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## CHAPTER 16

## DECAPOD CRUSTACEANS OF THE COCOS (KEELING) ISLANDS

BY

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# CHAPTER 16 DECAPOD CRUSTACEANS OF THE COCOS (KEELING) ISLANDS BY G.J. MORGAN \*

#### INTRODUCTION

Prior to the present study, the crustacean fauna of the Cocos (Keeling) Islands had been collected intensively only once, by C.A. Gibson-Hill in the years 1940-41. The Brachyura and Stomatopoda of his material were taxonomically reviewed by Tweedie (1950) and the hermit crabs by Forest (1956). Gibson-Hill's collection represents almost exclusively intertidal and terrestrial faunas. In the present survey, SCUBA was employed extensively to augment the poorly known subtidal faunas. Xanthoid crabs (families Xanthidae, Trapeziidae, Pilumnidae, Menippidae) and marine hermit crabs (families Diogenidae and Paguridae) are dominant decapod components of tropical rocky and coral reef ecosystems and were collected preferentially. Conversely, some taxa (e.g. caridean shrimps) are poorly represented in the present collection.

Specimens were sampled by reef walking in the intertidal and by SCUBA or snorkelling in the subtidal habitats. A total of 198 species of Decapoda is recorded of which 78 are new records for the Cocos (Keeling) Islands (see list of species). Station localities are listed by number (see Chapter 1, Fig.2) and some additional sites sampled are recorded by name. Station 9 (Direction Island) has been divided for this list into 9(a): blue hole south of Direction I. and 9(b): sand shallows between island and blue hole. In order to compile as complete a record of decapod crustaceans as possible, the list includes species recorded by the previous workers noted above. The species names are those currently used in the scientific literature and not necessarily the names cited by historical workers. The historical collections have not been examined and hence the accuracy of early identifications cannot be ascertained.

#### DISCUSSION

The most diverse decapod taxa of the Cocos (Keeling) Islands are the xanthoid and paguroid crabs with 77 and 48 species recorded respectively. Both taxa are particularly evident in subtidal and intertidal reef habitats, although the abundance of xanthoids was found to be somewhat lower than expected on the 1989 sampling expedition.

The islands can be divided broadly into several major habitat types with a convenient dichotomy between lagoon and outer oceanic environments.

In the lagoon, only a few species of hermit crab notably *Clibanarius longitarsus* and *Calcinus laevimanus* are present in the sheltered shallow intertidal areas of fine mud sediment. Hermits appear to be absent from the very extensive soft grey sediment flats in North and South Lagoons of West Island, but these flats support high numbers of

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Macrophthalmus verreauxi and Uca chlorophthalmus. The latter produces a distinct pattern of hexagonal territories in some upshore areas. The portunid Thalamita crenata is common in the shallows of the lagoon. Tweedie (1950) identified T. spinimana as the species plentiful in the shallow sandy, slightly weedy water of the lagoon' (Gibson-Hill, in Tweedie 1950) but in 1989 the common portunid in this habitat was T. crenata. It is possible that Tweedie's identification was spurious but he has recorded T. crenata from the 'outer edge of the atoll'. The large edible mud or mangrove crab Scylla serrata occasionally is caught by locals in the very sheltered areas of the lagoon but is rarely seen and presumably occurs in very low numbers. Ghost crabs, Ocypode ceratophthalma and O. cordimana, forage across the lagoon flats from their upshore burrows and are also numerous on the oceanic beaches. O. ceratophthalma occurs in its two colour morphs, with the olive green form far outnumbering the cream and brown morph. The terrestrial crab Cardisoma carnifex also feeds on exposed flats of the lagoon at low tide.

The continual natural process of sedimentary infilling of the lagoon, together with the occurrence of the above crabs in very high numbers, indicate that the populations of soft sediment crustaceans are relatively secure for the foreseeable future. In deeper areas of the lagoon and near the major channels allowing entry of oceanic water, hard and soft corals are present to a variable extent.

