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The coastal molluscan fauna of the northern Kermadec Islands, Southwest Pacific Ocean

F. J. Brook*

A total of 358 species of molluscs (excluding pelagic species) is recorded here from coastal marine habitats around the northern Kermadec Islands. The fauna is dominated by species that are widely distributed in the tropical western and central Pacific Ocean. The majority of these are restricted to the tropics and subtropics, but some range south to temperate latitudes. Sixty-eight species, comprising 19% of the fauna, are thought to be endemic to the Kermadec Islands. That group includes several species that have an *in situ* fossil record extending back to the Pleistocene. The fauna also includes a number of non-endemic species that are restricted to subtropical or subtropical-temperate latitudes in the southern Pacific Ocean. Some of these are restricted to the southwestern Pacific, others are shared with subtropical central and eastern Pacific islands.

The Kermadec Islands' coastal molluscan fauna is depauperate at the species/genus level in comparison with faunas in the tropical western and central Pacific Ocean, and is less diverse than the subtropical south Pacific faunas of Lord Howe, Norfolk and Pitcairn islands. The species composition of the Kermadec molluscan fauna in part reflects the present-day biogeographic isolation of the islands, their subtropical location and the small range of habitat types present. It is also an inheritance of a geological and paleo-oceanographic history that gave rise to faunal turnover and allopatric speciation.

Keywords: Kermadec Islands; molluscs; subtropical; biogeography; South Pacific

INTRODUCTION

The Kermadec Islands are a NNE-trending chain of volcanic islands in the southwestern Pacific Ocean (hereafter abbreviated to SWP), located northeast of the New Zealand mainland between 31°21′S 178°48′W and 29°14′S 177°51′W (Fig. 1). Raoul Island, also formerly known as Sunday Island, is the largest of the Kermadec group and is located at the northern end of the chain. It is fringed on its northeastern side by a series of small islands and rocks, including Meyer, Napier, Nugent, Dayrell and Chanter islands (Fig. 2). Raoul and nearby islands (2938 ha total area) are 100 km NNE of Macauley Island and adjacent Haszard Islet (306 ha total area), which in turn are 35 km NNE of Curtis and Cheeseman islands (59 ha total area). L'Esperance Rock (5 ha) and submerged Havre Rock at the SSW end of the Kermadec chain are 80 km distant from Curtis and Cheeseman islands.

The shallow-water (<50 m depth) marine biota at the Kermadecs is of considerable biogeographic and ecological interest, on account of the islands' physical isolation and geological setting, the range of latitude over which they extend, and their location midway between temperate New Zealand coasts and the tropical Tonga Islands (e.g. Cole et al. 1992; Francis 1993; Francis et al. 1987; Nelson & Adams 1984; Schiel et al. 1986). Oliver (1915) provided an excellent account of the Kermadec Islands molluscan fauna and an analysis of its

* Department of Conservation, P.O. Box 842, Whangarei, New Zealand.

