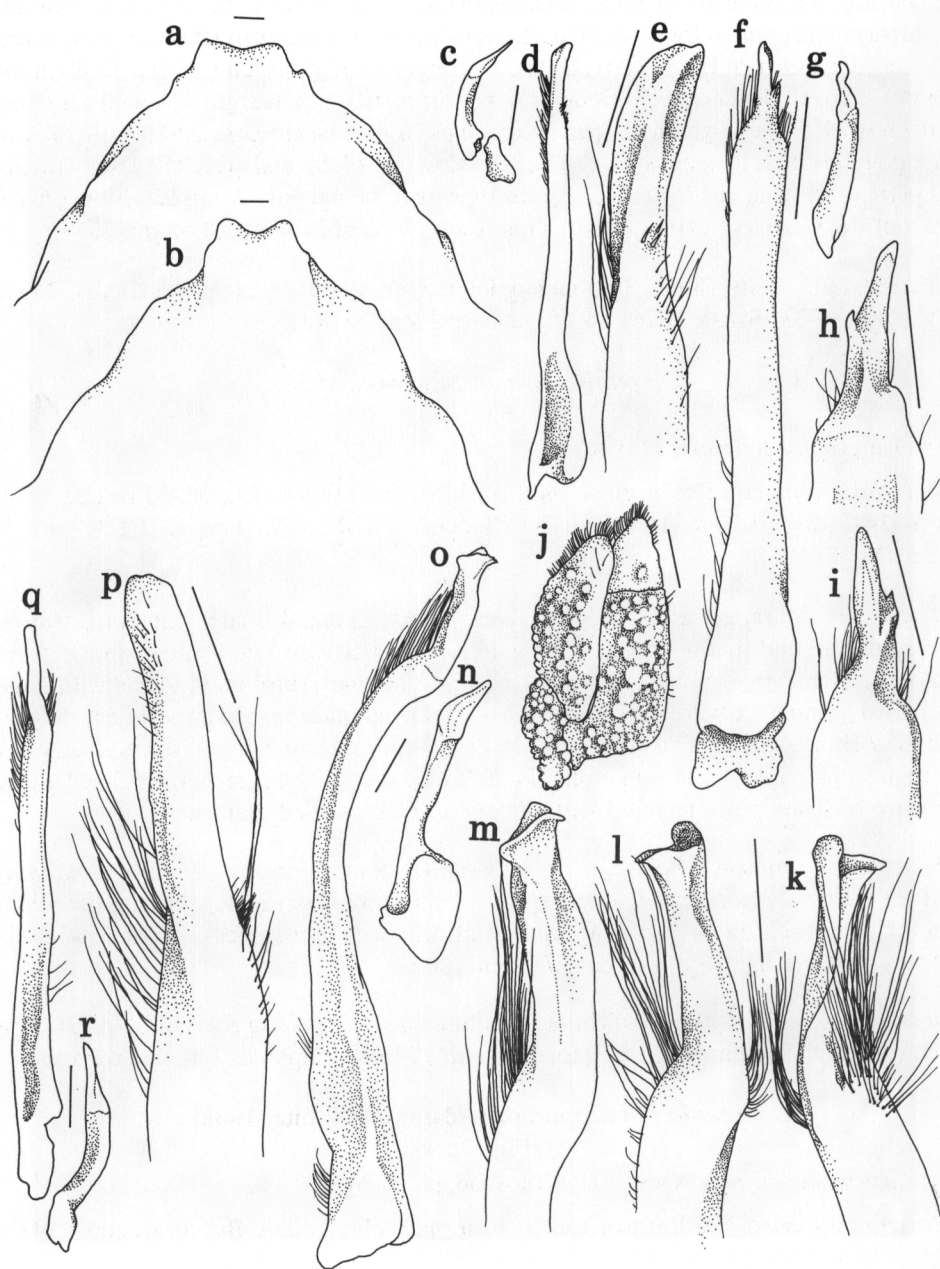


FIG. 2. *Arcania septemspinosa* (Fabricius, 1787), male: (a) front, dorsal view. *Arcania quinquespinosa* Alcock and Anderson, 1894, male: (b) front, dorsal view; (c) right G2; (d) right G1; (e) tip of right G1. *Heterolithadia fallax* (Henderson, 1893), male (11.12 × 11.58): (f), right G1; (g) right G2; (h)–(i) tip of right G1; (j) right 3rd maxilliped, outer surface. *Arcania elongata* Yokoya, 1933, male (25.4 × 21.7), (26.7 × 24.8): (k)–(m) tip of right G1; (n) right G2; (o), right G1. *Arcania novemspinosa* (Adams and White, 1848), male: (p) tip of right G1; (r) right G2. Scales: e, h, i, k–m, p = 0.5 mm; all others = 1.0 mm.

examined, the spine at the junction between the antero- and the posterolateral margins is always represented by a tubercle. *A. elongata* is distinct from its closer congeners, *A. undecispinosa* de Haan, 1841, and *A. novempinosa* (Adams and White, 1848) in the ovoid shape of the carapace (globular in the other two), the margins of the front being covered with coarse granules (pearly granules in *A. novempinosa* and a pavement of flat granules in *A. undecispinosa*) and the structure of the male G1. The last character is particularly diagnostic as *A. elongata* appears to be the only *Arcania* with the distal part of the G1 curved (Fig. 1o–q). This is a new record for the Philippines.

Distribution. East China Sea, Guangdong (China) (Dai and Yang, 1991); Japan (Yokoya, 1933; Sakai, 1976); Philippines (present record).

***Arcania globata* Stimpson, 1858**

(Fig. 1C)

Arcania globata Stimpson, 1858: 160

Material examined. **Philippines.** Sulu Archipelago, off Jolo Lt., 06°90'N 120°58'E, Stn 5141, trawl, 53.1 m, 15 February 1908, coll. USBF, APE, 1 ovig. ♀ (10.9 × 8.8) (USNM 134196).