The 1983 El Niño effect resulted in very extensive coral death and over much of the lagoon only small colonies of live hard corals have re-established. As many species of crustaceans are either symbiotic with live corals or prefer the live coral habitat, loss of corals is reflected in crustacean occurrences. Where live coral, especially *Pocillopora* spp., is present, the crustacean assemblage resembles that discussed for outside reef coral habitats. The dead coral rubble supports a lower diversity of hermit crabs with the diogenid *Calcinus latens* and several small species of pagurids dominant in numbers. Portunids and xanthoids are also present but often difficult to collect in the deep layer of coral fragments. Sandy areas and beds of the seagrass *Thalassia* and the alga *Caulerpa* support *Calcinus latens* and *C. laevimanus* in relatively low populations and several pagurids in high numbers, especially *Micropagurus vexatus*. Sandy areas are also habitat for several portunid species and *Calappa hepatica*.

If further live coral dieback were to occur in the lagoon, the symbiotic faunal communities would be placed at considerable risk. Presumably there has been, and would continue to be, replacement of coral crustacean communities by rubble and sand-living species.

The oceanic reefs of the Cocos (Keeling) Islands have also experienced major reduction of the live coral habitat. Percentage cover of live hard corals is low and many of the outside reefs are dominated by bare, wave scoured dead coral or coral rubble. The shallow subtidal and intertidal reef habitats are home to a variety of hermit crabs with Calcinus minutus, C. latens, C. sp. 1 (an undescribed species), Dardanus crassimanus and D. lagopodes common. The large Dardanus species, D. megistos, D. guttatus, D. gemmatus and D. deformis occur on shallow reef flats and adjacent sandy environments. A variety of xanthoids especially Pilodius areolatus, are fairly numerous under the coral and coral rubble. Where live branching coral is present, especially Pocillopora, symbiotic species of xanthoids (e.g. Trapezia and Cymo), and alpheids (e.g. Alpheus lottini), occur. Under coral slabs, particularly in the subtidal, several species of pagurid are common with the bright lilac Pylopaguropsis magnimanus especially obvious. As was recorded for Christmas Island (Morgan, unpublished), pagurids can be quite diverse and common in tropical reef habitats and their taxonomy requires considerable attention. Interestingly, the populations and diversity of porcellanids (porcelain crabs) were low at Cocos (Keeling).

There seemed no obvious explanation for this apart from the possible effects of a paucity of live coral.

Intertidal rock and rock-sand platforms support quite high populations of hermit crabs with Calcinus laevimanus most widespread and C. latens and Clibanarius humilis common in areas. High on the platforms, in very warm pools flushed only by spring tides, the only hermit crab is Calcinus seurati. Xanthoids are also characteristic of rocky platforms, especially species of Leptodius. Grapsids are usually the most conspicuous crabs on intertidal hard substrata, with Grapsus tenuicrustatus and G. intermedius the largest species on Cocos (Keeling). Three species of Pachygrapsus occur in a range of intertidal habitats, usually on or under rock or coral slabs.

Prior to this study, two species of rock lobster, *Panulirus penicillatus* and *P. versicolor* were recorded from the Cocos (Keeling) Islands (George 1968). The presence of a third species, *P. ornatus*, commonly referred to on the islands as the `leopard cray', was confirmed during the 1989 study. All three species are very widespread in the Indo-West Pacific area. *Panulirus* species have extended larval stages of several months with the planktonic phyllosoma capable of drifting great distances on ocean currents before settlement as the puerulus. It is probable that rock lobster stocks at Cocos (Keeling) are dependent upon larvae originating considerable distances from the islands and hence fishing overexploitation of the local breeding population is unlikely to severely effect settlement. It is certainly possible, however, that heavy fishing might deplete the population of table-size lobsters. Some form of monitoring of fishing effort would provide information on distribution of the species and their present abundance.

The Cocos (Keeling) Islands do not support the numbers or diversity of true terrestrial crabs so obvious on Christmas Island (Indian Ocean). The gecarcinid Cardisoma carnifex is very common on West Island, with apparently lower populations elsewhere. No specimens of C. rotundum recorded by Tweedie (1950) (as C. frontalis), were collected on the 1989 expedition. The grapsids Geograpsus crinipes and G. grayi cooccur on the islands, in lower numbers than Cardisoma. The presence of the Christmas Island 'red crab', Gecarcoidea natalis, was confirmed on North Keeling Island, but the species occurs in only small numbers. Tweedie (1950) stated that its occurrence was due to introduction with soil from Christmas Island to Direction Island and thence by larvae to other islands in the Cocos. This argument is convincing, given the small population of G. natalis on Cocos (Keeling) and the great distance (900 km) to Christmas Island, the only other habitat of the species.

