

Davie, P. J. F. and Short, J. W., 2001. Decapod Crustacea of North East Cay, Herald Cays, Coral Sea. *In: Herald Cays Scientific Study Report. The Royal Geographic Society of Queensland Inc. Geography Monograph Series 6: 75–86.*

[Other publications by John W. Short](#)

Decapod Crustacea of North East Cay, Herald Cays, Coral Sea

Peter J.F. Davie and John W. Short

Queensland Museum, PO Box 3300, South Brisbane, Qld 4101

Abstract North East Cay, Herald Cays, Coral Sea was surveyed for decapod crustaceans. 125 species were recorded plus some incidental collections of other crustacean groups. Of the decapods, nine species appear to be as yet undescribed, and 16 are newly recorded for Australian territorial waters. The species present have predominantly wide-ranging Indo-West Pacific distributions. Notes on abundance and habitat preference are provided.

Introduction

The present study was undertaken as part of a multidisciplinary "Herald Cays Scientific Study" organised by The Royal Geographical Society of Queensland from 15 - 28 June 1997.

The survey was confined to North East Cay, and because of strong winds, most of the collecting was restricted to patch reefs on the back reef slope on the more sheltered western side, and to the reef flat and intertidal zone.

North East Cay is situated on the central part of the Coral Sea Plateau, in the western Coral Sea at 16°56'S and 149°11'E, and about 350 km east of Cairns. It is separated from the Great Barrier Reef (GBR) region by the deep water Queensland Trough. It is one of six islets and cays of the Coringa-Herald National Nature Reserve declared in 1982 under the Australian Government *National Parks and Wildlife Conservation Act*.

There has been very little earlier work on the Crustacea of this area, although John Yaldwyn, a Curator of Crustacea at the Australian Museum in the 1960s, visited North East Cay and West Diamond Islet (McMichael & Yaldwyn 1965), spending about eight days collecting at each. Specimens from that trip have been reported in at least one subsequent taxonomic treatise (Griffin & Tranter 1986). The most comprehensive general report on the fauna of the region by Ayling and Ayling (1984) made no mention of the Crustacea.

Scope

The intention was to make a qualitative, representative collection of the decapod crustaceans occurring in a variety of habitats on North East Cay. A thorough knowledge of the

faunal composition, and the part each species plays in reef ecology, is vital to effective monitoring and management of any marine reserve. Another outcome of such a survey will allow the comparison of the composition of this fauna with that of similar reefal environments in eastern Queensland and northern Australia so as to gain an understanding of the biogeography of this relatively isolated reef system. Finally, it was the hope of a Museum scientist, that such an isolated pristine area would yield species as yet unreported by science.

Methods

Intertidal and terrestrial species were collected while active on the surface, from under upturned beach rock and coral, or dug from burrows. Reef flat species were collected by reef walking and snorkelling where not exposed. Subtidal collections were made using SCUBA — conspicuous fauna was hand collected but most species were found only after samples of the substrate, dead and living corals, and other potential invertebrate hosts, were collected and brought back to shore for careful inspection. These were each placed individually into plastic bags whilst underwater so that hosts would not be confused, and species associations would be maintained. On the shore, coral or substrate samples were carefully broken up, washed, and sieved to isolate the infauna. All specimens were preserved in 75% alcohol.

Results

A total of 125 species of decapod crustaceans were recorded, plus a few non-decapods belonging to other crustacean groups. These

are listed in taxonomic order in Appendix 1. The specific site data for the 16 sampling sites is presented in Appendix 2. For about 100 species, the identifications are considered reliable. Of the remaining, some have been identified with some reserve because the material was juvenile or damaged and missing diagnostic characters whilst for others, the group to which they belong has been so poorly studied that taxonomic problems make certainty impossible.

Up to nine apparently undescribed species were found: *Alpheus* ? sp. nov.; *Periclimenes* ? sp. nov. (nr *P. cornutus*); *Onycochelis* ? sp. nov.; *Periclimenella* aff. *spinifera* (De Man, 1902); *Periclimenes* aff. *ceratophthalmus* Borradaile, 1915; *Periclimenes* sp. nov.; *Aniculus* ? sp. nov. (nr *retipes*); *Elamena* sp. nov.; and *Oncinopus* sp. nov.

Sixteen species (see Table 1) are new records for Australian territory, and many mark significant range extensions. The rare *Nikoides maldivensis* Borradaile, 1915, is an interesting find as it was previously known from only seven specimens.

The 125 species found during 10 person-days collecting represents a reasonably rich decapod fauna and is similar to, or even

slightly greater than, reefal environments along the Kimberley coast of northwestern Australia as reported by Davie and Short (1995, 1996). The diversity, however, is significantly less than some more directly comparable oceanic coral reef systems that we have surveyed off north-western Australia, viz. Cartier Reef (161 spp.) and Hibernia Reef (152 spp.) from 6 person-days collecting at each reef. These reefs are relatively closer to the rich Indo-Malayan Province, and the coral environments are much richer with greater coral coverage and a subsequent greater complexity of niches. A comparison of *Brachyura* (crabs) from several reef systems that we have surveyed with similar methods and intensity is given in Table 2. As would be expected because of its more tropical latitude, North East (Herald) Cay is more diverse than the Elizabeth/Middleton Reefs, of the northern Tasman Sea.