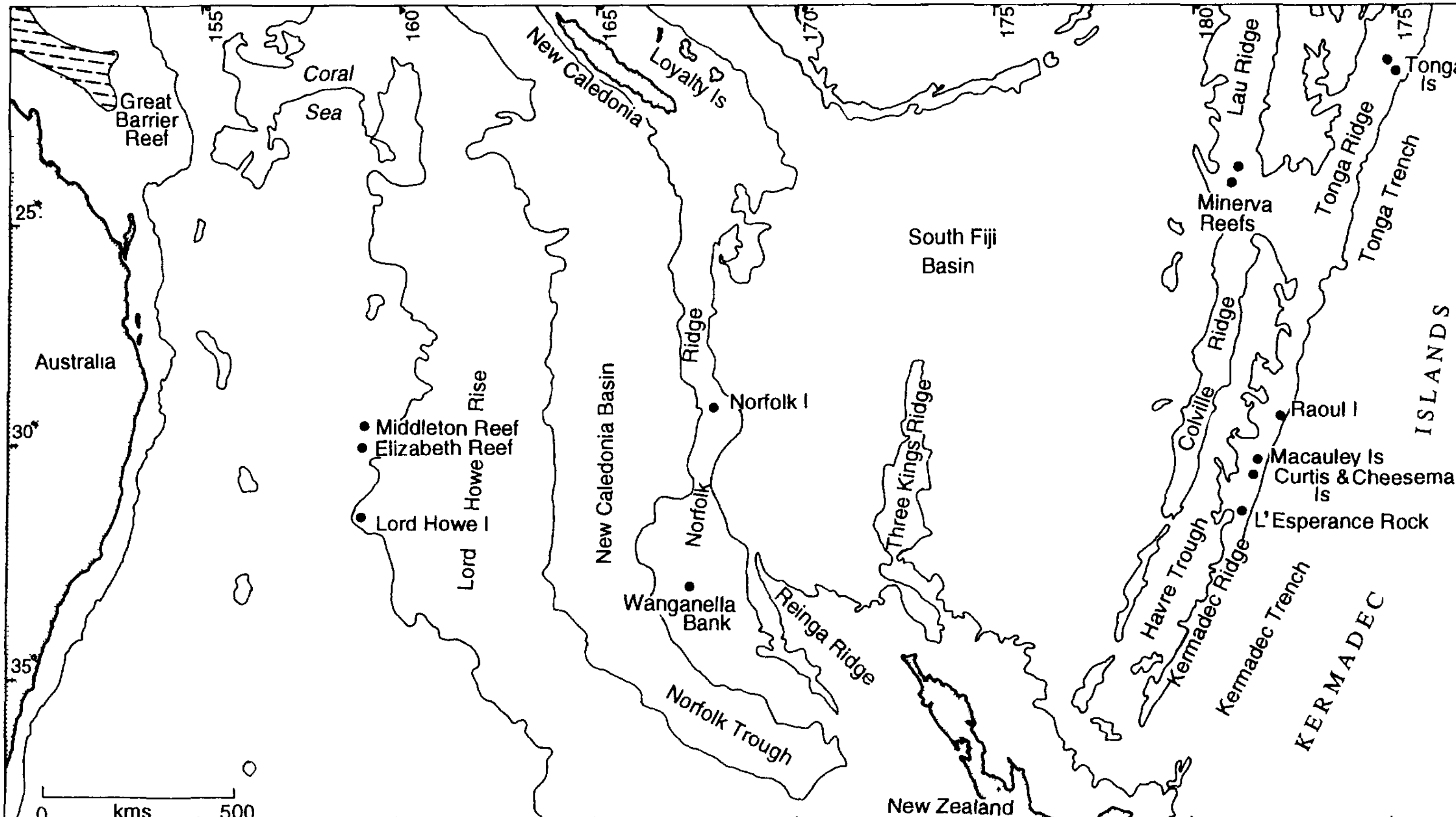