Only one species of the terrestrial hermit crab family Coenobitidae had been recorded previously from Cocos (Keeling), namely *Coenobita perlatus* (Forest 1956). It is odd that the two additional species collected in this study, *C. rugosus* and *C. brevimanus*, were not represented in Gibson-Hill's collection as the former in particular is not uncommon. The coconut or robber crab, *Birgus latro*, was not found during the 1989 expedition, despite searches for it, but is reported by local people to occur on at least West and North Keeling Islands, the latter occurrence being confirmed by the ANPWS ranger, Mr Paul Stephenson (pers. comm.). In addition, a specimen of *B. latro* is on display in the local museum on Home Island, reportedly collected on Cocos (Keeling). Charles Darwin (1845) noted that *B. latro* was common at the time of his visit in 1836 and it might be suggested that the presently very low population of the species is due to overexploitation by the islands' local inhabitants. Protection of the existing specimens will be necessary to ensure their continued survival on Cocos (Keeling).

There are no naturally occurring bodies of freshwater on the islands, although a brackish lake (Bechet Besar) is present towards the north end of West Island. Freshwater must be accessed by sinking wells into subterranean reserves. It is scarcely surprising therefore that no freshwater crustacea were collected, unlike Christmas Island. *Cardisoma carnifex* was observed to concentrate at temporary rainwater pools and several specimens were seen in a shallow well, totally immersed in freshwater.

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## LIST OF DECAPOD CRUSTACEA

## **KEY TO SYMBOLS**

- + New record for Cocos (Keeling) Islands
- \* Not collected during this survey
- \$ Not collected but occurrence confirmed

Numbers = sampling station (see Chapter 1, Fig.2)

#### **STENOPODIDEA**

## STENOPODIDAE

+ Stenopus hispidus (Olivier, 1811)

1

#### **CARIDEA**

## ALPHEIDAE

+	Alpheus lottini Guérin, 1829	12
+	Alpheus macrodactylus Ortmann, 1890	1
+	Alpheus strenuus strenuus Dana, 1852	1,12
+	Alpheus sp.	1
+	Synalpheûs stimpsoni (De Man, 1888)	19

## PALINURA

#### **PALINURIDAE**

 Panulirus penicillatus (Olivier, 1791)	1,10,20
\$ Panulirus versicolor (Latreille, 1804)	

+\$ Panulirus ornatus (Fabricius, 1798)

## **ANOMURA**

#### DIOGENIDAE

+	Aniculus retipes Lewinsohn, 1982	4,19,32
	Aniculus ursus (Olivier, 1811)	1,11
+	Aniculus sp.	1
+	Calcinus argus Wooster, 1984	4
	Calcinus elegans (H. Milne Edwards, 1836)	1,6,11,12,18,30
	Calcinus gaimardii (H. Milne Edwards, 1848)	1,6,9(a),11,25
+	Calcinus guamensis Wooster, 1984	11
	Calcinus laevimanus (Randall, 1839)	2,6,10,12,30,34

