

THE PENAEOIDEA OF THE NORFANZ CRUISE

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The NORFANZ Cruise was a collaboration between Australian, New Zealand and French scientific organisations to investigate the biodiversity of the Norfolk Ridge and Lord Howe Rise benthic communities. Most of the stations occupied during this cruise (89%) were in water deeper than 300m, with 40% in depths exceeding 1000m. Accordingly the penaeoid fauna consisted mostly of deeper water species and were collected at 73 stations by trawls and sledges. All five families of the Penaeoidea were represented by 21 species, the Aristeidae being predominant, mostly *Aristeus mabahissae*, *Aristaeomorpha foliacea*, *Austropenaeus nitidus*, plus *Aristeus virilis*, *Aristaeopsis edwardsianus*, *Hepomadus tener*. Benthescymidae: *Benthescymus investigatoris*, *B. howensis*, *Gennadas gilchristi*, *G. kempi*. Solenoceridae: *Gordonella kensleyi*, *Hadropenaeus lucasii*, *Haliporoides sibogae*, *Hymenopenaeus methalli*, *H. neptunus*, *H. obliquirostris*, *Solenocera comata*. Penaeidae: *Metapenaeus velutina*, *Funchalia villosa*. Sicyoniidae: *Sicyonia inflexa*, *S. truncata*. Details of location and depth of each species and the geographical range are given. As *Gordonella kensleyi* males were collected for the first time, a complete description can now be given. Examination of males of *Benthescymus urinator howensis* indicate it should be raised to specific rank. □ *Penaeoidea*, NORFANZ Cruise, Norfolk Ridge, Lord Howe Rise.

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The NORFANZ Cruise was planned to investigate the marine biodiversity of the Norfolk Ridge and Lord Howe Rise seamount and slope communities. It was a joint investigation between Australian, New Zealand and French scientific organisations, using the New Zealand R.V. Tangaroa. The scientific crew was made up from a rotation of personnel from various institutions: New Zealand (Te Papa and NIWA), Australia (CSIRO, Australian Museum, Museum Victoria, NT Museum, Queensland Museum, and University of Tasmania), France (IRD, MNHN), USA (California Acad. Sciences).

The Norfolk Ridge and Lord Howe Rise are prominent bathymetric features of the Tasman Sea between Australia and New Zealand. They are considered to be part of the old coastline of Gondwanaland. Parts of these ridges rise to chains of seamounts and plateaus 200–1000m below the surface. Previous limited investigations have found that some localities support rich and diverse communities, characterised by high levels of endemism.

The objectives of the Cruise were to sample communities and document the marine diversity from 14 seamounts and slopes to at least 1500 m. depth. The Cruise began on 9 May, 2003 with the first station at 34°06'S, 171°39'E to the west of Three Kings Islands (near the northern tip of the

North Island of New Zealand) and proceeded north along the Norfolk Ridge to 26°22'S, 167°01'E; turned west on a course of about 250° to Middleton Reef, 29°14'S, 159°06'E; south to Lord Howe Island, 31°45'S, 159°19'E; then set an easterly course to the West Norfolk Ridge, 34°12'S, 163°21'E, finally turning southeasterly along the West Norfolk Ridge approximately parallel to the original track, finishing on 7 June, 2003. A total of 168 stations were occupied, including 15 CTD and 9 photographic stations (Clark et al., 2003). Williams & Gowlett-Holmes (2003) provided a progress report.

Only 73 of the 168 stations yielded identifiable penaeoids (Table 1.). Most of these (34%) were collected by the ORH trawl; 26% by the Sherman epibenthic sledge; 19% by the "Ratcatcher" trawl, 15% by the beam trawl and the remainder by the NIWA sled and midwater trawl. The last was disappointing as a number of penaeoids have been shown to be epibenthic or bathypelagic, and thus likely to be caught by this device (Griffiths & Brandt, 1983; Kikuchi & Nemoto, 1991).

All 5 families of the Penaeoidea represented by 21 species were collected, but the Aristeidae were predominant. Nearly all have been recorded in Australian waters (Dall, 1999, 2001). Species distributions are discussed below.

SYSTEMATICS

Superfamily PENAEOIDEA

Family ARISTEIDAE Wood-Mason, 1891

Aristaeina Wood-Mason, 1891: 278.

Aristaeinae Alcock, 1901: 27; Ramadan, 1938: 36; Kubo, 1949: 193.

Aristaeinae Bouvier, 1908: 13; Balss, 1957: 1516; Crosnier, 1978: 14.

Aristeidae Crosnier, 1978: 14; Burkenroad, 1983: 281; De Freitas, 1985: 3; Pérez Farfante & Kensley, 1997: 175; Dall, 2001.

Aristaeidae Grey et al., 1983: 13, 14; Dall et al., 1990: 58.

For diagnoses and keys see Pérez Farfante & Kensley, 1997 and Dall, 2001.

***Aristaeomorpha foliacea* (Risso, 1827)**

Penaeus foliacea Risso, 1827: 69pl.2, fig.6; H. Milne Edwards, 1837: 418; Miers, 1878: 307.

Aristeus rostridentatus Bate, 1881: 189; 1888: 317, pl. 51.

Aristaeomorpha foliacea (see Crosnier, 1978 for bibliography to 1978); Crosnier, 1984: 54, figs 23, 24; 1985: 861; 1989: 42; 1994b, 369; Hayashi, 1983b: 280, fig. 53; Grey et al., 1983: 46, pl. 1; de Freitas, 1985: 16, fig. 11-7; Liu & Zhong, 1986: 33, figs 12, 13; Yu & Chan, 1986; Kensley et al., 1987: 279; Dall, 2001: 412, fig. 2.

MATERIAL. Station 2, 3♀, 12, 28, 33mm; Station 3, ♂, 30mm; Station 27, ♂, 34mm, ♀, 37mm; Station 28, ♀, 30mm; Station 43, ♀, 37mm; Station 80, ♀, 17mm; Station 81, 2♂, 35mm, 4♀, 25-49mm; Station 86, 3 juveniles 10-14mm; Station 89, 3 juv. 7-12mm, 2♂, 23-26mm, 5♀, 25-46mm; Station 94, ♀, 19.5mm; Station 108, 5♂, 25-38mm, 10♀, 14-42mm; Station 140mm, ♀, 40mm; Station 159, 10♂, 23-27mm, 10♀, 25-43mm.

REMARKS. 66 specimens were collected over most of the area sampled, at depths of 110-987m, 177m deeper than the maximum recorded range. This species is one of the most widely distributed of the Aristeidae, ranging from the West Pacific, around Australia, the Indian and Atlantic Oceans and the Mediterranean Sea. The present records fill a gap between New Caledonia and Australia.

***Aristaeopsis edwardsiana* (Johnson, 1867)**

Penaeus Edwardsianus Johnson, 1867: 897 [part].

Aristeus Edwardsianus Miers, 1878: 308 [part].

Aristeus coralinus Bate, 1888: 32, fig. 10.

Aristeus splendens Richard, 1900: 89; 1903: 67, 70, 71.

Aristaeopsis Edwardsiana Wood-Mason, 1891: 283, figs 8, 9; 1892: figs. 1-2; Alcock, 1899: 74.

Aristaeopsis edwardsiana Alcock & Anderson, 1894: 147; Pérez Farfante & Kensley, 1997: 175, pl. 36, fig. 7; Dall, 2001: 413, fig. 3.

Plesiopenaeus edwardsianus Faxon, 1895: 189 (for full synonymy to 1974 see Crosnier, 1978); Kensley et al., 1987: 281; Hayashi, 1983c: 268, fig. 59; Crosnier, 1985: 863; 1994b: 369; de Freitas, 1985: 20, figs 2-9; Liu & Zhong, 1986: 43, fig. 17; Grey et al., 1983: 38, pl. 2.