In terms of coral coverage and niche complexity, the reef flat at North East Cay was particularly disappointing. As reported by Ayling and Ayling (1984) there was very low coral coverage, and powerful wave action and strong tidal currents have meant that most of the reef surface is hard and consolidated. There is thus

Table 1: Species new to Australian territorial waters with their previously known distributions

Species	Distribution
<i>Discias musicus</i> Holthuis, 1981	Mariana Islands, West Pacific.
<i>Saron neglectus</i> De Man, 1902	East Africa and Red Sea to Johnston Is., Central Pacific.
<i>Nikoides maldivensis</i> Borradaile, 1915	East Africa to Indonesia, and Central Pacific.
<i>Coenobita clypeatus</i> (Herbst 1791)	East Africa to Tahiti.
<i>Calcinus laurentae</i> Haig & McLaughlin 1983	Previously known only from Hawai'i.
<i>Grapsus longitarsis</i> Dana, 1851	East Africa and Red Sea to Japan, Hawai'i and Tuamotu. Other unpublished records from northern Australia are present in Queensland Museum collection.
<i>Micippa platipes</i> Rüppell, 1830	Wide ranging Indo-West Pacific but not previously from Australia.
<i>Manella spinipes</i> (De Man 1902)	Japan, Indonesia (Amboina), and Hawai'i.
<i>Daldorfia rathbuni</i> (De Man 1902)	Japan, Indonesia (Ternate), and Hawai'i.
<i>Nanopilumnus</i> ? <i>coralliphilus</i> (Takeda & Miyake 1969)	Japan. This may possibly prove to be a new species.
<i>Planopilumnus vermiculatus</i> (A. Milne Edwards 1873)	Ryukyu Islands, Marshall Islands, New Caledonia.
<i>Tetraloides heterodactyla</i> (Heller 1861)	Red Sea, western Indian Ocean, Christmas Is., Solomon Islands, eastern Coral Sea.
<i>Pilodius spinipes</i> Heller, 1861	Red Sea, and Indian Ocean.
<i>Etisus odhneri</i> Takeda, 1971	Kenya, Palau.
<i>Palapedia marquesa</i> (Serène 1972)	Marquesas.
<i>Liocarpilodes armiger pacificus</i> Balss, 1938	Fiji, Indonesia.

very little loose material suitable as habitat for decapod crustaceans. Similarly, the bommies (patch reefs) in the more sheltered back reef area mostly had relatively little coral cover, and not much loose substrate, suggesting strong wave action during storm activity. These were generally algae dominated. While we were unable to sample the front reef slope because of rough conditions, observations on a single occasion by Hamish Malcolm and Angus Thompson, while doing a fish census, suggested that the habitat there was not appreciably different or richer than in the back reef.

A conspicuous feature of the underwater collecting was the relatively low abundances of most species. Although the final species count was respectable, in the majority of cases most of the species were only represented by one or a few specimens.

Nutrients, especially from bird guano and rotting vegetation, which seep from sand cays onto the surrounding reef flat, are undoubtedly important in increasing the flat's faunal diversity and carrying capacity. In the case of a system such as at North East Cay, however, where the reef flat is seldom exposed and is unprotected from strong tidal currents and bad weather, the nutrients will be quickly dispersed into deeper water and have little obvious impact on the intertidal zone.

Biogeography

The great majority of the species found, that were positively identified, have broad ranging Indo-West Pacific distributions. This is interesting because it indicates that these isolated reefs have been colonised by those species that have the most effective dispersal strategies.

Although nine species appear to be new, it is difficult to assert that these might be endemic to the Coral Sea area, because our state of knowledge of the decapods of the South West Pacific is still limited. Most areas have not been

thoroughly collected, and where they have, the identifications of many groups still await expert attention.

Three species are apparently more typical of the Indian Ocean and their presence is thus of interest. The eastern-most record of the hermit crab, *Calcinus lineapropodus*, was previously Cartier Is., off northwestern Australia. This species was described only in 1991, and it is thus very likely that it will be found to be more widely distributed in the Pacific as new collections are made and it is recognised. Another hermit, the specialised coral dweller, *Paguritta harmsi*, has been recorded from the Pacific and the GBR in the past, but the generic revision of McLaughlin and Lemaitre (1993) considered these previous identifications to be incorrect, and could only confirm it from Christmas Is., east Indian Ocean. A photograph which appears to be of this species from the Solomon Islands, however, has subsequently been published by Gosliner et al. (1996: 225). The present record, therefore, marks a significant southerly range extension in the West Pacific. The small crab, *Pilodius spinipes*, was also previously known only as far east as Thailand.