Diagnosis. Carapace globular, surface covered with small, sharp granulated spines, 10 spines around margin longer than others, posterior with two conical spines; front strongly bidentate, frontal teeth sharp, margins granular. Third maxillipeds with large rounded granules. Chelipeds slender, longer than carapace (excluding spines), fingers slightly shorter than palm, merus with large granules as on 3rd maxillipeds; anterior margins of ambulatory legs granular. Female abdomen with segments 3–5 fused, outer surface of fused piece covered with widely spaced rounded granules.

Remarks. Stimpson (1907: 156), in his original description says, '... it [*A. globata*] differs from *A. erinaceus* in wanting spines on the ambulatory feet; from *A. tuberculata* and *A. laevimana* in having sharp instead of tuberculiform spines'. I concur with his observations. This is a new record for Philippines.

Distribution. Off the coast of China, near Soon-Koo and Hong Kong Is., North China Sea (type locality unspecified), Japan (Sakai, 1976), Philippines (present record).

***Arcania novempinosa* (Adams and White, 1848)**

(Figs 2p–r)

Iphis novempinosa Adams and White, 1848: 56, pl. 13, fig. 1.

Material examined. **Philippines.** Luzon, near Mariveles, coll. A. Reese, acc. no. 56023, 1 ♂ (21.3 × 18.6, 25.7 × 23.3).

Diagnosis. Carapace globular, surface with widely spaced coarse granules, pterygostomian region with short, upcurved spine, posterior hepatic region with small tubercle, junction between antero- and posterolateral margins with upcurved spine, posterolateral margins and intestinal regions each with long, upcurved spine, posterior margin with one dorsoventrally flattened spine on either side; front strongly bidentate, each tooth surface finely granular. Third maxillipeds finely granular. Chelipeds about 2.6 × longer than carapace (excluding spines), palm slightly swollen at base, fingers slender, longer than palm; ambulatory legs more slender than chelipeds, anterior edge of dacylus

fringed with hairs. Male abdomen with segments 2, 6, 7 free, G1 slender, $2.7 \times$ longer than G2, apex produced to form elongated process, base of process with long setae.