MATERIAL. Station 67, ♀, 92mm; Station 94, ♀, 19.5mm; Station 95, ♀, 29mm.

REMARKS. This species appears regularly in deepwater trawls off eastern Australia, and is of minor commercial importance off Madagascar (Crosnier, 1978). As the recorded depth range is 200-1850m, Station 67 at 72-82m is exceptional. The species prefers muddy substrates (Dall, 2001), which may explain its sparseness in the present collections. It is cosmopolitan.

***Aristeus mabahissae* Ramadan, 1938**

Aristeus mabahissae Ramadan, 1938: 43, figs 2b, 3b, 4a-c; Crosnier, 1978: 65, figs 25c, 26c-f; 1985: 863; 1994: 369; Hayashi, 1983a: 190, figs 49, 50; Liu & Zhong, 1986: 44, fig. 18; Komai, 1993: 22; Dall, 2001: 415, fig. 4A.

MATERIAL. Station 3, ♀, 43mm; Station 16, 2♂, 34mm, ♀, 47mm; Station 33, ♂, 35mm, 3♀, 51mm; Station 63, 2♀, 36, 41mm; Station 73, 3♂, 25, 32, 35; Station 74, 5♀, 48-53mm; Station 80, 6♂, 16-31mm, 10♀, 23-45mm; Station 81, ♂, 24mm, 19♀, 18-40mm; Station 90, 3♂, 32-54mm, 3♀, 40-51mm; Station 92, ♂, 32mm, 3♀, 44-51mm; Station 93, 2♀ 39-41mm; Station 94, 9 juv. 9-12mm; Station 95, ♂, 27, 6♀, 40-51mm; Station 96, ♂, 31mm, 6♀, 33-50mm; Station 101, 6♀, 41-62mm; Station 103, 5♀, 35-62mm; Station 114m, 2♂, 30, 31mm, 6♀, 25-70mm; Station 119, 2♂, 19-34mm; 6♀, 20-49mm; Station 123, 5♂, 26-43mm, 9♀, 19-48mm; Station 128, 8♀, 37-52mm; Station 140, 4♀, 11-41mm; Station 141, 2♀, 22, 23mm; Station 146, ♂, 33mm, 7♀, 39-52mm; Station 147, 5♂, 16-32mm, 4♀, 28-45mm; Station 151, 4♀, 35-47mm; Station 155, 3♂, 30-31mm, 5♀, 41-50mm; Station 156, 4♀, 43-51mm; Station 159, 15♀, 18-45mm; Station 160, 2♀, 46, 53mm; Station 166, ♀, 8.5mm.

REMARKS. Although the largest collection of penaeoids on this Cruise, this species is sparse in the northern part of the Cruise area, more frequent on the Lord Howe Rise, and most numerous on the West Norfolk Ridge. It was trawled at depths between 800-1460m, thus exceeding the known depth range (500-1100m) at seven stations. *A. mabahissae* has been recorded from the Australian east and west coasts, Madagascar, Maldives Islands, Indonesia, South China Sea, Japan, Wallis Islands (Dall, 2001).

Doubts have been raised about the identity of this species by A. Crosnier (pers. comm.). The glabrous species of *Aristeus* are closely similar, difficult to separate and prior to Crosnier (1978), depended on relative lengths of pereopod segments for separation. Crosnier (1978, 1984, 1994b) showed that the number of photophores on the pereopods, particularly the fifth, are constant within a narrow range for each species. Unfortunately, the photophores cannot be seen in old or poorly preserved specimens, i.e. the types of *A. semidentus*, *A. antennatus* and *A. mabahissae*.

Much depends on the identifications made by Crosnier (1978). He compared his material with the types of *A. semidentatus* and *A. mabahissae* in the Natural History Museum, London and considered that they matched closely. Unfortunately, he had only four specimens of *A. semidentatus*, but from the data he provided (Crosnier, 1978) they appear to be very consistent. Recently Crosnier (unpubl.) searched, without success, for this species around the locality where the type specimens were found (Kermadec Islands). This search included the vicinity of New Caledonia, Vanuatu and Solomon Islands, as well as material from the NORFANZ Cruise. The latter had most *A. mabahissae* features of the pereopods (numbers of photophores and ratios of length of carpus/length of merus) with the exception of the carpus/merus ratio of the fifth pereopods, which was within the *A. semidentatus* range for the NORFANZ and New Caledonia material.

A further sample of 28 specimens, mostly female, 20-60 mm carapace length, from the NORFANZ collection show a range of photophores 7-12, mean 10.5, on the carpus of the fifth pereopod, and 8-12, mean 10.3, on the propodus, consistent with those *A. mabahissae* from various localities examined by Crosnier (unpubl.) and by Dall (2001) for Australian specimens. However, the carpus length/merus length ratio of the fifth pereopods ranged 1.03-1.43 suggesting that this ratio is not a reliable feature by itself for separating *A. mabahissae* from *A. semidentatus*.

Aristeus virilis (Bate, 1881)

- Hemipenaeus virilis*, Bate, 1881:187; 1888:303, pl. 44, fig.4.
Aristeus tomentosus, Bate, 1881: 189; 1888: 307, pl. 49, figs 2,3, pl. 50.
Hemipenaeus virilis, Bate, 1888: 303, pl. 44, fig. 4.
Aristeus virilis, Faxon, 1895: 196; Alcock, 1901: 30; Kubo, 1949: 194, figs 1, 6, 8, 13, 14,19, 23, 36, 44, 65, 69, 72, 78, 85, 86.
Aristeus virilis, Bouvier, 1908: 70; de Man, 1911: 6, 27; de Man, 1913: pl. 2, fig. 6; Ramadan, 1938: 39; Okada et al., 1966: 140, 141, 151, pl. 1, fig.3; Crosnier, 1978: 61, figs 25a,b, 26a,b; 1984: 21; 1985: 861; 1989: 42; 1994a: 352; Hayashi, 1983a: 190, figs 51, 52c,d; de Freitas, 1985: 3, fig. 11-1; Liu & Zhong, 1986: 37, fig. 14; Yu & Chan, 1986; Kensley et al., 1987: 281; Dall, 2001: 416, fig. 4B.

MATERIAL. Station 43, ♀, 17mm (damaged).

REMARKS. Recorded as the commonest of Australian penaeoids (Dall, 2001), but apparently rare in the NORFANZ area. Known range: South Africa, Madagascar, Andaman Islands, Indonesia, around Australia, New

Caledonia, New Hebrides, Wallis Islands, South China Sea, Philippines, Japan.

Austropenaeus nitidus (Barnard, 1947)

- Plesiopenaeus nitidus* Barnard, 1947: 383; 1950: 622; Crosnier, 1978: 89; Kikuchi & Nemoto, 1986: 52.
Austropenaeus nitidus Dall, 2001: 417, fig. 5.

MATERIAL: Station 47, 9♀, 31-39mm; Station 66, ♀, 17mm; Station 72, 2♂, 25,26mm, 20♀, 33-39mm; Station 73, 5♂; Station 77, ♀, 33mm; Station 90, 2♂, 21, 24mm, 6♀, 29-34mm; Station 91, 2♂, 21, 23mm, ♀, 30mm, 4 juveniles; Station 92, 4♀, 28-37mm; Station 92, ♂ 22mm, 5♀, 28-37mm; Station 101, 4♀, 33-39mm; Station 103, 5♀, 29-42mm; Station 121, ♂, 26mm, ♀, 23mm; Station 142, 3♀, 26-38mm; Station 145, ♀, 16mm; Station 146, 8♂, 18-23mm, 11♀, 15-25mm; Station 150, ♂, 22mm; Station 151, 2 juveniles; Station 155, ♂, 22mm; Station 156, 6♂, 24-26mm, 11♀, 18-38mm; Station 158, 6 juveniles 10-18mm; Station 160, 2♂, 18-27mm, 4♀, 23-27mm; Station 163, 2♀, 17-21mm.