	Calcinus latens (Randall, 1839)	1,6,8,9(a),9(b),12, 17, 18,22,23,30,34, 36	
+ + + + + .	Calcinus minutus Buitendijk, 1937 Calcinus pulcher Forest, 1958 Calcinus seurati Forest, 1951	4,6,7,13,15,19,25,32 4,9(a),15,32 10,30	
+	Calcinus sp. 3	4,7,13,15,19,22,25, 32 4	
++	Calcinus sp. 3 Calcinus sp. 4	4,6,15,25	
+	Calcinus sp. 5	15	
+	Calcinus sp. 6	25	
	Clibanarius corallinus (H. Milne Edwards, 1848)	6,10,12,30	
*	Clibanarius eurysternus Hilgendorf, 1878		
+	Clibanarius humilis Dana, 1852	2,30	
+	Clibanarius laevimanus Buitendijk, 1937	2 2	
+ *	Clibanarius longitarsus (De Haan, 1849)	2	
*	?Clibanarius merguiensis De Man, 1888 Clibanarius striolatus Dana, 1852		
+	Dardanus crassimanus (H. Milne Edwards, 1848)	1,4,8,15,19,23,32	
•	Dardanus deformis (H. Milne Edwards, 1836)	12	
	Dardanus gemmatus (H. Milne Edwards, 1848)	1,24	
	Dardanus guttatus (Olivier, 1811)	1,6,8,11,30	
	Dardanus lagopodes (Forskål, 1775)	7,8,12,13,15,19,32	
	Dardanus megistos (Herbst, 1804)	6,9(b),11,12,17,18,	
	Dardanus scutellatus (H. Milne Edwards, 1848)	19,34 6,9(b),12,17,34	
+	Diogenes sp.	9(b),19,22	
+	Paguristes sp.	4,6,25,32	
+	Trizopagurus strigatus (Herbst, 1804)	7,22	
PAGU	JRIDAE		
+	Micropagurus vexatus Haig and Ball, 1988		
	4,7,9(a),13,15,19,22,		
1	23,25,26,32 Nematopagurus cf. muricatus (Henderson, 1896)	22	
+ +	Pagurixus anceps (Forest, 1954)	1,6,12,30	
*	Pagurixus tweediei (Forest, 1956)	1,0,12,50	
	Pagurixus sp.	1,7,13,19,22,25,32	
+	Pylopaguropsis magnimanus (Henderson, 1896)	4,7,13,25,32	
+	Pagurid sp. 1	1,6	
+	Pagurid sp. 2	9(a),15,16,26,36	
+	Pagurid sp. 3	1,16,17,18,26	
+	Pagurid sp. 6	22	
COEN	IOBITIDAE		
\$	Birgus latro (Linnaeus, 1767)	North Keeling	
+	Coenobita brevimanus Dana, 1852	21	
	Coenobita perlatus H. Milne Edwards, 1837	1,2,6,10,21	
+	Coenobita rugosus H. Milne Edwards, 1837	2,6,10,13,21	
PORCELLANIDAE			
+	Petrolisthes asiaticus (Leach, 1820)	6	
•	- OF OTHER CONTINUES (ADDRESS, TOMO)	Č	

+ Petrolisthes carinipes (Heller, 1861)	1	
GALATHEIDAE		
+ Galathea sp.	1,19,23	
1	•	
BRACHYURA		
Dromiacea DYNOMENIDAE		
* Dynomene hispida Desmarest, 1825		
+ Dynomene cf. pilumnoides Alcock, 1899	4,32	
* Dynomene praedator A. Milne Edwards, 1879	1,52	
+ Dynomene sp.	4,25,32	
	, ,	
Oxystomata		
CALAPPIDAE		
Calappa hepatica (Linnaeus, 1758)	9(b),19	
Overwheinsho		
Oxyrhyncha MAJIDAE		
EPIALTINAE		
+ Huenia grandidierii A. Milne Edwards, 1865	20	
Menaethius monoceros (Latreille, 1825	1,20,24	
Perinia tumida Dana, 1852	1,24	
+ Simocarcinus obtusirostris (Miers, 1879)	18	
D. S. A. TIDAT A. IT		
MAJINAE  Cyclar suborbigularis (Stimpson, 1907)	1	
Cyclax suborbicularis (Stimpson, 1907) + Schizophrys aspera (H. Milne Edwards, 1834)	1,32	
Settizopia ys aspera (11. 1411the Edwards, 1054)	1,52	
MITHRACINAE		
+ Micippa thalia (Herbst, 1803)	11	
PARTHENOPIDAE		
AETHRINAE	20	
Actaeomorpha erosa Miers, 1878	20	
EUMEDONINAE		
* Eumedonus pentagonus (A. Milne Edwards, 1879)		
PARTHENOPINAE		
* Daldorfia horrida (Linnaeus, 1758)		
Compaidon		
Cancridea ATELECYCLIDAE		
* Kraussia integra (De Haan, 1835)		
+ Kraussia cf. nitida Stimpson, 1858	23	
* Kraussia rugulosa (Krauss, 1843)	_	
Brachyrhyncha		
PORTUNIDAE CATODIDINAE		
CATOPTRINAE  * Caruna tanuines Dana 1851		
* Carupa tenuipes Dana, 1851		