The following 12 species represent the West Pacific Ocean element, and are not found in the Indian Ocean: *Discias musicus*; *Alpheus acutofemoratus*; *Synalpheus paraneomeris*; *Parapontonia nudirostris*; *Philarius lifuensis*; *Calcinus inconspicuus*, *Calcinus laurentae*, *Manella spinipes*, *Daldorfia rathbuni*, *Nanopilumnus ? coralliphilus*, *Planopilumnus vermiculatus*, *Liocarpilodes armiger pacificus*.

The reduced species numbers at North East Cay, combined with the broad ranging nature of most of the species, both point to the effects of isolation. It is well acknowledged that species diversity decreases eastward into the Pacific, however the large complex reef systems of New Caledonia both further south and east than

Table 2: A comparison of the number of brachyura (crab) species, and total number of decapoda species from several oceanic Australian reef systems.

Location	Crabs	Decapods	Intensity (person-days)	Reference
Cartier Reef, Timor Sea	75	161	6	Davie & Short (1993); Bruce (1993)
Hibernia Reef, Timor Sea	57	152	6	Davie & Short (1993); Bruce (1993)
North East (Herald) Cay, Coral Sea	63	125	10	This paper
Elizabeth/Middleton Reefs, Tasman Sea	48	*	10	Queensland Museum database

* The total number of decapods for Elizabeth/Middleton Reefs is not given as these were not collected intensively as part of our survey and, therefore, the data is not comparable.

the Herald Cays, have a very high faunal diversity and an apparent high degree of endemism. New Caledonia's large land mass and more complex geological setting have, perhaps, helped ameliorate negative impacts of historical sea-level changes, and no doubt act as a buffer against severe cyclone damage by always sheltering some parts of the reef and thus allowing quick recovery of damaged sections. Terrigenous inputs into its lagoon via rainfall and coastal streams provide nutrients to the system which no doubt sustain increased abundances and have allowed a complex sediment-dependent fauna to develop.

Notable Absences

Ayling and Ayling (1984), in discussing their fish data, remarked that "many species, and even whole families, that are common and widely distributed on the GBR were either absent from the Coral Sea reefs visited or were recorded on the basis of only a few individuals sighted". This also holds true for the decapod Crustacea. To a great extent decapods are cryptic or inconspicuous and therefore random chance will play a significant part in any collecting effort, particularly with more uncommon species, and, therefore, it is difficult to be too deterministic about what *should* be found. It is our experience, however, that a trained collector will return virtually all the common decapod crustaceans, and a large percentage of the rare species, over a period of about 10 days in any one area. Continued collecting will yield additional species but the return for effort is greatly reduced. The following list should, therefore, be considered within the context of these remarks, and attempts to point out only those very common, widespread species that were not found at North East Cay.

Order Stomatopoda: Only one small species of stomatopod was found from two sites. Species of *Gonodactylus* and *Gonodactylaceus* are normally moderately common and to be expected.

Family Alpheidae: Low diversity of *Alpheus* and *Synalpheus* species.

Family Palaemonidae: *Coralliocaris graminea* very commonly associated with *Acropora* corals on the GBR; *Harpiliopsis beaupresii* and *Fennera chacei* are both common GBR species living in *Pocillopora* and *Stylophora* colonies. *Periclimenaeus* species are typically common on sponges and it is unusual to record only a single species.

Family Hippolytidae: *Saron marmoratus* is a very common, relatively large shrimp on the GBR, but only the smaller *S. neglectus* is apparently present.

Family Porcellanidae: This group of 'half-crabs' includes free living species (under dead corals) and species commensal with sponges and corals. Only a single species of *Petrolisthes* was found, and this was abundant in the lower intertidal zone. More than 12 species in seven genera are known from the GBR, and they were, therefore, conspicuous by their absence.

Family Diogenidae: *Dardanus megistos*, *Dardanus scutellatus*, and *Trizopagurus strigatus* are all common hermit crabs of the GBR that might have been expected.

Family Majidae: *Schizophrys aspera* (H. Milne Edwards 1834) is normally an abundant species associated with living and dead coral from South Africa to Hawai'i, and thus its absence was very surprising.

Family Pilumnidae: *Pilumnus* species are commonly found associated with dead coral but none were recorded.

Family Portunidae: Two small species of swimming crabs in the genus *Thalamita* were found but they were very rare. This genus is typically common, especially the relatively large species such as *Thalamita danae* Stimpson, 1858, *T. admete* (Herbst 1803) and *T. coerulipes* Jacquinet, 1852. The coral inhabiting *Thalamitoides quadridens* A. Milne Edwards, 1879, may also have been expected.

Family Xanthidae: This is the most diverse crab family on coral reefs. Twenty species were recorded but some of the largest, most conspicuous, and abundant species on the GBR were not found, viz. *Atergatis floridus*, *Carpilius convexus*, *Etisus laevimanus*, *Leptodius exaratus*, *Phymodius unglatus*.