Remarks. According to Alcock (1896: 267), *A. novemspinosa* may be synonymous with *A. undecimspinosa* de Haan, 1841, as the former differs from the latter species only in the following characters: (1) the surface of the carapace, in adults, is almost smooth, without any isolated granules or prickles; (2) the marginal spines are very much larger (except for the spine at the junction of the subhepatic and branchial regions); (3) the regions of the carapace are not well-defined; (4) the front is more prominent; and (5) the adult male chelipeds are $2.5 \times$ the carapace length, and the merus is finely granular only at the base. I agree with Alcock (1896) on these points, and can find no other differences between the two species. Dai and Yang (1991) figured the G1s of both species and they are very similar in structure. *A. novemspinosa* was described from the Philippines and Amboin, whilst *A. undecimspinosa* was from Japan. A direct comparison of the types will probably show both species to be synonymous, but until then they are retained as separate species.

Distribution. China, Philippines, Amboina Is., Australia (Dai and Yang, 1991).

***Arcania quinquespinosa* Alcock and Anderson, 1894**
(Figs 2b–e, 7F)

Arcania quinquespinosa Alcock and Anderson, 1894: 206.

Material examined. **China Sea.** Stn 5303, 62.2 m., 9 August 1908, coll. USBF, APE, 1 ovig. ♀ (17.6×17.8 , 20.4×31.7) (USNM 65337). China Sea, vic, Hong Kong, Stn 5302, 69.5 m., 9 August 1908, coll. USBF, APE, 1 ovig. ♀ (USNM 65336). Stn 5304, 62.2 m., 9 August 1908, coll. USBF, APE, 1 ♂ (USNM 65338). Stn 5302, 69.5 m., 9 August 1908, coll. USBF, APE, 2 ♀ ♀ (USNM 65336). **Philippines.** Quezon Province, Cabaleta Is., 32.9–58.6 m sand and mud bottom, 21–25 April 1959, coll. F. G. Dayrit and J. E. Norton, 1 ♂ (11.1×10.7 , 13.1×20.9 , 11.2×11.6 , 13.4×23.3), 1 ovig. ♀. Buton Strait, Tikola Peninsula, Stn 5642, 67.7 m, 14 December 1909, coll. USBF, APE, 1 ovig. ♀ (USNM 65334). East Mindanao, Nagubat Is., Stn 5235, 80.5 m, 9 May 1908, coll. USBF, APE 1 ♂ (USNM 65335).

Diagnosis. Carapace granular towards margins, faint grooves demarcating regions of carapace, hepatic region swollen such that projecting front becomes sharply disjunct from rest of carapace, subhepatic region with small tubercle, junction of antero- and posterolateral margins with long, sharp, backward and upward projecting spine, intestinal region with long, sharp upward curving spine, posterior portion of posterolateral margin with small tubercle, posterior margin with two small spines on either side; front sharply bidentate. Fingers of cheliped $2 \times$ as long as palm; ambulatory legs slender. anterior and posterior margins of dactyli fringed with hair. G1 slender, $3 \times$ longer than G2, apex drawn out to form elongated process with setae at base, tip of process slightly expanded.

Remarks. The closest congener of *A. quinquespinosa* seems to be *A. septemspinosa* (Fabricius, 1787). Alcock (1896: 266) differentiates them using the following characters: (1) *A. quinquespinosa* is a much smaller species, the carapace of the adult being < 12 mm in length and < 14 mm in breadth; (2) the carapace of

A. quinquespinosa has a 'broadly conical' outline due to the bulging branchial regions whereas in *A. septemspinosa*, the carapace is 'bluntly rhomboidal'; (3) the front in *A. quinquespinosa* is sharply bidentate instead of bilobate (as in *A. septemspinosa*); (4) in *A. quinquespinosa*, the carapace spines are relatively smaller, the spine on the posterolateral region being either absent or reduced to a tubercle; (5) grooves demarcating the regions of the carapace are present on the carapace of *A. quinquespinosa*, except for the transverse crease separating the hepatic from the branchial regions, the regions of the carapace are not clearly demarcated in *A. septemspinosa*; (6) the fingers of the chelipeds of *A. quinquespinosa* are nearly $2 \times$ the length of the palm whilst those in *A. septemspinosa* are a little longer than the palm; and (7) there is a red white-edged ocellus on the cardiac region of live or freshly preserved specimens of *A. quinquespinosa* whilst for *A. septemspinosa*, the carapace is 'streaky and patchy red'. The specimens examined by the author were all creamy white. An additional character is that the hepatic region of *A. quinquespinosa* is swollen in such a way as to cause the front to appear sharply disjunct from the rest of the carapace (Fig. 1a, b).