PORTUNINAE			
+	Charybdis erythrodactyla (Lamarck, 1818)	12	
*	Charybdis obtusifrons Leene, 1936		
	Portunus granulatus (H. Milne Edwards, 1834)	1	
+\$	Scylla serrata (Forskål, 1775)		
	Thalamita admete (Herbst, 1803)	1,6,9(a),12,17,18,36	
+	Thalamita chaptali (Audouin and Savigny, 1825)	36	
	Thalamita crenata H. Milne Edwards, 1834	2	
+	Thalamita dakini Montgomery, 1931	18,24	
+	Thalamita demani Nobili, 1905	4	
*	Thalamita integra Dana, 1852		
*	Thalamita picta Stimpson, 1858		
*	Thalamita spinimana Dana, 1852		
+	Thalamitoides quadridens A. Milne Edwards, 1869	20,25,32	
	Thalamitoides tridens A. Milne Edwards, 1869	9(a),16,36	
V A NT	THIDAE		
	DLYDECTINAE		
r	Lybia tessellata (Latreille, 1812)	27	
*	Polydectus cupulifer (Latreille, 1812)	21	
	Toryaecius capanger (Laucine, 1812)		
C <sub>2</sub>	YMOINAE		
	Cymo andreossyi (Audouin, 1826)	12,27	
*	Cymo quadrilobatus Miers, 1884		
LI	OMERINAE		
*	Liomera bella (Dana, 1852)		
*	Liomera caelata (Odhner, 1925)		
*	Liomera laevis (A. Milne Edwards, 1873)		
+	Liomera monticulosa (A. Milne Edwards, 1873)	4	
*	Liomera pallida (Borradaile, 1900)		
+	Liomera rugata (H. Milne Edwards, 1834)	6	
*	Liomera stimpsoni (A. Milne Edwards, 1865)	1.02	
	Liomera tristis (Dana, 1852)	1,23	
+	Liomera venosa (H. Milne Edwards, 1834)	32	
+	Liomera sp.	25	
FI	JXANTHINAE		
*	Euxanthus exsculptus (Herbst, 1790)		
+	Paramedaeus simplex (A. Milne Edwards, 1873)	13,19	
·	i di di nococcini compress (i i i i i i i i i i i i i i i i i i	12,12	
A	CTAEINAE		
*	Actaeodes consobrinus (A. Milne Edwards, 1873)		
+	Actaeodes tomentosus (H. Milne Edwards, 1834)	6,27	
+	Gaillardiellus orientalis (Odhner, 1925)	12,20,27	
*	Gaillardiellus superciliaris (Odhner, 1925)		
*	Paractaea rufopunctata (H. Milne Edwards, 1834)		
	Psaumis cavipes (Dana, 1852)	6,12,18	
*	Pseudoliomera granosimana (A. Milne Edwards, 1865)	25	
	Pseudoliomera speciosa (Dana, 1852)	25	

* * + *	ZOSIMINAE  Atergatopsis signatus (Adams and White, 1848)  Lophozozymus dodone (Herbst, 1801)  Lophozozymus pulchellus A. Milne Edwards, 1867  Platypodia cristata (A. Milne Edwards, 1865)  Platypodia granulosa (Ruppell, 1830)  Platypodia cf. pseudogranulosa Serene, 1984  Zozymodes pumilus (Jacquinot and Lucas, 1852)  Zosimus aeneus (Linnaeus, 1758)	1,17,34 1 4,32
* * * + *	XANTHINAE  Lachnopodus gibsonhilli (Tweedie, 1950)  Lachnopodus subacutus (Stimpson, 1858)  Lachnopodus tahitensis De Man, 1889  Leptodius exaratus (H. Milne Edwards, 1834)  Leptodius gracilis (Dana, 1852)  Leptodius nudipes (Dana, 1852)  Leptodius sanguineus (H. Milne Edwards, 1834)  Lioxanthodes alcocki Calman, 1909  Macromedaeus nudipes (A. Milne Edwards, 1867)  Neoxanthias impressus (Lamarck, 1818)	6,30 30 6,10,12,27 24 18 1,11
+ + + + +	ETISINAE  Etisus bifrontalis (Edmondson, 1935)  Etisus demani Odhner, 1925  Etisus dentatus (Herbst, 1785)  Etisus frontalis Dana, 1852  Etisus laevimanus Randall, 1840  Paraetisus sp.	18 1 1 17,18,20
+ * +	CHLORODIINAE Chlorodiella barbata (Borradaile, 1900) Chlorodiella cytherea (Dana, 1852) Chlorodiella laevissima (Dana, 1852) Phymodius granulosus (De Man, 1888) Phymodius monticulosus (Dana, 1852) Phymodius ungulatus (H. Milne Edwards, 1834) Pilodius areolatus (H. Milne Edwards, 1834) Pilodius pubescens Dana, 1852	9(a),17,36 1,27 1 17,36 6 1,6,12,18,20, 23,27
+	Pilodius scabriculus Dana, 1852 Tweedieia odhneri (Gordon, 1934)  RAPEZIIDAE	1,6,12 6,7,22,32
*	TRAPEZIINAE Tetralia glaberrima (Herbst, 1790) Trapezia areolata Dana, 1852 Trapezia cymodoce (Herbst, 1799)  Trapezia digitalis Latreille, 1825 Trapezia ferruginea Latreille, 1825 Trapezia guttata Ruppell, 1830 Trapezia rufopunctata (Herbst, 1799)	16,27 1,4,7,13,24,25, 27,32 7,32 25,36 7,22