The absence of many common species, taken with the relatively low abundances of the species that are present, point to the possibility that population sustenance, and simple diversity, relies to some extent at least on recruitment from outside the system via long-lived larvae, and that composition is thus largely chance driven. It may, however, just be a factor of the relative lack of habitat complexity available at this time in the reef system's development. Ayling and Ayling (1984) gave anecdotal evidence that, prior to the 1980s, the coral cover on the reefs had been significantly higher, and suggested "It is possible that some unknown agent caused extensive coral death on

the Coral Sea reefs ...". If this were so, then there does not appear yet to have been significant recovery, and this would also have had follow-on detrimental effects on the diversity and abundance of the crustaceans of the area.

Biotopes

Decapods play an important role in the functioning of coral reef systems. While some species are wide-ranging across a number of habitat types, most have quite specific niche requirements. The following is an attempt to place the species found at North East Cay into broad ecological categories. Information on relative abundance, and specific habitats, is also provided where possible. This will, hopefully, act as meaningful, qualitative, baseline information should the fauna be monitored by future expeditions.

Commensal Associates of Live Coral

Paguritta harmsi — lives in old worm tubes in the surface of corals; *Philarius lifuensis* — from *Acropora*, 6-18 m depth; *Alpheus lottini* — associated with madrepora corals to about 50 m depth; *Synalpheus charon* — on living coral; *Harpiliopsis depressa* — associated with *Pocillopora* and *Stylophora*; *Jocaste lucina* — associated with *Acropora*; *Periclimenes madreporae* — on madrepora corals; *Jocaste japonica* — in *Acropora* to a depth of 15 m; *Calcinus minutus* — littoral to about 30 m depth, usually associated with live coral, sometimes coral rubble, often amongst branching coral, especially acroporids; *Hapalocarcinus marsupialis* — females encapsulated in galls on ends of branches of certain corals (present material in *Seriatorpora*), tiny dwarf males may be found associated; *Cryptochirus coralliodytes* — typically found in holes in the surface of massive coral (Faviidae), present specimens were in *Platygyra sinensis*; *Tetralia rubridactyla* — commensal in branches of Pocilloporidae corals; *Tetralia fulva*, *Tetraloides heterodactyla*, *Trapezia cymodoce*, *Trapezia digitalis*, *Trapezia guttata*, *Trapezia septata*, *Cymo deplanatus*, *Cymo melanodactylus* — amongst branches of "branching" corals.

Commensal Associates of Other Taxa

Parapontonia nudirostris — associated with crinoids; *Alpheus frontalis* — in tubes of algae endocommensal; *Thor paschalis* — coral

reef where there is abundant algal growth, reportedly common in intertidal pools with algae; *Periclimenes soror* — coral reef associated with a wide variety of asteroid hosts; *Periclimenes tenuipes* — coral reef to 24 m depth, intertidal pools at extreme low spring tides; free-living, nocturnal, but also reported associated with anemones and feeding on anemone mucus; *Allogalathea elegans* — very common, littoral to 146 m depth, associated with crinoids.

Non-commensal Inhabitants of Coral Communities (Dead or Living)

Calcinus lineapropodus; *Alpheus acutofemoratus*; *Alpheus alcyone*; *Alpheus bucephalus*; *Alpheus pacificus*; *Synalpheus paraneomeris*; *Synalpheus tumidomanus*; *Calcinus inconspicuus*; *Gonodactylellus affinis*; *Menaethius monoceros*; *Tylocarcinus dumerilii*; *Tylocarcinus styx*; *Cyclax suborbicularis*; *Thalamita picta*; *Domecia hispida*; *Pilodius ? scabriculus*; *Chlorodiella cytherea*; *Chlorodiella laevissima*.

Free-living Typically Sublittoral Species (also see "Littoral" species)

Palaemonella spinulata — coral reef to about 25 m depth, found under coral; *Periclimenes tenuipes* — coral reef to about 24 m depth, intertidal pools at extreme low spring tides; typically free-living, nocturnal (but also see "Commensal Associates of Other Taxa" above); *Stenopus hispidus* — apparently rare, in coral crevices, and underwater caves; cleaner symbiont; *Panulirus penicillatus* — in clear waters, 1-4 m, rocky and coral reefs, often in surf zones and in surge channels; rarely seen but rough weather did not allow diving around suitable habitat; *Panulirus versicolor* — coral reef; to about 15 m depth often on seaward edges of the reef plateau, in clear water and surf areas, nocturnal, cryptozoic; *Calcinus gaimardii* — may also occur in littoral zone; specimens inhabit a large variety of shells; *Daldorfia rathbuni* — rare, on the substrate under dead coral at c. 15 m; *Calappa calappa* — rare, coral reef, benthic; *Thalamita corrugata* — coral reef, under dead coral and stones; littoral to about 11 m depth; *Carupa tenuipes* — sometimes from coral, may also occur in littoral zone; *Lybia tessellata* — coral reef, under dead coral slabs and in coarse rubble; this crab always carries a tiny sea anemone in each

chela; *Paraxanthias notatus* — coral reef, rock bottom; littoral to 35 m depth; *Pilodius pubescens* — under dead coral and rocks.