REMARKS. This is the largest collection of this species so far recorded. Depth range was 565 – 1530m, all but one station below 1000m; seven of these exceeded the maximum published depth of 1300m. The geographical range falls well within the limits of 26°S to approx. 40°S (Dall, 2001), who disputes its reported occurrence in the North Pacific at 22° N (Kikuchi & Nemoto, 1986). Otherwise *Austropenaeus nitidus* appears to be a Southern Hemisphere species ranging from the south Atlantic Ocean, off Cape of Good Hope and Natal, Amsterdam and St. Paul Islands, south Indian Ocean, south and east Australia, Lord Howe Rise and Norfolk Ridge. It is likely to occur around the North Island of New Zealand and to the east, depending on bottom topography.

Hepomadus tener Smith, 1884

- Hepomadus tener* Smith, 1884:409, pl. 9, figs 7,8; 1887; Bouvier, 1908:57, pl.1, fig.5, pl.13, figs 1-12; Burkenroad, 1936: 86; Ramadan, 1938:55; Roberts & Pequegnat, 1970, 43, fig.3; Pequegnat & Roberts, 1971:9; Pérez Farfante, 1973: 442, figs 1-8; Crosnier, 1985: 860; 1994: 369; Dall, 2001: 419, fig. 7.
Hepomadus tener? Wood-Mason, 1891: 189.
Aristaeus (Hepomadus) tener? Alcock, 1901: 42.
Hepomadus glacialis Milne Edwards & Bouvier, 1909: 194, figs 13-19, pl.1, fig.3.

MATERIAL. Station 47, ♂, 41mm, ♀, 49mm

REMARKS. Collected at 1530-1934m; as the depth range is 765-5400m (Dall, 2001), a large part of its habitat may not have been reached on this Cruise. It nowhere appears to be common. Its known range is Zanzibar, Madagascar, Réunion, Bay of Bengal, NW Australia, Wallis Islands, W. and E. Atlantic Ocean.

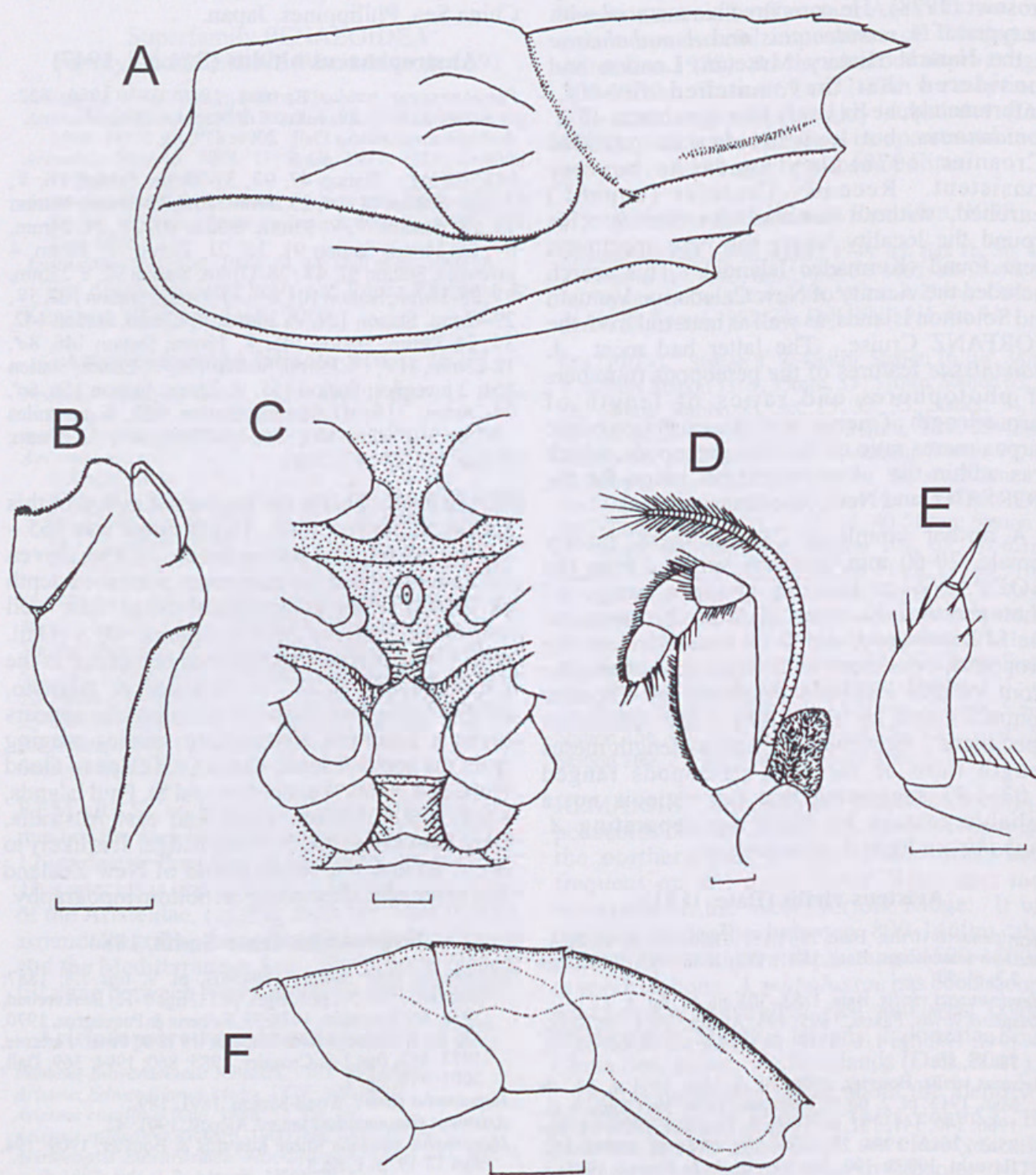


FIG. 1. *Benthescymus howensis* Dall, 2001. ♀ holotype, 22 mm, AM P40648, Lord Howe rise, 28°44'S, 161°54'E, 1325m. A, carapace; C, thelycum; D, maxilliped 2; E, maxilliped 3, dactyl; NORFANZ Cruise, Stn. 74, 32°26'S, 161°45'E, 1171-1259m. B, ♂, 24 mm, right half petasma, anterior view; NORFANZ Cruise, Stn. 160, 34°59', 169°30', 1735m. F, ♀, 21mm, abdominal somites 4-6. Scale bars = 1mm, except F = 5mm. A, C, D, E, are from Dall, 2001.

Family BENTHESICYMIDAE Wood-Mason,
1891

Benthescymina Wood-Mason, 1891: 286.

Benthescymae Bouvier, 1908, 33: 16; Burkenroad, 1936: 15; Anderson & Lindner, 1943: 290; Balss, 1957: 1517; Tirmizi, 1960: 321; Roberts & Pequegnat, 1970: 32.

Benthescyminae Crosnier, 1978: 14; Hayashi, 1983d: 36.

Benthescymidae Pérez Farfante & Kensley, 1987: 56.

For diagnoses and keys see Pérez Farfante & Kensley, 1997 and Dall, 2001.