Distribution China (South and East China Sea), Japan, Indonesia, India, Sri Lanka, Laccadive Is, Iran, Persian Gulf, Red Sea, Vietnam, Philippines (Chen, 1989).

Arcania septemspinosa (Fabricius, 1787)

(Figs 2a, 1D)

Cancer septemspinus Fabricius, 1787:463

Material examined. **Philippines** Stn 5209, 14 April 1908, coll. USBF, APE, 2♂♂ (17.2×16.3 , 24.6×43.8), (17.2×16.7 , 21.0×40.9), 2♀♀ (18.4×17.4 , 26.3×46.7) (18.9×18.4 , 23.7×39.1). Corregidor Lt., off South Luzon, Stn 5107, 51.2 m, coll. USBF, APE, 9.i.1908, 1♀ (USNM 65347). Mariquitdaquit Is., off East Leyte, Stn 5204, 27.5 m, 11 April 1908, coll. USBF, APE 1♂ (USNM 65349). Taratara Is., off West Samar, Stn 5208, 47.6 m, 14 April 1908, coll. USBF, APE, 1♂ (USNM 65366), St. Fernando Is., West coast of Luzon, Stn 5442, 82.4 m, 11 May 1909, coll. USBF, APE, 1♂ (USNM 65368). **China Sea.** Stn 5302, 69.5 m, coll. USBF, APE, 9 August 1909 1M (USNM 65367).

Diagnosis. Carapace rhomboidal, surface with irregular patches of granules, hepatic region separated from branchial region by transverse crease, subhepatic region with small tubercle, junction of antero- and posterolateral margins with long, sharp, upward and backward projecting spine, posterolateral margin with small, sharp spine, intestinal region with long, sharp, upward curving spine, posterior margin with a small spine on either side of median line; front bilobed. Chelipeds slender, fingers slightly longer than palm; anterior and posterior margins of dactylus of ambulatory legs fringed with hair.

Remarks. This species is allied to *A. quinquespinosa*. The differences between the two species are enumerated under the remarks for *A. quinquespinosa*.

Distribution. Malay Peninsula, India, Persian Gulf, China, Red Sea, Cape of Good Hope (Dai and Yang, 1991).

Heterolithadia Alcock, 1896
Heterolithadia fallax (Henderson, 1893)
 (Figs 2f–j, 1E)

Ebalia fallax Henderson. 1893:402, pl. 38, figs. 4–6.

Material examined. Philippines. Gulf of Davao, Linao Pt, Stn 5253, 51.2 m, 18 May 1908, coll. USBF, APE, 2♂♂ (11.1 × 11.5, 12.0 × 12.4) (USNM 65344).

Diagnosis. Carapace broader than long, surface covered with flat-topped granules, except in hepatic regions, anterolateral margin thickened, ending posteriorly in large, granular swelling, median ridge present with two granular swellings on gastric regions on either side, cardiac region with one tubercle, intestinal region with two tubercles, posterior margin bilobed; front broadly bilobed. Fingers of chelipeds about 2 × longer than palm, cutting edges finely denticulate and setose. Male abdomen with segments 3–6 fused, penultimate segment with a tooth; G1 moderately stout, 3.8 × longer than G2, with unequally bifurcated tip, base of tip setose.

Remarks. Ihle (1918) disagreed with Alcock (1896) that *Heterolithadia* and *Nursilia* are closely related but he gave no reason for this. *Heterolithadia* does resemble *Nursilia* Bell, 1855, in terms of the proportions of the carapace, the bilobed front, the swellings on the anterolateral margins, the gastric, cardiac and intestinal regions, the proportions of the fingers of the chelipeds relative to palm, the finely denticulate cutting edges of the fingers, the presence of a tooth on the penultimate segment of the male abdomen and the bifurcated tip of the male G1. However, according to Alcock (1896:259–260), the movable finger of the cheliped in *Heterolithadia* moves through an arc of >75° whilst that in *Nursilia* moves through an arc of 130°. Also, the chelipeds of *Heterolithadia* are somewhat more slender than those of *Nursilia* and the species of this genus usually have a thin carapace margin.