Littoral and Reef Flat Species

Calcinus elegans — reef flat on coral, and coral rubble, also sublittoral to about 10 m depth; *Calcinus laevimanus* — abundant on reef flat, also sublittoral; on sand and coral rubble; *Calcinus latens* — also sublittoral to about 5 m depth, wide variety of habitats including reef flat, rubble and sand; *Clibanarius corallinus* — in protected areas on reef flat, also sublittoral; *Dardanus guttatus* — reef flat but also sublittoral; sand bottom; usually in cone shells; *Dardanus lagopodes* — common, reef flat; found in broad mouthed shells; *Petrolisthes asiaticus* — abundant, typically living on underside of beach rock or dead coral; *Perinia tumida* — on and amongst algae and encrusting fauna in pools and shallow subtidal; *Grapsus albolineatus* — common on and under rocks; high tidal zone; *Grapsus longitarsis* — rare on rocks about mid-tide level; *Grapsus tenuicrustatus* — common on rocks along the seaward side; *Pachygrapsus minutus* — abundant on beach rock and dead coral, mid to low tide zone; *Percnon planissimum* — common under beach rock and dead coral slabs on reef flat and in intertidal pools; *Macrophthalmus boscii* — common, typically living in moist sandy algal turf on top of beach rock at lower tidal levels; *Thalamita picta* — uncommon, under rocks in sandy pools on beach rock; *Daira perlata* — under beach rock and dead coral slabs on flat; *Eriphia scabricula* — common in small holes in surface of beach rock, mid to low intertidal; *Eriphia sebana* — abundant, found in crevices of rock mid to low intertidal zone, also may be out walking around; *Actaeodes tomentosus* — common, under rocks and dead coral, low intertidal pools and reef flat; *Chlorodiella cytherea* — uncommon, under rocks in sandy pools on beach rock; *Euxanthus exsculptus* — rare, reef flat under rocks and rubble; *Palapedia rastripes* — probably common but shy, under rocks and dead coral in coarse sand on reef flat; *Leptodius sanguineus* — abundant, under rocks and dead coral, low intertidal pools and reef flat; *Pilodius areolatus* — common, under rocks and rubble, low intertidal pools and reef flat; *Zozymodes pumilus* — rare, under rocks and rubble, low intertidal pools, reef flat, and shallow sublittoral.

Terrestrial and Semiterrestrial Species

Coenobita clypeatus — rare, a very large purple species found under vegetation away from the beach; *Coenobita perlatus* — a distinctive bright orange-red species, it is the most abundant of the *Coenobita* species; a nocturnal species typical of offshore reefs; large migrations to the sea occurred over a few days at a particular point on the beach towards the north-western end; *Coenobita rugosus* — rare, small, olive-green species; *Ocypode ceratophthalma* — sand beaches, lower to mid shore level; *Ocypode pallidula* — typical of offshore coral cays and sand banks; supralittoral zone, very common around campsite towards south-western end; predominantly nocturnal.

Remarks

The most conspicuous and abundant components of the crustacean fauna are semi-terrestrial and terrestrial. These species occur on the sandy beaches (two species of Ghost Crabs, *Ocypode*), around the beach rock (large *Grapsus* rock crabs), and beneath the vegetation in the interior of the island (terrestrial hermit crabs, *Coenobita*). These species are present in huge numbers and give the island a very strong "crustacean-feel". They are active predator/scavengers, and must play an enormously important ecological role in the island food chains. The occurrence of three species of *Coenobita* is noteworthy, although only *C. perlatus* was common. *Coenobita perlatus* is the only species found on the Great Barrier Reef cays. An interesting observation was made of hundreds of *Coenobita perlatus* streaming out of the *Argusia* shrubs behind the beach towards the north-western end of the island. They made their way to the water in a narrow corridor, before returning back into the vegetation by the same route. This exact behaviour was first remarked upon by McMichael and Yaldwyn (1965). This species is widespread and abundant around the island, and individuals often can be found actively moving about near the water's edge from late afternoon and into the night. Why they are driven to congregate for this curious migration at one point on the beach remains a mystery, although it is presumably related to reproduction.

In contrast, below the water one is struck by the relative absence of crustaceans. This is an illusion, as there are in fact a relatively large number of species present — they are however,

for the most part, in low abundances and cryptozoic.

Continued collecting effort would, without doubt, yield a greater number of species for North East Cay, particularly if more forgiving weather allowed access to other parts of the northern and eastern reef where different types of habitat would presumably occur. Also, resampling in summer may show seasonal changes in species presence and abundance.