***Benthescymus investigatoris* Alcock &
Anderson, 1899**

Benthescymus investigatoris Alcock & Anderson, 1899a: 282; 1899b, pl.41, fig.2; Alcock 1901: 44; Rathbun, 1906: 906; Balss, 1927: 247, fig.1; Burkenroad, 1936: 49; Anderson & Lindner, 1943: 298; Crosnier, 1978: 21, pls 7c,d, 8c,d, 9, 10; 1984: 20; 1985: 857; 1989: 41; 1994a: 351; 1994b: 368; Hayashi, 1983d: 440, fig. 61; Kikuchi & Nemoto, 1991: 88, figs 16,17; Dall, 2001: 427, fig. 12.

Benthescymus investigatori, Borradaile, 1910: 258.

Benthescymus Investigatoris, de Man, 1911: 5,14; 1913, pl. 1, fig. 1.

MATERIAL. Station 47, 2♀ 19mm, 1 juvenile, 7mm; Station 78, 7 juveniles 13-17mm; Station 80, ♂, 14mm; Station 93, juvenile 7mm; Station 94, 40 small juveniles; Station 96, 2♂, 21mm, 5F (damaged, approx.22mm); Station 101, 5♀ 17-28mm; Station 114, 2♂, 18-21mm, 2♀ 18-20mm; Station 120, juvenile 6mm; Station 123, 3♀ 17-21mm; Station 129, ♀ 22mm; Station 146, 2♂, 17-19, 6♀ 19-23mm; Station 151, ♂, 17mm; Station 155, 2♀ 21, 22mm; Station 156, 2♂, 19mm, 3♀ 21-23mm; Station 163, ♀ 18mm; Station 167, 4♂, 25mm, 9♀ 18-21mm+10 damaged.

REMARKS. This is one of the commonest *Benthescymus* species, one trawl off NE Queensland yielding 150 specimens (Dall, 2001). It has been recorded throughout the Indo-West Pacific from the east coast of Africa, through the Indian Ocean to Hawaii and the Wallis Islands, including the NW and E coasts of Australia, Lord Howe Rise, Norfolk Ridge, Indonesia, Philippines, Japan.

***Benthescymus howensis* Dall, 2001
(Fig. 1)**

Benthescymus urinator howensis Dall, 2001: 428, fig. 13.

MATERIAL. Station 71, 2♀ 23, 28mm; Station 74, 4♂ 21-25mm, 4♀ 18-23mm; Station 103, 3♂ 15-24mm, 4♀ 23-25mm; Station 120, 2♂ 25-29mm, ♀ 28mm; Station 121, 3♂ 11♀ all damaged; Station 160, ♂, 19mm, 4♀ 20-23mm; Station 163, ♂ 26mm; Station 168, ♂ 24mm.

DIAGNOSIS. Integument soft and thin, carapace often damaged; rostrum reaching the eye, with two fairly prominent dorsal teeth, sometimes with third small tooth or indications thereof; posterior tooth behind margin of

carapace. Antennal and hepatic spines present; branchiostegal spine prominent, situated on margin of carapace with short carina. Cervical sulcus deep, notching mid-dorsum and with lower branch continuous with branchiocardiac sulcus; branchiocardiac carina prominent; postcervical sulcus obscure, marginal carina well developed. Abdomen without postero-median spine on somite 4; without distinct spine on somite 5 in about half of specimens, the remaining half with small spine; somites 5 and 6 dorsally carinate; sixth somite more than twice length of fifth; a complex of feeble lateral carinae and sulci on somites 5 and 6 (Fig. 1F). Merus of second maxilliped expanded, length/width ratio 2.4 (Fig. 1D); dactyl of third maxilliped broadest below its mid-point, tapering distally with one spine at the tip (Fig. 1E). Petasma leaf-like, with short dorsomedian lobule occupying about one third total length of the petasma, distally bluntly pointed, with small rounded projection on the lateral corner; ventrolateral lobule at right angles to the ventromedian lobule, with its lateral margin slightly thickened (Fig. 1B). Thelycum with prominent swelling on the sternite of 5th pereopods, anterior end bluntly pointed; small pointed projection on the 4th sternite (Fig. 1C).

REMARKS. Dall (2001) did not feel justified in erecting a new species on the basis of two females, one of which was damaged, and instead erected the sub-species *B. urinator howensis*. The NORFANZ Cruise specimens (41 including 18 males) have shown that the erection of a species is justified. *B. howensis* is closely related to *B. urinator* Burkenroad, 1936, the principal taxonomic differences being in the lack of a well-defined carina and postero-median spine on abdominal somite 4. Also, the dorsomedian lobule of the petasma, which bears the cincinnuli, is barely one third of the total length of the petasma, whereas in *B. urinator* it is about half the length. A further difference may be in the preferred habitat depth, *B. urinator* so far being collected from depths ranging from 2560-4180m (mean 3558m) compared with 1287-1975m (mean 1483m) for *B. howensis*. While only 13 specimens of *B. urinator* have been collected so far, they have been from a wide range of locations in the Indo-West Pacific: southern Indian Ocean, off the approaches to Torres Strait, northwest Pacific and off Kauai Island, Hawaii (Kikuchi & Nemoto, 1991). *Benthescymus howensis* has so far been collected only from the Lord Howe Rise (type locality) and adjacent West Norfolk Ridge.