The genus name was cited in Alcock (1896) as '*Heterolithadia*, Wood-Mason, (name only)'. It appears that Wood-Mason may have suggested the name but the description was written by Alcock. Thus, authorship of *Heterolithadia* should correctly be attributed to Alcock (1896). This is a new genus and species record for the Philippines.

Distribution. Gulf of Manaar; Andaman Is.; Orissa Coast, off Sulu (Ihle, 1918), Phillipines (present record).

Heteronucia Alcock, 1896
Heteronucia laminata (Doflein, 1904)
 (Figs 3a–e)

Philyra laminata Doflein, 1904:46, pl. 15, figs 5, 6.

Material examined. Philippines. Stn 5417, 25 March 1909, coll. USBF, APE, 2♂♂ (14.3 × 13.7, 17.4 × 17.1). Stn 5372, 24 February 1909, coll. USBF, APE, 1♂ (16.5 × 15.4). Stn 5411, 23 March 1909, coll. USBF, APE, 1♂ (16.5 × 15.3), 1♀ (17.4 × 16.6). Stn 5412, 23 March 1909, coll. USBF, APE, 1♂ (18.91 × 17.39).

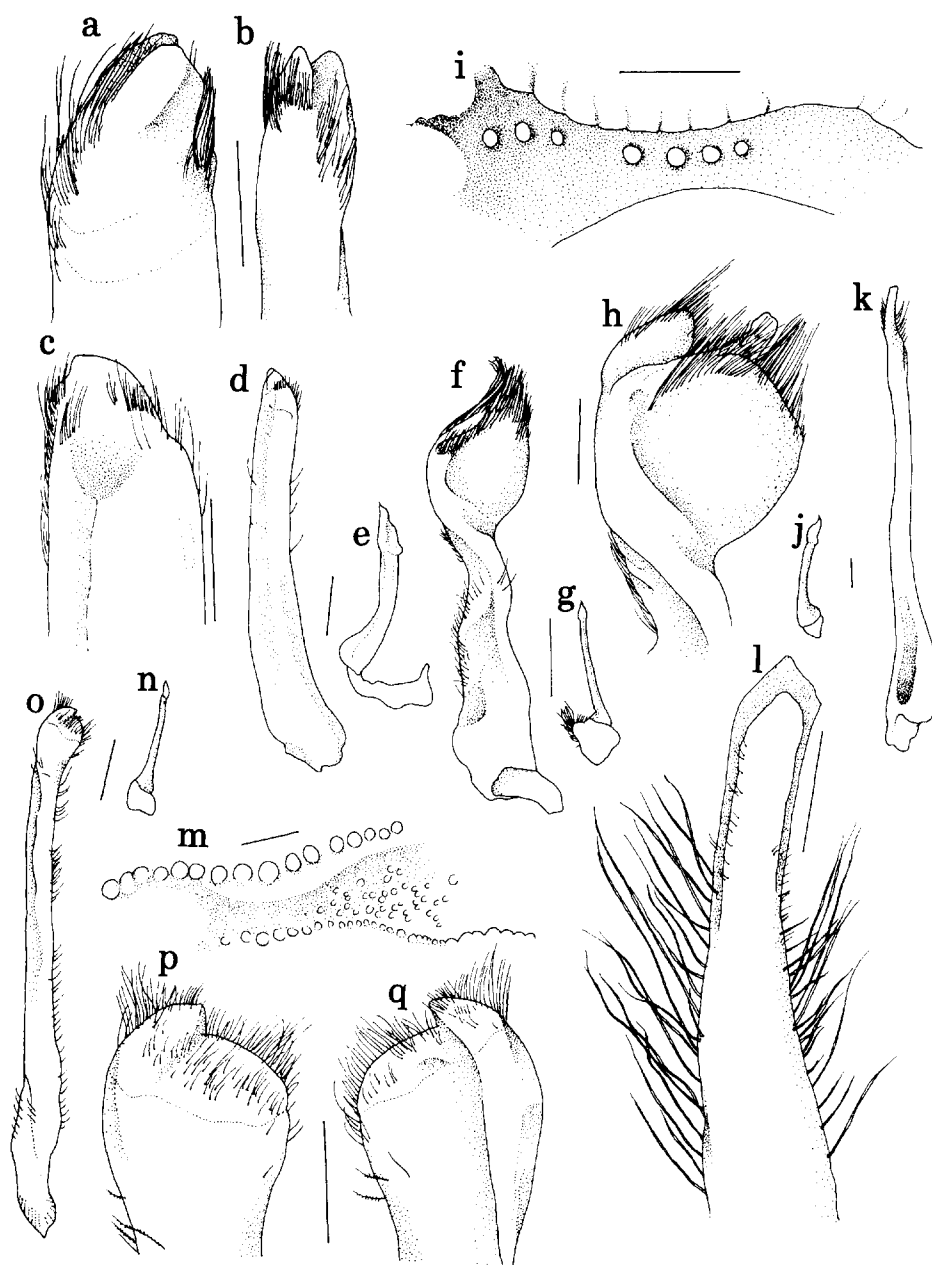


FIG. 3. *Heteronucia laminata* (Doflein, 1904), male (16.5 × 15.3): (a)–(c), tip of right G1; (d) right G1; (e) right G2. *Leucosia cheverti* Haswell, 1880, male: (f) right G1, partially denuded; (g) right G2; (h), tip of right G1, partially denuded; (i), right thoracic sinus. *Ixoides cornutus* MacGilchrist, 1905, male: (j) right G2; (k) right G2; (l) tip of right G1. *Leucosia craniolaris* (Linnaeus, 1758), male: (m) right thoracic sinus; (n) right G2; (o) right G1; (p), (q) tip of right G1. Scales: a–c, h, l, p, q = 0.5 mm; all others = 1.0 mm.

Diagnosis. Carapace ovoid, covered entirely by short velvety tomentum, widely spaced, medium sized granules under tomentum, intestinal region tumid and separated from rest carapace by groove, lateral margins entire, not divided into lobes, posterior margin divide into two large, rounded lobes; front bilobed, lobes rounded. Third maxillipeds granular as on dorsal surface of carapace. Sternum granular, suture between sternite 3–4 invisible, sternite 5 in male with two large granules on either side of abdomen. Chelipeds short and stout, palm very swollen, fingers open vertically, slightly longer than palm. Abdominal segments 3–5 fused in male, segments 4–6 in female. G1 2.3 × longer than G2, G1 apex covered with long hairs, with two round lobes.