There are no specific conservation or management issues arising from the present study that would be likely to affect future planning. The most significant fact regarding the sublittoral decapod fauna is the relatively low abundance of most species, and this would perhaps point to a system that may lack short-term resilience. This may, however, be mediated by recruitment from neighbouring reefs within the Coringa-Herald National Nature Reserve system. The present reserve protection given to

North East Cay, plus its low rate of visitation, should be sufficient to protect the decapod crustacean fauna. Given the speculation that this area may have suffered considerable coral loss by an agent or agents unknown, it would certainly be interesting to revisit the site at 10-15 year intervals to monitor recovery or other change.

Acknowledgments

We would particularly like to thank Dr A.J. (Sandy) Bruce for his assistance in identifying many of the shrimps. Andrew Humpherys also gave valuable help in preliminary sorting and some identifications. Most of all we are indebted to the Royal Geographical Society of Queensland for the extraordinary opportunity to accompany their members to this remote and exciting locality. In particular Pat and Lyn Comben made it all possible through their superb organisation and culinary skills.

References

- Ayling, A.M. & Ayling, A.L. 1984, *Coral Sea National Nature Reserves, Report on a preliminary survey of the Lihou Reef and Herald-Coringa National Nature Reserves*, Unpublished Report for Australian National Parks and Wildlife Service.
- Bruce, A.J. 1993, Chap. 4.10, 'Crustacea — Caridea', in *Survey of the Marine Biological and Heritage Resources of Cartier and Hibernia Reefs, Timor Sea*, eds B.C. Russell & J.R. Hanley, Northern Territory Museum of Arts and Sciences: Darwin, pp. 69 - 70, 128 - 131.
- Davie, P.J.F. & Short, J.W. 1995, 'Part 9. Crustaceans', in *Marine Biological Survey of the Southern Kimberley, Western Australia*, eds F.E. Wells, J.R. Hanley & D.I. Walker, Western Australian Museum, Perth, pp. 118-126.
- Davie, P.J.F. & Short, J.W. 1996, 'Part 8. Crustaceans', in *Marine Biological Survey of the Eastern Kimberley, Western Australia*, eds D.I. Walker, F.E. Wells & J.R. Hanley, Western Australian Museum, Perth, pp. 68-74.
- Gosliner, T.M., Behrens, D.W. & Williams, G.C. 1996, *Coral Reef Animals of the Indo-Pacific. Animal life from Africa to Hawai'i exclusive of the Vertebrates*, Sea Challengers, Monterey, California.
- Griffin, D.J.G. & Tranter, H. 1986, The Decapoda Brachyura of the Siboga Expedition, Part VIII, Majidae, Siboga-Expeditie, Leiden, Monogr. XXXIX, C4 (= Livr. 148)
- McLaughlin, P.A. & Lemaitre, R. 1993, A review of the hermit crab genus *Paguritta* (Decapoda: Anomura: Paguridae) with descriptions of three new species, *Raffles Bulletin of Zoology* 41(1): 1-29.
- McMichael, D.F. & Yaldwyn, J.C. 1965, Collecting in the Coral Sea, *Australian Natural History* 15(2): 33-38.
- Short, J.W. & Davie, P.J.F. 1993, Chap. 4.9, Decapod Crustacea — non-Caridea, in *Survey of the Marine Biological and Heritage Resources of Cartier and Hibernia Reefs, Timor Sea*, eds B.C. Russell & J.R. Hanley, Northern Territory Museum of Arts and Sciences: Darwin, pp. 67-69, 123-127.