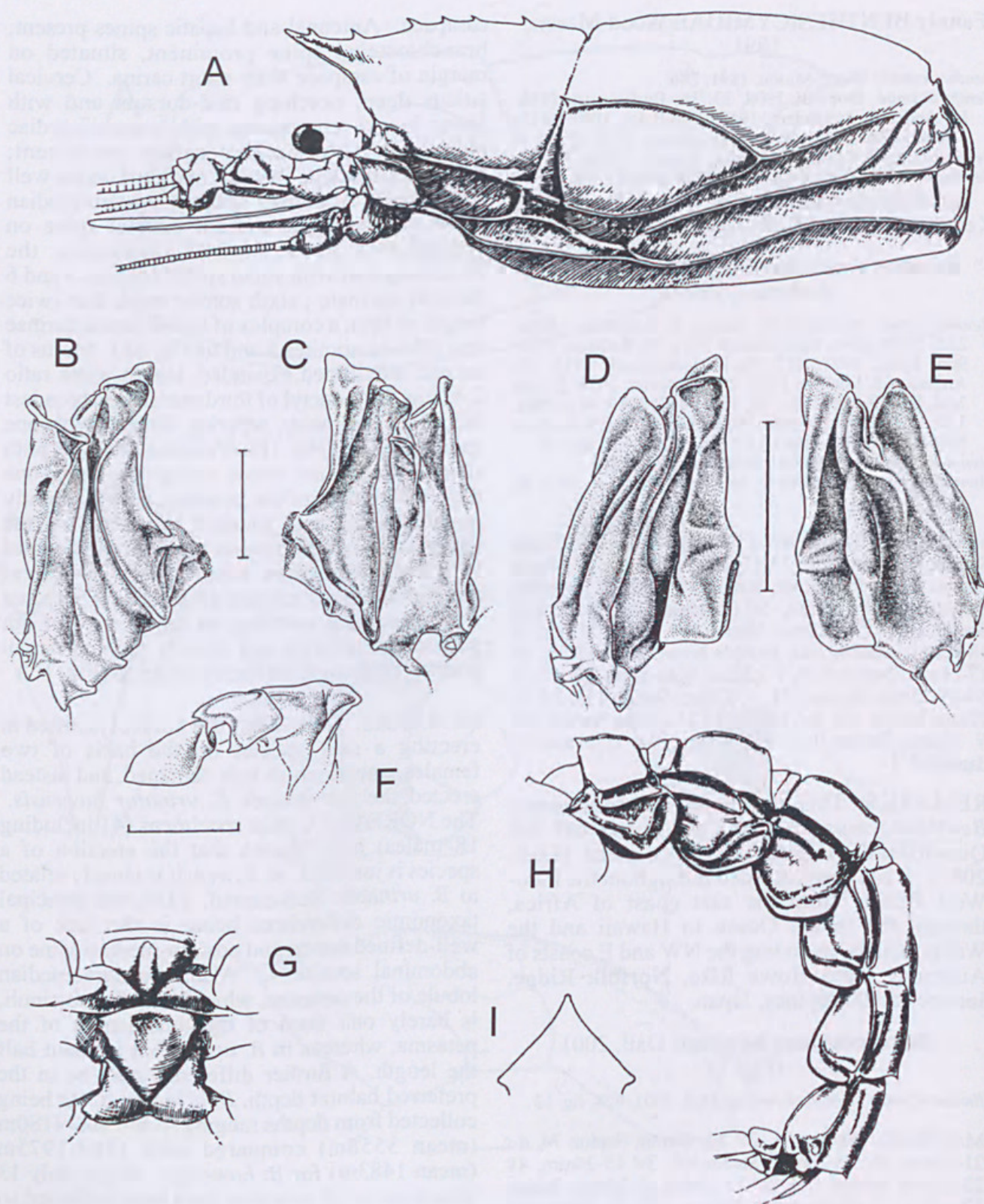


FIG. 2. *Gordonella kensleyi* Crosnier, 1988. ♀ holotype, 53.5 mm, A, anterior half of body, G, thelycum, H, abdomen, I, transverse section of dorsal part of somite 3; B, C, F NORFANZ Cruise, Stn. 103, 33°46'S, 167°29'E, 1430-1460 m, ♂, 53 mm, left half petasma, B, anterior face, C, posterior face, F, upper part viewed from above; D, E, Cruise Halipro, Stn. Bt 82, 23°56'S, 168°28'E, 1846-1869 m, ♂ 47.6 mm, left half of petasma, D, anterior face, E, posterior face. Scale = 5mm. A, G, H, I are reproduced from Crosnier, 1988, with the authorization of © Publications Scientifique du Muséum national d'Histoire naturelle, Paris. B-E are original, executed by J. G. Dejouannet of the Muséum national d'Histoire naturelle, Paris.

Gennadas gilchristi Calman, 1925

Gennadas gilchristi Calman, 1925: 6, pl.1, figs 3, 4; Burkenroad, 1936: 36, fig. 58; Barnard, 1950: 633, 118g, h; Kensley, 1968: 301; 1971: 280, fig. 6; Griffith & Brandt, 1983: 179; Kensley et al., 1987: 277; Iwasaki & Nemoto, 1987; Dall, 2001: 431, fig. 16.

MATERIAL. (All under 9mm); Station 82, ♂; Station 89, ♂; Station 120 ♂; Station 129, ♂; Station 140, ♂; Station 142, ♂, ♀; Station 151, 3 ♀; Station 158, 2 ♂; Station 163, 2 ♀; Station 164, 2 ♂, ♀; Station 166, ♂, 2 ♀

REMARKS. This is a mesopelagic species with a preferred depth range of 200-700m; it is the commonest *Gennadas* species in southeastern and southern Australian seas. Recorded range: off Cape Peninsula and west coast of S. Africa, Argulhas Basin, S. Indian Ocean, S. and SE Australia (33°-45°S), Norfolk Ridge.

Gennadas kempfi Stebbing, 1914

Gennadas kempfi Stebbing, 1914: 283, pl. 27; Calman, 1925:4; Burkenroad, 1936: 68, figs 52, 54; Barnard, 1950: 630, figs 118a-d; Kensley, 1971: 285, fig. 8; Kensley, et al., 1987: 278; Iwasaki & Nemoto: 1987, 38; Dall, 2001: 432, fig. 18.

MATERIAL. Station 163, ♀.

REMARKS. The sole NORFANZ record is almost at the known northern limit (32°S) of this species. It is unique in that it is an Antarctic species, recorded down to 62°27'S, between 115° - 150°E (Iwasaki & Nemoto, 1987).

Known range: SE Indian Ocean, S and SE Australia, Antarctic Ocean, New Caledonia basin, SE Atlantic Ocean, 0-3400m; probably a mesopelagic species.

Family SOLENOCERIDAE Wood-Mason
1891

Solenocerina Wood-Mason, 1891: 275.

Solenocerinae Burkenroad, 1934b: 63; Ramadan, 1938: 56; Crosnier, 1978: 14, 96, 1985: 31; 1988: 563; 1989, 379.

Solenoceridae Pérez Farfante, 1978: 2, 1988: iv, 26; Grey et al. 1983: 14; De Freitas, 1985: 28; Pérez Farfante & Kensley, 1997: 157; Dall, 1999: 555.

For diagnosis and keys see Pérez Farfante & Kensley, 1997 and Dall, 1999.

Gordonella kensleyi Crosnier, 1988
(Fig. 2)

Gordonella kensleyi Crosnier, 1988:597, figs 2e, 12b, 15h,i, 16g.

Haliporus villosus Kensley, 1968.

MATERIAL: Station 47, 2♂ 46, 50mm, ♀ 65mm (damaged); Station 71, 2♂ 44, 51mm, 3♀ 55-69mm; Station 73, 2♂ 22, 42mm, ♀ 22mm; Station 101, 3♀ 58, 68, 68mm (damaged); Station 103, 2♂ 49, 53mm, 2♀ 47, 59mm; Station 168, one, badly damaged.

DIAGNOSIS: Integument glabrous, soft, flexible; cephalothorax bulbous with relatively slender abdomen and long pleopods. Rostrum acute, slender, reaching about middle of second segment of antennular peduncle, with two or three dorsal teeth; four or five postrostral teeth, with indications of additional posterior tooth.

Carapace with post-orbital, antennal, pterygostomial, hepatic and supra-hepatic spines; post-orbital, antennal, hepatic, branchiostegal and accessory carinae present (Fig. 2A). Abdomen with prominent lateral carinae; dorso-median spines on third, fourth and fifth somites; dorsum of third somite acutely pointed (Fig. 2H, I). Petasma (Fig. 2B, F) has cincinuli for about lower one third of inner margin; extremity of ventro-median lobule slightly thickened and bluntly pointed; dorso-lateral lobule poorly defined and ventro-lateral lobule slightly hollowed with blunt angular tip. Thelycum (Fig. 2G) with triangular plate on fifth sternum, apex directed posteriorly, anterior edge slightly convex; fourth sternal plate of similar shape, but smaller with longitudinal, median swelling.

REMARKS. At present there are only three species within this genus: *G. villosa*, *G. paravillosa* and *G. kensleyi*. The first is known only from the type, which is in very poor condition. *G. paravillosa* has been collected off northeast Australia and Indonesia, whereas *G. kensleyi* has been found off South Africa and New Caledonia, as well as the NORFANZ locations of Lord Howe Rise and West Norfolk Ridge. This the first time that males of this species have been collected. The depth range for NORFANZ material was 1132-1934m compared with recorded depths of 1510-2798m.

Hadropenaeus lucasii (Bate, 1881)

Solenocera lucasii Bate, 1881: 185.

Philonicus lucasii Bate, 1888: 62.

Pleoticus lucasii Bate, 1888: 227, pl. 42, fig. 4.

Haliporus Lucasii Bouvier, 1908: 80.

Haliporus lucasii de Man, 1911: 7, 41 43.

Hymenopenaeus lucasii, Burkenroad, 1936; Anderson & Lindner, 1945: 289; Kubo, 1949: 213, figs 8B, 20Q, 27K-N, 66O,P, 72C,I, 80H, 91, 92A-C.