Remarks. Alcock states that for *Heteronucia*, the ‘... basal antennal joint is fused with the orbit and with the front, and the extremely minute antennary flagellum is entirely inside the orbital wall’ (Alcock, 1896:177). This condition is not found in the specimens which the author examined. Instead, the basal antennal joint and the 2nd article are loosely lodged. However, Ihle (1918) believes that the mobility of the basal antennal joint is taxonomically insignificant. This character is rather difficult to examine in most specimens due to the layer of sediment that almost invariably covers them. Chen (1989) transferred the species to *Heteronucia* Alcock, 1896, solely on the basis that the fingers of the chelipeds opened in a vertical instead of horizontal plane. This character is rather subjective and specimens sometimes have fingers opening in a plane intermediate between the horizontal and vertical, depending on how the chelipeds are placed during examination. In my opinion, additional characters should be used to justify the transfer of the species to *Heteronucia*. It is clear that the boundary between *Heteronucia* and *Nucia* needs to be clarified and redefined. I have therefore retained the species in *Heteronucia* until such a revision is done.

Distribution. Nias Is., South of Bangkum, Indonesia (type locality); China (South China Sea), Japan, Philippines (Chen, 1989).

Ixa Leach, 1815

Ixa edwardsii Lucas, 1858

(Fig. 1G)

Ixa edwardsii Lucas, 1858: pl. 4, fig. 3.

Material examined. **Philippines.** West Luzon, South Fernando Pt Lt., Stn 5442, 82.4 m, 11 May 1909, coll. USBF, APE 1 ♀ (28.9 × 40.0, 67.7) (USNM 65432).

