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 Aristaeus mabahissae, Aristaeomorpha foliacea, Austropenaeus nittidus, plus Aristaeus virilis, Aristaeopsis edwardsianus, Hepomadus tener. Benthesicymidae: Benthesicymus investigatoris, B. howensis, Gennadas gelchrisi, G. kempf. Solenoceridae: Gordonella kensleyi, Hadropenaeus lucasti, Hippurus 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 Benthesicymus urinator howensis indicate it should be raised to specific rank.

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

Aristaeidae Wood-Mason, 1891: 278.

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

MATERIAL. Station 2, 3, 12, 28, 33mm; Station 3, 30mm; Station 27, 34mm, 9, 37mm; Station 28, 9, 30mm; Station 43, 37mm; Station 80, 9, 17mm; Station 81, 27, 25mm, 9, 39mm; Station 86, 3 juveniles 10-14mm; Station 89, 3 juveniles 7-12mm, 2, 23-26mm, 9, 25-40mm; Station 94, 9, 19.5mm; Station 108, 5, 25-38mm, 10, 14-42mm; Station 140, 9, 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. 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 species of the Aristeidae, ranging from the West Pacific, the Mediterranean Sea, Japan, Wallis Islands (Dall, 2001) 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.

Aristaeus mabahissae Ramadan, 1938

MATERIAL. Station 3, 9, 43mm; Station 16, 2, 34mm, 9, 47mm; Station 33, 3, 35mm, 9, 51mm; Station 63, 29, 36, 41mm; Station 73, 3, 25, 32, 35; Station 74, 5, 48-53mm; Station 80, 6, 16-31mm, 10, 23-45mm; Station 81, 3, 24mm, 19, 18-40mm; Station 90, 5, 32-54mm, 3, 40-51mm; Station 92, 3, 32mm, 9, 44-51mm; Station 93, 9, 39-41mm; Station 94, 9 juveniles, 9-12mm; Station 95, 9, 27, 69, 40-51mm; Station 96, 5, 31mm, 6, 33-50mm; Station 101, 6, 41-62mm; Station 103, 5, 35-62mm; Station 114, 2, 30, 31mm, 6, 25-70mm; Station 119, 2, 19-34mm, 6, 20-49mm; Station 123, 5, 26-43mm, 9, 19-48mm; Station 128, 9, 37-52mm; Station 140, 4, 11-41mm; Station 141, 29, 22-33mm; Station 146, 34, 35, 50mm; Station 147, 5, 16-32mm, 49, 28-45mm; Station 151, 45, 35-47mm; Station 151, 5, 30-31mm, 5, 41-50mm; Station 156, 4, 43-51mm; Station 159, 15, 18-45mm; Station 160, 2, 46, 53mm; Station 166, 9, 5.5mm.

REMARKS. Although the largest collection of penaeoids on this Cruise, this species is sparse in the northern part of the Cruise area, more numerous on the West Norfolk Ridge. It was frequent on the Lord Howe Rise, and most numerous on the East Pacific Rise. It was trolled 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 Aristaeus are closely similar, difficult to separate and prior to Crosnier (1978), depended on relative lengths of pereopod segments for separation. Crosnier (1978, 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. semidentatus, 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 of *A. semidentatus* 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., 1968: 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; Kenseley et al., 1987: 281; Dall, 2001: 416, fig. 4B.

**Material.** Station 43, 9, 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.

**Austropeneus nitidus** (Barnard, 1947)


*Austropeneus nitidus* Dall, 2001: 417, fig. 5.

**Material.** Station 47, 9°, 31-39mm; Station 66, 9°, 17mm; Station 72, 2°, 25,26mm, 20°, 33-39mm; Station 73, 5°; Station 77, 9°, 33mm; Station 90, 2°, 21, 24mm, 6°, 29-34mm; Station 91, 2°, 21, 23mm, 9°, 30mm, 4 juveniles; Station 92, 49°, 28-37mm; Station 92, 0°, 22mm, 5°, 28-37mm; Station 101, 4°, 33-39mm; Station 103, 5°, 29-42mm; Station 121, 0°, 26mm, 9°, 23mm; Station 142, 3°, 26-38mm; Station 145, 9°, 16mm; Station 146, 8°, 18-23mm, 11°, 15-25mm, Station 150, 9°, 22mm; Station 151, 2 juveniles; Station 155, 0°, 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 *Austropeneus 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; Perez Farfante, 1973: 442, figs 1-8; Crosnier, 1985: 860; 1994: 369; Dall, 2001: 419, fig. 7.

**Hepomadus tener** Wood-Mason, 1891: 189.

**Aristeus (Hepomadus) tener** Alcock, 1901: 42.

**Hepomadus glacialis** Milne Edwards & Bouvier, 1909: 194, figs 13-19, pl.1, fig.3.

**Material.** Station 47, 9°, 41mm, 9°, 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. *Benthesicymus 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

Benthesicymina Wood-Mason, 1891: 286.

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

Benthesicymus investigatoris Alcock & Anderson, 1899

Benthesicymus 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; 1990a: 351; 1994b: 368; Hayashi, 1983d: 440, fig. 61; Kikuchi & Nemoto, 1991: 88, figs 16,17; Dall, 2001: 427, fig. 12.