Hymenopenaeus lucasi Crosnier & Forest, 1973: 260; Crosnier, 1978: 115, figs 37f-h, 39c, 43a, 44.

Hadropenaeus lucasi Crosnier, 1989: 44; 1994b: 369; Kensley et al., 1987: 17.

Hadropeneus lucasii Pérez Farfante, 1977; Hayashi, 1984b: 445, fig. 78; Dall, 1999: 560, fig. 5.

MATERIAL. Station 106, ♂ 13mm, 2♀ 16, 18mm; Station 107, 8♀ 15-21.5mm; Station 108, ♂ 20mm; Station 132, 2♂ 10, 13.5mm

REMARKS. All specimens were collected on the West Norfolk Ridge at depths of 121-698m, extending the known depth range; distribution is from Mozambique to Indonesia, NW and E Australia, Wallis Islands, Japan and Hawaii.

***Haliporoides sibogae* (de Man, 1907)**

Haliporus sibogae de Man, 1907: 38; 1911: 7, 38; 1913: pl. 3, fig. 10a-b, pl. 4, fig. 10c-q.

Haliporoides sibogae Pérez Farfante, 1977: 290; Crosnier, 1984: 1989: 44; 1994; Grey et al., 1983: 15; Hayashi, 1984b: 445; Yu & Chan, 1986; Dall, 1999: 562, fig. 6B.

Haliporoides sibogae australiensis Kensley et al., 1987: 562.

Hymenopenaeus sibogae Crosnier, 1978: 104, figs 36a, 38d; 1985: 23.

Parahaliporus sibogae Kubo, 1949: 208, figs 10, 8C, 9A, 14D, 23IJ, 36A-D, 44E, 66Q,R, 68O, 72E,K, 81D, 90.

MATERIAL. Station 6, ♂ 30mm; Station 64, 2♂ 34, 35mm; 3♀ 35-45mm; Station 81, 3♂ 21, 22, 36mm; 2♀ (damaged); Station 82, 2 juveniles; Station 83, 2♂ 33, 35mm; ♀ 30mm; Station 89, 8♂ 22-33mm; 3♀ 43-47mm; Station 108, 2♀ 43-47mm; Station 125, ♀ 38mm.

REMARKS. Nearly all were collected on the Norfolk Rise and West Norfolk Ridge at depths between 542-780m. Range: Madagascar to Indonesia, NW and E Australia, South China Sea, Japan and New Zealand at depths between 100-900m. Has been fished commercially off the New South Wales coast.

***Hymenopenaeus methalli* Crosnier & Dall, 2004**

Hymenopenaeus methalli Crosnier & Dall, 2004: 17.

MATERIAL. Station 43, ♂ 17mm; 2♀ 16-21mm; 9 juveniles, damaged; Station 80, 2♀ 20mm; Station 102, 3♂ 12, 20, 20mm; Station 108, 2♂ 20mm; Station 147, 2♀ 20, 25mm.

REMARKS. Station at 26°25.94'S was at the northern limit of the Cruise; the remainder were either on the Lord Howe Rise or West Norfolk Ridge, depth 750-1478m., but the sole record at 1478m is exceptional, with 930m the maximum recorded elsewhere. The type locality is NW of New Caledonia, 19°42.40'S, 158°50.80'E. and it has been collected around New Caledonia, Vanuatau, Chesterfield and Tonga Islands, at 650-930m.

***Hymenopenaeus neptunus* (Bate, 1881)**

Haliporus neptunus Bate, 1881, 1888; de Man, 1911.

Hymenopenaeus neptunus Crosnier & Forest, 1973: 128; Crosnier, 1984: 24; 1989: 49, 51; 1994a: 353; 1994b: 370; Dall, 1999: 567, fig. 8C.

MATERIAL. Station 73, ♂ 17mm; ♀ (no carapace, similar size to male); Station 101, ♀ 16mm; Station 114, 2♂ 20, 21mm; 2♀ 21, 25mm.

REMARKS. The above stations were either on the southern part of the Lord Howe Rise or the West Norfolk Ridge at depths from 1132m to 1470m. This species has been collected from the Indian Ocean to Indonesia, the Philippines, NE Australia, Wallis Islands, depth range 700-1500m, most below 1000m.

***Hymenopenaeus obliquirostris* (Bate, 1881)**

Haliporus obliquirostris Bate, 1881: 186; 1888: 286, pl. 41, fig. 2.

Hymenopenaeus obliquirostris Crosnier & Forest, 1973: 264, fig. 87e; Crosnier 1989: 49, figs 2c, 4a,b; Pérez Farfante & Kensley, 1997: 173; Lee et al., 2001: 58, figs 2G-K, 3K,L, pl. 1D; Crosnier & Dall, 2004: 3, figs 3-5.

MATERIAL. Station 73, 4♂ 18-21mm; 2♀ 20, 24mm; Station 114, 2♂ 22, 23mm; 3♀ 22, 24, 24mm; Station 121, 3♀ 22, 25, 25mm; Station 123, ♂ 21mm; 2♀ 21, 27mm; Station 142, ♀ 25mm; Station 146, 2♂ 18, 21mm; 2♀ 18-31mm; Station 160, ♂ 19mm.

REMARKS. This species was restricted to the southern part of the Lord Howe Rise and the West Norfolk Ridge, at depths between 969 and 1345m. Until recently the only record of this species was off the Kermadec Islands by the HMS Challenger (Bate, 1881). It was recorded around Taiwan by Lee et al. (2001) and in the waters around New Caledonia, as well as the present locality, by Crosnier & Dall (2004). The depth range is 632-1345m.

***Solenocera comata* Stebbing, 1915**

Solenocera comatum Stebbing, 1915: 67, pls 13,14; Barnard, 1950: 617, figs 113k, 114; Kensley, 1972: 18, fig. 7c-e; 1974: 70.

Solenocera comatus Burkenroad, 1934: 71; 1939: 6; Anderson & Lindner, 1945: 287.

Solenocera brevipes Kubo, 1949: 246, figs 1S, 8X, 20N, 27F-H, 45D, 66IJ, 72Q,W, 80A, 98H-J, 99, 100.

Solenocera comata Crosnier, 1978: 139, figs 48b, 49b, 50d, 51b-e, 52b; 1984: 869; 1985: 869; 1994: 355; Hayashi, 1984a: 358; Dall, 1999: 577, fig. 16.

MATERIAL. Station 20, 6 juveniles; Station 106, ♂ 14mm, ♀ 15mm.

REMARKS. The absence of *Solenocera* species from most of the collections on this cruise may have been due to two factors: first, most of the trawls were at depths greater than 700m, whereas most *Solenocera* species recorded in the southwest Pacific prefer depths up to 500m; second, they are inhabitants of soft, silty bottoms, which are lacking in the area covered by the Cruise. *S. comata* was collected on the Norfolk Ridge at depths of 126-227m. The known range is the western Indian Ocean, Indonesia, Timor Sea, Philippines, Japan, at 90-460m.

Family SICYONIIDAE Ortmann, 1898

Sicyoninae Ortmann, 1898: 1121; Balss, 1957: 1520.

Eusicyoninae Burkenroad, 1934: 116.

Sicyonidae Grey et al., 1983: 13, 31.

Sicyoniidae Pérez Farfante & Kensley, 1997: 152, Crosnier, 2003: 201.

***Sicyonia inflexa* (Kubo, 1949)**

Eusicyonia inflexa Kubo, 1949: 458, figs. 8O, 48D, 77C,I, 79G, 159, 160A-F.

Sicyonia inflexa Starobogatov 1972: 410, pl.11, fig.148b-e; Miyake, 1982: 173, Hayashi, 1985a: 142; 1985b: 196, figs 88c, 89c, 91d; 1986: 81, fig. 40; 1992: 151, figs 83c, 84c, 86d; Crosnier 2003: 267.