Diagnosis. Carapace with two lateral projections gradually tapering to a point, carapace covered with round granules, regions demarcated by shallow grooves, intestinal region raised to form small mound, posterior margin with two round lobes; front broadly bidentate. Endognath of ischium of third maxillipeds covered with closely packed large, pearly granules except for inner edge, proximal 0.75 of exognath covered in similar fashion. Chelipeds long and slender, fingers about half length of palm. Female abdomen coarsely granular, with two grooves running on either side of median line.

Remarks. The pattern of pearly granulation on the 3rd maxillipeds in *Ixa edwardsii* is particularly diagnostic as this condition is absent in other *Ixa* species. From the description given, the specimens recorded by Alcock (1896:273) as *Ixa inermis* appear to be conspecific with *I. edwardsii*. Hence, *I. inermis* sensu Alcock, 1896, was

synonymized with the latter species by Chen (1989) and by Dai and Yang (1991). I agree with their action, particularly since Alcock (1896) clearly mentioned the unique pearly granulation on the third maxillipeds.

Distribution. India, China, Persian Gulf, Red Sea, Turkey, Zanzibar, Northern Australia (Dai and Yang, 1991), Philippines, Indonesia (Chen, 1989).

Ixa pulcherrima (Haswell, 1880)

(Fig. 1H)

Arcania pulcherrima Haswell, 1880:58, pl. 6, fig. 4.

Material examined. **Philippines.** Gulf of Davao, Linao Pt, Stn 5253, 51.2 m, 18 June 1908, coll. USBF, APE, 1♀ (14.8 × 15.9, 22.7) (USNM 65351).

Diagnosis. Carapace broader than long, dorsal surface covered with round granules, margins with pointed granules, large tubercles on hepatic, subhepatic, anterolateral, branchial, cardiac and intestinal regions, junction of posterolateral margin with granular conical spine, posterolateral margin with shorter spine, posterior margin with two flattened spines: front bilobed, lobes triangular. Chelipeds longer than carapace, palm slightly swollen at base, fingers slightly shorter than palm; dactylus of ambulatory legs shorter than propodus. Female abdomen with segments 4–6 fused.

Remarks. Miers (1884) synonymized *Arcania septemspinosa* Bell, 1855, with *Ixa pulcherrima* after examining the type specimen of the former species in the British Museum. Serène and Lohavanijaya (1973: 41) agreed with his action, stating 'He (Miers) gave good reasons to maintain the name of Haswell and stipulated that the specimen from Bell (1855) is from Borneo and not of unknown locality, as Bell states ...'. However, Chen (1989: 227) raised doubts about it as the fingers of the chelipeds in her specimen of *I. pulcherrima* are shorter than the palm (nearly as long as palm in Bell, 1855: fig. 7) and the fused piece of the female abdomen is round in Bell's figure whilst that for Chen's specimen (Chen, 1989: pl. 6, fig. 4) and Haswell's specimen (Haswell, 1880: pl. 6, fig. 4) is oval. She concluded that Bell's *Arcania septemspinosa* (1855) is a species distinct from *Ixa pulcherrima*. I have not examined Bell's specimen and thus am unable to comment on the validity of Mier's action (1884). Prior to this, Serène and Lohavanijaya (1973) synonymized *Ixa investigatoris* Chopra, 1933, with *Ixa pulcherrima* and suggested the future possibility of transferring *I. investigatoris* to *Arcania*. Chen (1989) stated that 'The specimens identified by *Ixa pulcherrima* by Serène and Lohavanijaya (1973: 41, pl. 4a) belong to *I. investigatoris* ...', but did not give her reasons for it. Thus, *I. pulcherrima* and *I. investigatoris* should be recognized as distinct until the type specimens of both are examined and compared.

Distribution. Chevert Is., Australia (type locality), Borneo, the Indian Ocean and the Philippines (Serène and Lohavanijaya (1973)).

Ixoides MacGilchrist, 1905

Ixoides cornutus MacGilchrist, 1905

(Figs 3j–1, 4A, B)

Ixoides cornutus MacGilchrist, 1905: 255.