Benthesicymus investigatori, Borradaile, 1910: 258.

Benthesicymus 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); Station101, 5♀ 17-28mm; Station114, 2♂, 18-21mm, 2♀ 18-20mm; Station 120, juvenile 6mm; Station 123, 3♀ 17-21mm; Station 129, ♀ 22mm; Station146, 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♀ 19-21mm=10 damaged.

REMARKS. This is one of the commonest Benthesicymus 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.

Benthesicymus howensis Dall, 2001

(Fig. 1)

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

MATERIAL. Station 71, 2♀ 23, 28mm; Station 74, 4♂ 21-25mm, 4♀ 18-23mm; Station103, 3♀ 15-24mm, 4♀ 23-25mm; Station 120, 2♂ 25-29mm, ♀ 28mm; Station 121, 3♀ 11♀ all damaged; Station 160, ♂, 19mm, 4♀ 20-23mm; Station163, ♂, 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 cincinuli, 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). Benthesicymus 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 = 5 mm. A, G, H, I are reproduced from Crosnier, 1988, with the authorization of © Publications Scientifiques 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, σ, Station 89, σ, Station 120 σ, Station 129, σ, Station 140, δ; Station 142, σ, δ; Station 151, 3 δ; Station 158, 2 δ; Station 163, 2 δ; Station 164, 2 σ, δ; Station 166, 2 σ, 2 δ.

**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 kensleyi** Stebbing, 1914

*Gennadas kensleyi* 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, 9.**NOTE:** Section of this page is missing.

**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. This the first time that males of this species have been collected. The depth range for *Gennadas 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.

**Hadropeneus lucasii** (Bate, 1881)

*Solenocera lucasii* Bate, 1881: 185.

*Philonicus lucasii* Bate, 1888: 62.

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

*Haliporus lucasi* Bouvier, 1908: 80.

*Haliporus lucasi* de Man, 1911: 7, 41 43.


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


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

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

**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, pterygostomian, 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 northeastern 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 these species have been collected. The depth range for NORFANZ material was 1132-1934m compared with recorded depths of 1510-2798m.
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.

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

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


*Hyaliporidae sibogae* australiensis Kensey et al., 1987: 562.


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


**RemARKS.** The absence of 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; Kensey, 1972: 18, fig. 7c-e; 1974: 70.


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

**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 on 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.

*Hymenopenaeus methalli* Crosnier & Dall, 2004

*Hymenopenaeus methalli* Crosnier & Dall, 2004: 17.

**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.

**Hymenopenaeus obliquirostris** (Bate, 1881)

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

*Hyaliporus obliquirostris* Crosnier & Forest, 1973: 264, fig.87c; Crosnier 1989: 49, figs 2c, 4a,b; Pêrez Farfante & Kensey, 1973; 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 112, 2° 22, 23mm; 3° 22, 24, 24mm; Station 121, 3° 22, 25, 25mm; Station 123, 3° 21, 21, 27mm; Station 142, 2° 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 or 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.

*Hymenopenaeus methalli* Crosnier & Dall, 2004

*Hymenopenaeus methalli* Crosnier & Dall, 2004: 17.

**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.
Family SICYONIIDAE Ortmann, 1898

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

Sicyoniidae Burkenroad, 1934: 116.

REMARKS. Near Norfolk Island, 322-327m.

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

Sicyonia truncata (Kubo, 1949)


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

Sicyonia inflexa Crosnier, 1985a: 46.

Sicyonia inflexa (Kubo, 1949)

Station 6, 9 10mm; Station 55, 9 (newly moulted); Station 82, 2v; Station 94, 9 damaged; Station 107, 39; Station 126, 9; Station 150, 9; Station 154, 59, 31 9.

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.


MATERIAL. Station 6, 9 10mm; Station 55, 9 (newly moulted); Station 82, 2v; Station 94, 9 damaged; Station 107, 39; Station 126, 9; Station 150, 9; Station 154, 59, 31 9.

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)

Sicyonina truncata Kubo, 1949.


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

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.

Penaeinae Ortmann, 1898.

Funiculinae Bouvier, 1908; Balss, 1957.

Haliporinae Bouvier, 1908; Balss, 1957.


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).

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


Funchalia woodwardii Bouvier, 1905 (part).

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.


MATERIAL. Station 59, 20 juveniles, 8-11mm; Station 61, 9 12mm, 17mm, plus a large number of juveniles; Station 67, 9 8mm, 29 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.

<table>
<thead>
<tr>
<th>Station No.</th>
<th><em>Region</em></th>
<th>Time</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Depth range(m)</th>
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</table>

**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 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
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 PENAEOIDA**

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 Penaeoidae 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 400m (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. Aristidae 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, Austropeneaus nitidus, range 26°–40° S, and Gennadas kempfi, 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; Benthesicymus investigatoris, Gennadas gigchristi, Hadropenaeus lucasti, Haliporoides sibogae, Hymenopenaeus neptunus, Solenocera comata, Metapeneaus velutina, Sicynia 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 Benthesicymus 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 Benthesicymus 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 Benthesicymus 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.

ACKNOWLEDGEMENTS

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