Appendix 1: Species by Sites List for North East (Herald) Cay, Coral Sea

* marks new Australian records

Species.....	Sites	Species.....	Sites
Order THORACICA		<i>Onycocaris</i> ? sp. nov.....	
Suborder LEPADOMORPHA		<i>Palaemonella spinulata</i> Yokoya, 1936	
Family LEPADIDAE		<i>Parapontonia nudirostris</i> Bruce, 1968	
<i>Lepas anserifera</i> Linnaeus, 1758.....	5	<i>Periclimenaeus</i> sp.	
Order AMPHIPODA		<i>Periclimenella</i> aff. <i>spinifera</i> (de Man, 1902).....	
Suborder CAPRELLIDEA		<i>Periclimenes</i> aff. <i>ceratophthalmus</i> Borradaile, 1915 .	
Family CAPRELLIDAE		<i>Periclimenes madreporae</i> Bruce, 1969	
Caprellidae sp.....	16	<i>Periclimenes soror</i> Nobili, 1904	
Suborder UNDETERMINED		<i>Periclimenes tenuipes</i> Borradaile, 1898	
<i>Amphipoda</i> sp.	15, 16, 3	<i>Periclimenes</i> sp. nov.	
Order ISOPODA		<i>Periclimenes</i> ? sp. nov. (nr <i>P. cornutus</i>).....	
Suborder ASELOTOTA		<i>Philarius lifuensis</i> (Borradaile, 1898).....	
Family UNDETERMINED		Family PROCESSIDAE	
<i>Asellota</i> sp.....	15	* <i>Nikoides maldivensis</i> Borradaile, 1915.....	
Order STOMATOPODA		Infraorder STENOPODIDEA	
Family GONODACTYLIDAE		Family STENOPIIDAE	
<i>Gonodactylellus affinis</i> (De Man, 1902)	3, 5	<i>Stenopus hispidus</i> (Olivier, 1811)	
Order DECAPODA		Infraorder PALINURA	
Suborder PLEOCYEMATA		Family PALINURIDAE	
Infraorder CARIDEA		<i>Panulirus penicillatus</i> (Olivier, 1791).....	
Family ALPHEIDAE		<i>Panulirus versicolor</i> (Latreille, 1804) ?	
<i>Alpheus acutofemoratus</i> Dana, 1852.....	3	(sight record, identity not certain)	
<i>Alpheus cf acutofemoratus</i> Dana, 1852	4	Infraorder ANOMURA	
<i>Alpheus alcyone</i> de Man, 1902	4	Family COENOBITIDAE	
<i>Alpheus bucephalus</i> Coutiere, 1905	15, 7	* <i>Coenobita clypeatus</i> (Herbst 1791)	misc. c
<i>Alpheus ? bucephalus</i> Coutiere, 1905.....	16	<i>Coenobita perlatus</i> H. Milne Edwards, 1837	misc. c
<i>Alpheus frontalis</i> H. Milne Edwards, 1837	3	<i>Coenobita rugosus</i> H. Milne Edwards, 1837	misc. c
<i>Alpheus lottini</i> Guerin-Meneville, 1829	7, 9	Family DIOGENIDAE	
<i>Alpheus ? miersi</i> Coutiere, 1905		<i>Aniculus</i> ? sp.nov. (nr <i>retipes</i>)	
<i>Alpheus ? pachychirus</i> Stimpson, 1861	3	<i>Calcinus elegans</i> (H. Milne Edwards, 1836).....	
<i>Alpheus pacificus</i> Dana, 1852	4	<i>Calcinus gaimardii</i> (H. Milne Edwards, 1848) ...	misc. c
<i>Alpheus</i> ? sp. nov.....	5, 9	<i>Calcinus inconspicuus</i> Morgan, 1991.....	13, 15, 7
<i>Alpheus</i> sp.....	15, 3, 4, 5, 9	<i>Calcinus laevimanus</i> (Randall, 1839)	1
<i>Athanas</i> sp.....	9	<i>Calcinus latens</i> (Randall, 1839)	11, 13, 2
<i>Synalpheus charon</i> (Heller, 1861)	6, 7	* <i>Calcinus laurentae</i> Haig and McLaughlin, 1983	
<i>Synalpheus paraneomeris</i> Coutiere, 1905	15	<i>Calcinus lineapropodus</i> Morgan & Forest, 1991	13, 15, 1
<i>Synalpheus tumidomanus</i> (Paulson, 1875).....	7	<i>Calcinus minutus</i> Buitendijk, 1937.....	13
Family BRESILIIDAE		<i>Clibanarius corallinus</i> (H. Milne Edwards, 1848)	
* <i>Discias musicus</i> Holthuis, 1981	9	<i>Dardanus guttatus</i> (Oliver, 1812).....	
Family RHYNCHOCINETIDAE		<i>Dardanus lagopodes</i> (Forsk. 1775)	10, 13, 16, 2, 5
<i>Rhynchocinetes</i> unident sp.	12 (sight record)	Family GALATHEIDAE	
Family HIPPOLYTIDAE		<i>Allogalatea elegans</i> (Adams and White, 1848).....	14, 7
* <i>Saron neglectus</i> De Man, 1902	15, 3, 5, 7	<i>Galathea</i> sp. 1	15, 16, 3, 5, 7,
<i>Saron</i> sp.	3	<i>Galathea</i> sp. 2	
<i>Thor paschalis</i> Heller, 1862	12, 15	Family PAGURIDAE	
Family PALAEMONIDAE		<i>Pagurus</i> sp.	
<i>Exoclimenella</i> sp.....	5	<i>Paguritta harmsi</i> (Gordon, 1935).....	12,
<i>Harpiliopsis depressa</i> (Stimpson, 1860).....	6, 7, 9	Family PORCELLANIDAE	
<i>Harpiliopsis</i> sp.....	3	<i>Petrolisthes asiaticus</i> (Leach, 1820)	1,
<i>Jocaste japonica</i> (Ortmann, 1890).....	3	Infraorder BRACHYURA	
<i>Jocaste lucina</i> (Nobili, 1901)	15, 3, 5	Family CALAPPIDAE	
<i>Jocaste</i> sp.....	6	<i>Calappa calappa</i> (Linnaeus, 1758)	misc. coll