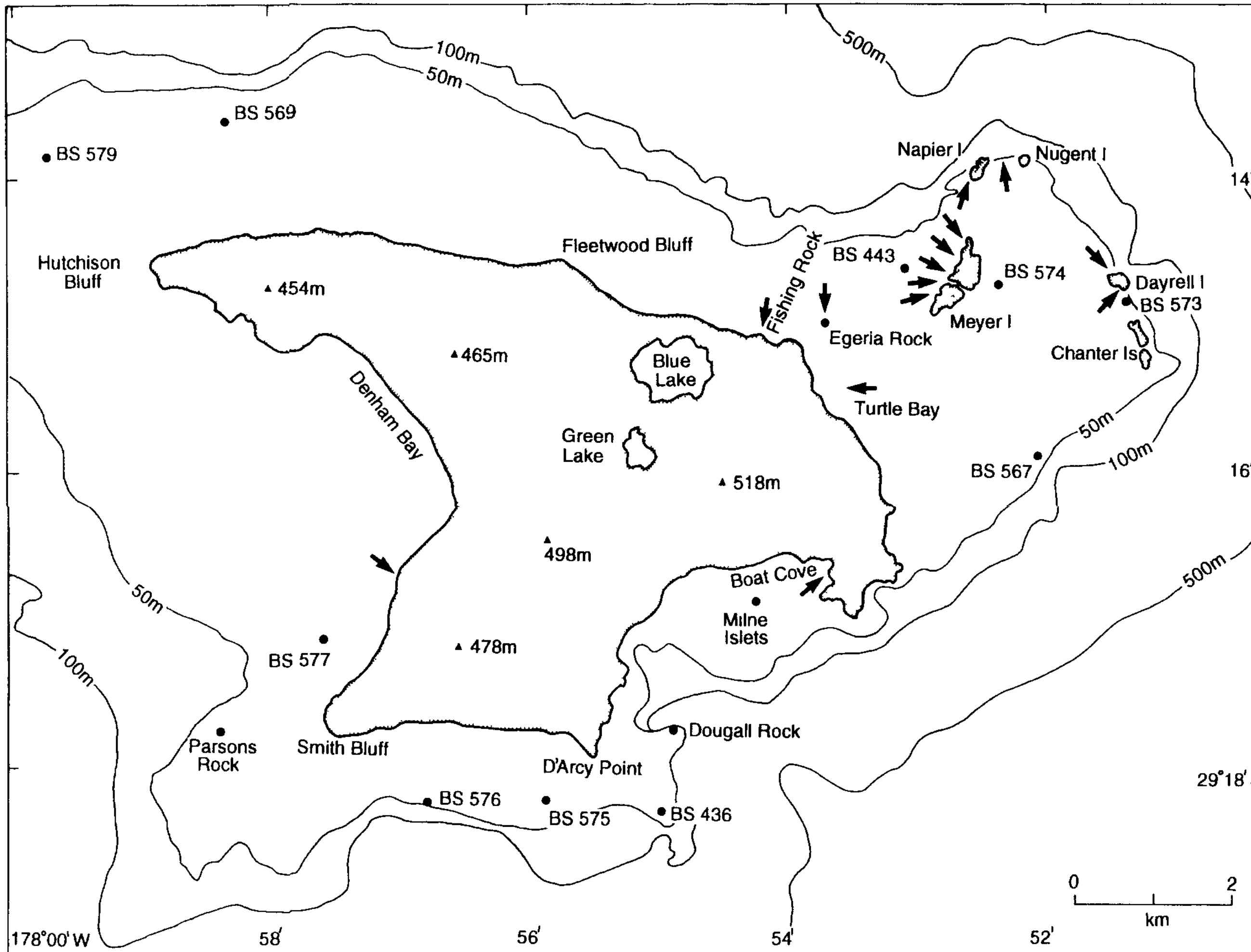