Sicyonnia inflexa Crosnier, 1985a: 46.

Eusyconia longicauda Stebbing 1914; Barnard, 1950.

Sicyonia longicauda Kensley, 1972:24; 1977:15; 1981,20; de Freitas 1984a:29.

MATERIAL. Station 6, ♀ 10mm; Station 55, ♀ (newly moulted); Station 82, ♂, 2♀; Station 94, ♀ damaged; Station 107, 3♀; Station 126, ♀; Station 150, ♀; Station 154, 5♂, 31 ♀.

REMARKS. Collected on the Norfolk Ridge, the Lord Howe Rise and the West Norfolk Ridge, 292-1150m. Extensively collected from South Africa, Mozambique, Madagascar, Indonesia, N.W. Australia, around New Caledonia, Chesterfield Islands, Tonga, Fiji, Philippines, Taiwan and the South China Sea and Japan, 260-936m.

***Sicyonia truncata* (Kubo, 1949)**

Eusicyonia truncata Kubo, 1949.

Sicyonia truncata Starobogatov, 1972: 412; Kensley, 1972: 24; 1981: 20; de Freitas 1984a: 29; 1984b: 3; Hayashi 1985a: 29; 1985c:261; 1992: 152, 162; Burukovsky, 1991: 36; 1992: 495; Takeda & Hanamura, 1994: 11; Crosnier 2003: 238.

Sicyonia laevis Rathbun, 1906.

Sicyonia longicauda Rathbun, 1906 (in part).

MATERIAL. Station 20, 10 juveniles, 4 – 8mm.

REMARKS. Near Norfolk Island, 322-327m. Recorded from South Africa, Madagascar, Indonesia, N.W. Australia, New Caledonia, Chesterfield Islands, Vanuatu; Fiji, Tonga, Hawaii, Japan, 110-510m depth.

Family PENAEIDAE Rafinesque-Schmaltz, 1815

Penedia Rafinesque-Schmaltz, 1815

Penaeidae Dana, 1852a, b; Boas, 1880; Bate 1881, 1888; Ortmann, 1898; Alcock, 1901; Bouvier, 1908; de Man, 1911; Barnard, 1950; Balss, 1957; Pérez Farfante, 1978; Williams, 1984; de Freitas, 1987; Pérez Farfante, 1988; Dall et al., 1990, Pérez Farfante & Kensley, 1997.

Penaeinae Ortmann, 1898; Bouvier, 1908; Burkenroad, 1934b; Balss, 1957.

Parapenaeinae Ortmann, 1898.

Funchaliae Bouvier, 1908; Balss, 1957.

Haliporae Bouvier, 1908; Balss, 1957.

Funchaliinae Burukovsky & Romensky, 1991.

REMARKS. The Penaeidae is the best known and most numerous of the five families of the Penaeoidea, but two factors may have contributed to the paucity of species of this family on the NORFANZ Cruise: 1) the majority of penaeids inhabit coastal waters less than about 200m depth and most of the NORFANZ collections were made in depths greater than this; 2) seamounts and ridges lack the extensive soft sands and muds characteristic of inshore areas, which are the preferred benthic environment of the most abundant penaeids.

***Funchalia villosa* (Bouvier, 1905)**

Hemipenaeopsis villosa Bouvier, 1905 (part).

Grimaldi richardi Bouvier, 1905 (part).

Funchalia woodwardi Bouvier, 1908 (part); Lens & Strunck, 1914.

Funchalia vanhoffeni Lenz & Strunck, 1914:303.

?*Funchalia* Gurney, 1924.

Funchalia villosa Burkenroad, 1936:129; Dall, 1957:163; Crosnier & Forest, 1973:19; Grippa, 1976:80; Kensley, 1977:17; Griffiths & Brandt, 1983:177; Crosnier, 1985:869; Kensley et al., 1987:281; Burukovsky & Romensky, 1991:31.

MATERIAL. Station 71, 2♂ 15, 16mm; ♀ 18mm.

REMARKS. This is a pelagic species (Kensley et.al., 1987) but was collected in a "ratcatcher" trawl at 1920-1934m, so presumably was caught when the trawl was being recovered. *Funchalia villosa* has a world-wide, though scattered, distribution. Dall (1957) reported that the Lord Howe Island collection was at that time the first authentic record for the Southern Hemisphere, but Griffiths & Brandt (1983) found that it was commonly associated with warm water eddies in the surface waters down to about 200m.

***Metapenaeopsis velutina* (Dana, 1852)**

Penaeus velutinus Dana, 1852: 604; 1885:pl. 11, fig. 4; Bate, 1881: 175 (part).

Metapenaeus velutinus Rathbun, 1906:903.

Metapenaeopsis velutina Starobogatov, 1972: 406, 409; Burukovsky, 1974: 36(key); 1983: 49; Crosnier, 1991: 247.

Metapenaeopsis insona Racek & Dall, 1965:41; Starobogatov, 1972: 406, 408; Burukovsky, 1983: 50.

Metapenaeopsis caliper Liu & Zhong, 1988: 238, 269.

MATERIAL. Station 59, 20 juveniles, 8-11mm; Station 61, ♂ 12mm, ♀ 17mm, plus a large number of juveniles; Station 67, ♂ 8mm, 2♀ 9, 10mm.

REMARKS. All the *M. velutina* were collected in the vicinity of Middleton Reef and Lord Howe Island. Station 59 was recorded as being made with an ORH trawl at 1600m, whereas Stations

TABLE 1. List of Stations where Penaeoidea were Collected. *Region: SNR = South Norfolk Ridge; NNR = North Norfolk Ridge; LHP = Lord Howe Plateau; WNR = West Norfolk Ridge. **Gear code: 10 = ORH trawl. A deep water rough bottom wing trawl used in the Orange Roughy fishery with proven record for seamount fishing; 60mm cod-end option. 11 = Nicknamed "Ratcatcher". A 40mm cod-end wing trawl designed for close bottom fishing for juvenile Orange Roughy on flat soft bottom. 13 = Beam trawl. French design with previous success for sampling invertebrate epifauna on similar voyages. 20 = NIWA sled. Used successfully for sampling seamounts on previous French cruises. 21 = Sherman epibenthic sled, 1.9 m x 2.2 m x 0.8 m high, with 25 mm cod-end mesh. 53 = Midwater