+	Trapezia septata Dana, 1852	7,12,22,27
	DOMECIINAE  Domecia hispida Eydoux and Souleyet, 1842	9(a),27
*	CARPILIIDAE  Carpilius convexus (Forskål, 1775)  Carpilius maculatus (Linnaeus, 1758)	
M *	ENIPPIDAE OZIINAE Lydia annulipes (H. Milne Edwards, 1834) Ozius tuberculosus H. Milne Edwards, 1834	2
*	ERIPHIINAE  Eriphia scabricula Dana, 1852  Eriphia sebana (Shaw and Nodder, 1803)	6
	DACRYOPILUMNINAE  Dacryopilumnus rathbunae Balss, 1932	Loc. unrecorded
+	PILUMNIDAE  Pilumnus minutus (De Haan, 1835)	27
	INCERTAE SEDIS  Daira perlata (Herbst, 1790)  Pseudozius caystrus (Adams and White, 1848)	1,8,11,24,27,32 6,30
+	PALICIDAE Crossotonotus brevimanus (Ward, 1933)	19
0	CYPODIDAE  OCYPODINAE  Ocypode ceratophthalma (Pallas, 1772)  Ocypode cordimana Desmarest, 1825  Uca chlorophthalmus (H. Milne Edwards, 1837)	1,2,6,10, West Island 1, West Island 2
	MACROPHTHALMINAE  Macrophthalmus verreauxi H. Milne Edwards, 1848	
G +	RAPSIDAE GRAPSINAE Geograpsus crinipes (Dana, 1851) Geograpsus grayi (H. Milne Edwards, 1853) Grapsus intermedius De Man, 1887 Grapsus tenuicrustatus (Herbst, 1783) Metopograpsus thukuhar (Owen, 1839) Pachygrapsus minutus A. Milne Edwards, 1873 Pachygrapsus cf. planifrons De Man, 1888 Pachygrapsus plicatus (H. Milne Edwards, 1837)	1, 21 2, 21 2, 6, 30 2,6,27,buoys(lagoon) 2 1,12,30 6,12 12
+	SESARMINAE  Cyclograpsus integer H. Milne Edwards, 1837	2,6

+	Sesarma (Parasesarma) sigillata Tweedie, 1950 Sesarma (Parasesarma) lenzii De Man, 1895 Sesarma (Chiromantes) sp.	2 2 2
PL. * +	AGUSIINAE  Percnon abbreviatum (Dana, 1851)  Percnon affine (H. Milne Edwards, 1853)  Percnon guinotae Crosnier, 1965  Percnon planissimum (Herbst, 1804)  Plagusia depressa tuberculata Lamarck, 1818	12 1,7 12,27 Buoys (lagoon)
+ VA	RUNINAE  Pseudograpsus albus Stimpson, 1858  Thalassograpsus harpax (Hilgendorf, 1892)	6 10
GECA*	RCINIDAE Cardisoma carnifex (Herbst, 1794) Cardisoma rotundum (Quoy and Gaimard, 1824) Gecarcoidea natalis (Pocock, 1888)	2, West Island 21
CRYP +	TOCHIRIDAE  Hapalocarcinus marsupialis Stimpson, 1859	4