Fig. 1 Map of Southwestern Pacific Ocean, showing location of the Kermadec Islands in relation to other landmasses, islands and submarine ridges (depth contour at 2000 m)

Fig. 2 Map of Raoul Island area, showing location of dredge stations shallower than 50 m depth (with BS prefix) and dive sites (arrowed); depth contours are at 50 m, 100 m and 500 m.



zoogeographic relationships based on information available at that time. The present study was undertaken with the intention of providing an update of Oliver's work by incorporating new records obtained from dredge, SCUBA and fossil collections, as well as subsequently published records and taxonomic revisions of Kermadec molluscan species. It is more restricted in scope than Oliver (1915), in that it covers only the benthic coastal marine chiton, bivalve, gastropod and cephalopod faunas from northern islands (i.e. Raoul, Napier, Nugent, Meyer, Dayrell and Chanter).

Previous work

The first records of coastal marine molluscs from the Kermadec Islands were made by Cheeseman (1888), who listed six species of gastropod collected from intertidal rocks and beach washups, and commented on the occurrence of a large intertidal limpet there. Descriptions of new species of limpet and records of additional coastal marine taxa were subsequently made by Pilsbry (1894) and Suter (1899, 1905, 1906, 1907, 1909).

Extensive collections of coastal marine molluscs, including material dredged from shallow subtidal depths (i.e. down to 40 m) were made around Raoul and adjacent islands by T. Iredale, W. R. B. Oliver and R. S. Bell in 1908, and also by R. S. Bell in 1909–10. These collections provided the basis for a large number of species descriptions and new records, including those of Berry (1914), Beu (1968), Fulton (1915), Iredale (1910, 1912, 1914a, 1914b, 1917, 1939, 1940), Kaas & van Belle (1985a, 1985b, 1990, 1994), O'Neill (1985, 1989), Powell (1927, 1966, 1973), Thiele (1915) and Weaver & DuPont (1970). However, undoubtedly the most significant study on the 1908–10 collections was that of Oliver (1915), comprising an annotated checklist of 261 fossil and Recent molluscan taxa, including a number of new records and descriptions of new taxa, a summary of previous taxonomic work, and descriptions of the ecological setting and biogeographic relationships of the Kermadec molluscan fauna.

In 1952 a few dredge hauls were made at depths between 55 m and 85 m around Raoul Island by the Danish research ship 'Galathea', and some of the molluscs obtained were listed and described by Powell (1958, 1967a). Further dredge sampling of shallow subtidal faunas around Raoul Island (i.e. at approximately 20–50 m depth) was carried out by A. J. Black from r.v. 'Acheron' in 1975 and 1976, and that, along with material collected earlier, has provided the basis for records and taxonomic descriptions of coastal Kermadec Islands molluscs published since the late 1970s. These include studies by Beu (1978), Cernohorsky (1978, 1984), Dijkstra & Marshall (1997), Fleming (1978), Houbrick (1986), Marshall (1977, 1979, 1981a, 1981b, 1983), Ponder (1983, 1985), Warén (1981) and Willan (1993).

Descriptions of the biogeographic relationships of the Kermadec Islands coastal molluscan taxa, in addition to those by Oliver (1915), were given by Dell (1957), Fleming (1973), Iredale (1910, 1914a), Marshall (1979, 1981a) and Rehder (1980).

Fossil molluscan taxa from the Kermadec Islands were listed by Oliver (1910, 1915) and Marshall (1979, 1981c).

ENVIRONMENT

Geology

The Kermadec Islands are the emergent crowns of large volcanic mountains that rise more than 1 km above the crest of the NNE-trending submarine Kermadec Ridge. That ridge extends between northeastern New Zealand and the Tonga Islands, and is situated above an active WNW-dipping subduction zone at the boundary of the Indian and Pacific crustal plates (Karig 1970; Ewart et al. 1977). It is flanked to the east by the 8000–10 000–m-deep Kermadec Trench, and to the west by the 2500–3000–m-deep Havre Trough, which separates the Kermadec Ridge from the parallel submarine volcanic Colville Ridge 175–200 km to the west-northwest. The Kermadec Islands are themselves of Pleistocene and Holocene age (Brothers & Martin 1970; Brothers & Searle 1970; Doyle et al. 1979; Lloyd & Nathan 1981). However, sedimentary rocks that contain reworked microfossils as old as earliest Miocene have been dredged from the top and flanks of the Kermadec and Colville ridges (P. F. Ballance pers. comm. 1997), indicating a long history of volcanism in the region. The Havre Trough is a back-arc basin that is thought to have begun opening in the Pliocene (Caress 1991; Wright 1993).

The oldest rock units exposed in the Raoul Island area are Early Pleistocene in age. They comprise submarine lava flows, volcanic breccia, hyaloclastite, and coral patch reefs, algal limestone and fossiliferous volcaniclastic lithofacies, which are inferred to have accumulated at intertidal to mid-shelf depths on the flanks of ephemeral volcanic islands (Brook 1998). Paleogeographic reconstructions in Lloyd & Nathan (1981, figs 21, 52) indicate that volcanic islands have existed continuously in the Raoul Island area at least since the Middle to Late Pleistocene, beginning with formation of a subaerial lava-dominated shield volcano centred on present-day southern Raoul Island, and subsequently extended by subaerial tephra-dominated eruptions with associated episodes of caldera formation, which have continued to the present day.

Hydrology

Satellite-derived sea surface temperature data summarised in Francis et al. (1987) indicate that surface waters in the Raoul Island area have an annual temperature range of approximately 16–26° C, with monthly means ranging from a minimum of 18°C in August-September to a maximum of 24°C in February. The depth of the upper mixed layer (i.e. to the top of the seasonal thermocline) in the Kermadec region varies between 30 m and 65 m (Ridgway & Heath 1975).