Species.....	Sites
Family CRYPTOCHIRIDAE	
<i>Cryptochirus coralliodytes</i> Heller, 1861	12, 9
<i>Hapalocarcinus marsupialis</i> Stimpson, 1859	13, 9
Family GRAPSIDAE	
<i>Grapsus albolineatus</i> Lamarck, 1818	
* <i>Grapsus longitarsis</i> Dana, 1851	4
<i>Grapsus tenuicrustatus</i> (Herbst 1783)	
<i>Pachygrapsus minutus</i> A. Milne Edwards, 1873	1, 4
<i>Pachygrapsus cf minutus</i> A. Milne Edwards, 1873	
<i>Percnon planissimum</i> (Herbst, 1804)	4
Family HYMENOSOMATIDAE	
<i>Elamena</i> sp. nov.....	11, 13
Family MAJIDAE	
<i>Cyclax suborbicularis</i> (Stimpson, 1907)	10
<i>Hyastenus</i> sp.....	9
<i>Majidae</i> sp.....	16
<i>Menaethius monoceros</i> (Latreille, 1825).....	3
* <i>Micippa platipes</i> Ruppell, 1830.....	4
<i>Oncinopus</i> sp. nov.	9
<i>Perinia tumida</i> Dana, 1852	3
<i>Tylocarcinus dumerilii</i> (H. Milne Edwards, 1834)	5
<i>Tylocarcinus styx</i> (Herbst, 1803).....	3, 7
Family OCYPODIDAE	
<i>Macrophthalmus boscii</i> Audouin/Savigny, 1825.	1, 4
<i>Ocypode ceratophthalma</i> (Pallas 1772)	misc. colln
<i>Ocypode pallidula</i> Jacquinet, 1842	misc. colln
Family OZIIDAE	
<i>Daira perlata</i> (Herbst 1790)	16
<i>Eriphia scabricula</i> Dana, 1852.....	1, 4
<i>Eriphia sebana</i> (Shaw & Nodder, 1803)	4
Family PALICIDAE	
* <i>Manella spinipes</i> (De Man, 1902).....	16
Family PARTHENOPIDAE	
* <i>Daldorfia rathbuni</i> (De Man, 1902).....	7
Family PILUMNIDAE	
* <i>Nanopilumnus ? coralliphilus</i> (Takeda & Miyake, 1969).	15
* <i>Planopilumnus vermiculatus</i> (A. Milne Edwards, 1873)	11
Family PORTUNIDAE	
<i>Carupa tenuipes</i> Dana, 1851	15
<i>Thalamita corrugata</i> Stephenson & Rees, 1961.....	3
<i>Thalamita picta</i> Stimpson, 1858.....	4, 8
<i>Thalamita</i> sp.....	13
Family TRAPEZIIDAE	
<i>Domecia hispida</i> Eydoux & Souleyet, 1842	7
<i>Trapezia cymodoce</i> (Herbst 1799).....	7
<i>Trapezia digitalis</i> Latreille, 1828	6
<i>Trapezia guttata</i> Ruppell, 1830	7
* <i>Trapezia lutea</i> Castro, 1997	6
<i>Trapezia septata</i> Dana, 1852.....	6, 7
<i>Trapezia</i> sp.	9
<i>Tetralia fulva</i> Serène, 1984	3, 6, 7
<i>Tetralia rubridactyla</i> Garth, 1969	6
* <i>Tetraloides heterodactyla</i> (Heller, 1861)	7
Family XANTHIDAE	
<i>Actaeodes tomentosus</i> (H. Milne Edwards, 1834)	4, 8
<i>Chlorodiella cytherea</i> (Dana, 1852)	3, 5, 8
<i>Chlorodiella laevis</i> (Dana, 1852)	15, 3

Species.....	Sites
<i>Cymo deplanatus</i> A. Milne Edwards, 1873.....	6, 7
<i>Cymo melanodactylus</i> de Haan, 1833.....	6
* <i>Etisus odhneri</i> Takeda, 1971	11
<i>Etisus splendidus</i> Rathbun, 1906.....	misc. colln
<i>Euxanthus exsculptus</i> (Herbst, 1790)	8
<i>Leptodius sanguineus</i> (H. Milne Edwards, 1834).....	1, 4
* <i>Liocarpilodes armiger pacificus</i> Balss, 1938.....	14
<i>Lybia tessellata</i> (Latreille, 1812)	2
* <i>Palapedia marquesa</i> (Serène, 1972).....	10, 11
<i>Palapedia rastripes</i> (Muller, 1887).....	11
<i>Paraxanthias notatus</i> (Dana, 1852)	10
<i>Pilodius areolatus</i> (H. Milne Edwards, 1834).....	11, 2, 4
<i>Pilodius pubescens</i> Dana, 1852	3, 6
<i>Pilodius ? scabriculus</i> Dana, 1852.....	4
* <i>Pilodius spinipes</i> Heller, 1861.....	15
? <i>Pilodius</i> sp.	8
<i>Zozymodes pumilus</i> (Jacquinot, 1852)	4