Station No.	*Region	Time	Latitude	Longitude	Depth range(m)	**Gear code
2	SNR	1615	34 09.37	171 27.79	544-584	10
3	"	1937	34 03.21	171 08.1	1051-1320	10
6	"	0206	34 09.14	171 27.95	542-554	21
8	"	0622	34 09.75	171 27.33	558-573	21
16	"	0959	29 59.62	167 38.73	1245-1285	10
20	"	1926	29 41.84	168 02.62	322-337	13
27	"	1907	28 54.47	167 41.04	110-441	10
28	"	2121	28 51.94	167 40.59	718-859	10
33	NNR	1853	28 29.37	167 47.15	1056-1116	10
43	"	1031	26 25.94	167 10.87	750-774	13
44	"	1250	26 23.53	167 01.21	1019-1030	10
47	"	0227	28 29.88	161 15.56	1530-1530	11
55	"	1237	29 13.12	159 00.45	292-330	20
59	"	1922	29 14.97	159 02.72	1600-1600	10
61	"	2133	31 49.11	159 20.74	86-89	21
63	"	0307	31 42.53	159 07.93	798-880	10
64	"	0518	31 40.55	159 09.43	587-700	10
66	"	1054	31 45.73	159 20.93	565-960	21
67	"	1316	35 35.83	169 33.43	72-82	21
71	"	0030	32 03.98	159 52.80	1920-1934	11
72	LHP	0740	32 11.59	160 51.66	1342-1361	11
73	"	1434	32 25.94	161 47.62	1132-1197	11
74	"	1906	32 26.08	161 45.36	1171-1259	10
77	"	0020	32 26.70	161 46.95	1130-1147	13
78	"	0455	32 39.33	162 33.11	864-870	13
80	"	0954	32 42.50	162 33.86	850-872	11
81	"	1916	34 01.95	162 35.96	780-818	11
82	"	0106	34 12.44	162 39.50	758-760	13
83	"	0320	34 11.83	162 37.10	761-765	10
86	"	0833	34 11.06	162 39.19	430-740	21
89	"	1349	34 12.18	162 41.18	748-772	11
90	"	1951	34 12.17	163 21.36	1090-1117	11
91	"	2217	34 12.41	163 17.20	1076-1083	13
92	"	0038	34 12.70	163 21.59	1080-1120	10
93	WNR	1854	33 49.47	167 03.45	804-944	10
94	"	2124	33 49.50	166 58.80	950-987	13
95	"	2326	33 49.24	167 03.35	805-938	11
96	"	0433	33 37.10	166 55.60	1017-1042	11
101	"	1922	33 45.20	167 28.30	1410-1470	10
102	"	2220	33 42.45	167 27.03	1451-1478	13
103	"	0055	33 46.55	167 29.28	1431-1460	11

TABLE 1. (continued).

Station No.	*Region	Time	Latitude	Longitude	Depth range(m)	**Gear code
106	"	1100	32 37.58	167 35.17	121-126	13
107	"	1405	32 36.49	167 43.98	699-707	13
108	"	1547	32 35.67	167 44.12	698-724	11
114	"	0641	32 35.22	167 47.66	1021-1052	11
119	"	1501	32 32.65	167 47.05	957-977	10
120	"	1747	32 36.57	167 50.33	1303-1313	10
121	"	2132	32 36.39	167 50.59	1331-1345	13
123	"	0249	32 36.23	167 47.09	926-969	11
125	SNR	1832	33 23.60	170 09.53	605-622	21
126	"	1931	33 23.41	171 11.58	469-526	21
128	"	2314	33 23.57	170 09.95	627-662	10
129	"	0450	33 29.24	170 00.71	1158-1230	10
132	"	1057	33 22.61	170 12.70	514-540	21
140	WNR	1403	34 19.14	168 24.63	831-846	10
141	"	1611	34 17.09	168 21.50	785-800	13
142	"	1903	34 16.49	168 24.08	1246-1249	10
145	"	2346	34 17.84	168 25.82	1251-1268	21
146	"	0306	34 14.43	168 21.18	1195-1202	11
147	"	0523	34 18.14	168 23.18	809-857	11
150	"	1346	34 34.99	168 55.54	1000-1150	21
151	"	1641	34 34.13	168 56.48	1013-1340	10
154	"	2232	34 37.20	168 57.03	521-539	13
155	"	0035	34 34.81	168 57.79	813-1000	11
156	"	0241	34 34.26	168 56.53	1013-1350	11
158	"	1055	35 10.27	169 29.24	867-869	13
159	"	1228	35 08.12	169 28.37	868-872	11
160	"	1735	34 58.85	169 29.60	1288-1294	11
163	"	2353	34 59.13	169 26.50	1278-1287	10
164	"	0409	35 15.70	169 38.25	771-772	10
166	"	0734	35 17.17	169 33.63	815-867	10
167	"	1200	35 35.83	169 33.43	1760-1789	11
168	"	1614	35 56.46	170 01.01	0-1975	53

61 and 67 were made with a Sherman dredge at 72-89m. The greatest depth recorded in the literature is 320m, so the 1600m for Station 57 is questionable. *M. velutina* has been recorded from the Seychelles, NW. and E. Australia, South China Sea, Philippines, New Caledonia, Hawaii, 55-320m.

SIGNIFICANCE OF THE NORFANZ PENAEOIDEA

The area of the NORFANZ Cruise was between 159° E and 172° E, immediately to the south of the New Caledonia Region. The waters around this island and further east, south of the equator, as far as French Polynesia have been thoroughly investigated by the Centre IRD in

New Caledonia during the last 25 years. Over 95 species of Penaeoidea have been identified in a region previously thought to be very limited in species numbers (A. Crosnier, pers. com.). The NORFANZ collection might therefore have been expected to be essentially similar to that of the New Caledonia Region but two factors would have modified the species composition: 1) Depth. Most NORFANZ trawls that collected penaeoids were made in depths greater than 400 m (Table 1). The Penaeidae, Solenoceridae and Sicyoniidae usually inhabit waters less than about 400m deep – only 5 NORFANZ stations out of 73 that collected penaeoids were in this category. Aristeidae and Benthescymidae generally inhabit deeper waters i.e. below 400m

and so depth is not a major limiting factor in species diversity of these families. 2) Latitude. The Cruise was in subtropical waters (approx. 26°–36°S). The greatest diversity of penaeoid species is within the tropics (Dall et al., 1991). This factor would eliminate homeothermous tropical species but include sub-tropical species e.g. in the NORFANZ collection, *Austropenaeus nitidus*, range 26°–40° S, and *Gennadas kemp*i, range 32°–62° S, (Dall, 2001).

Three species in the NORFANZ collection are cosmopolitan in their distribution (*Aristaeomorpha foliacea*, *Aristaeopsis edwardsiana* and the pelagic *Funchalia villosa*). Twelve extend through the Indo-West Pacific (*Aristeus mabahissae*, *A. virilis*, *Hepomadus tener*, *Benthescymus investigatoris*, *Gennadas gilchristi*, *Hadropenaeus lucasii*, *Haliporoides sibogae*, *Hymenopenaeus neptunus*, *Solenocera comata*, *Metapenaeopsis velutina*, *Sicyonia inflexa*, *S. truncata*). All of these species have been recorded for E. Australia (Crosnier, 1991, 2001; Dall, 1999, 2001) so these records can be regarded as extending their known range into the eastern sub-tropics of the Tasman Sea.

The rare species, *Gordonella kensleyi*, has been recorded in the Mozambique Channel and immediately south of New Caledonia (Crosnier, 1988), so the NORFANZ record extends its range. It will probably be found in eastern Australia and other intermediate locations. Until recently the only record of *Hymenopenaeus obliquirostris* was from the Kermadec Islands by the CHALLENGER in 1881, but it has now been found around Taiwan (Lee et al., 2001), New Caledonia and the NORFANZ area (Crosnier & Dall, 2004). With such widely separated locations it is likely to be found in intermediate areas. *Hymenopenaeus methalli* is reported from the New Caledonia Region as far as Tonga and in the NORFANZ area, a limited range for a member of this genus.

Overall the NORFANZ collection gives no indication that the area is faunistically isolated for the Penaeoidea, except for *Benthescymus howensis*, which has not been collected outside the NORFANZ area. All other species collected have a wide distribution at least in the southwest Pacific, most in the Indo-West Pacific. The types of *Benthescymus howensis* were from the Lord Howe Rise, but specimens were also collected by NORFANZ on the West Norfolk Ridge. Since this ridge extends well into the New Caledonia

Region, it is likely that *Benthescymus howensis* has a wider distribution.

Since the Penaeoidea probably all have planktonic larvae, endemism on seamounts and ridges of the Tasman Sea is unlikely. Many of the adults of the species collected by the NORFANZ are bathypelagic or mesopelagic, but even if an adult population on a seamount was surrounded by depths well beyond their normal range, their planktonic larvae could bridge these in time.

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