Sea surface salinity around Raoul Island is typically high (Ridgway & Heath 1975). Water clarity is also generally high, although wave action and terrestrial runoff can increase turbidity levels inshore, and more widespread plankton 'blooms' do occur rarely (J. Rotzel pers. comm. 1994).

The circulation of surface and near-surface waters in the Kermadec region is complex and poorly known. The overall pattern of oceanic circulation in the SWP is dominated by a large subtropical anticyclonic gyre. At low latitudes the Trade Wind Drift field generates an overall westward flow towards the Coral Sea and northwestern Australia, whereas at higher latitudes the return flow is predominantly to the east and northeast (Wyrtki 1960). In summer months the Trade Wind Drift field is pushed south by the northerly monsoon, and at times the northern part of the Kermadec chain lies in the path of south to southwest-flowing tropical water (Wyrtki 1960; Stanton 1969; Ridgway & Heath 1975). However, for most of the year the islands are in the path of the return flow of the subtropical gyre, and are influenced by eastward-flowing subtropical watermasses, or by cooler subtropical watermasses flowing north to NNE from northeastern New Zealand (Heath 1975, 1980, 1985; Reid 1986; Ridgway & Heath 1975; Roemmich & Cornuelle 1990). Additional evidence for the existence of surface currents flowing from New Zealand to the Kermadec Islands is given by the periodic washup of drift algae, seeds, logs and other flotsam derived from New Zealand on beaches at Raoul and Macauley islands (Oliver 1910; Sykes & Godley 1968; Nelson & Adams 1984).

Habitats

There is a limited range of physical habitat types at intertidal and shallow subtidal depths around the northern Kermadec Islands, and all but a very few sites – such as Boat Harbour on the Meyer Islands, and the northern side of the Milne Islets in Boat Cove – are exposed to unrefracted oceanic swell and storm waves. The smaller islands are encircled by rocky reefs, whereas boulder coasts and gravelly sand beaches predominate around Raoul Island. Steeply sloping rocky reefs, commonly with crevices, caves and overhangs, occur to between 10 m and 70 m depth around the smaller islands and rocks, and on parts of the southern and southeastern coasts of Raoul Island. More gently sloping substrata of *in situ* rock or large boulders are present locally around Meyer, Chanter and Raoul islands to depths of approximately 20–30 m. Volcaniclastic gravel and sand substrata extend offshore from sandy and boulder coasts around Raoul Island, and fringing aprons of mixed volcaniclastic-bioclastic gravelly and sandy sediments are present below approximately 10–20 m depth to seawards of rocky reefs around Raoul and the smaller islands. Lenses of bioclastic sandy gravel are present locally below approximately 15 m depth on rock ledges and at the base of steeply sloping to overhanging submarine rock faces around some of the smaller islands, and off headlands on the southeastern coast of Raoul Island. No muddy sediments are known from shallow subtidal depths around the northern Kermadec Islands.

Filamentous, frondose and crustose algae generally form the dominant benthic cover on unshaded low tidal and shallow subtidal reefs and boulder substrata around Raoul and adjacent islands. The tufted macroalga *Galaxaura filamentosa* locally forms dense stands on reefs at depths between 5 m and 20 m, and other species of frondose macroalgae form small patches on reefs and lush speciose swards on coarse gravel substrata. The fucalean kelp *Sargassum cristaefolium* occurs as rare small plants on some low intertidal and immediate subtidal reefs, but there are no subtidal kelp stands (Cole et al. 1992; Morton & Miller 1973; Nelson & Adams 1984; Schiel et al. 1986; pers. obs.). This is in contrast to the situation in the early part of this century, when *Sargassum* kelps formed stands from the lowermost intertidal to 1–5 m depth on rocky reefs around Raoul Island (Iredale 1910; Oliver 1915).

Hermatypic scleractinian corals are present at the Kermadec Islands, but there are no coral reefs or bioherms. Hermatypic coral cover on rocky reefs around the northern Kermadec Islands is typically greatest at 1–6 m depth, constituting up to 40%. Below that, corals generally contribute less than 10% of benthic cover on reefs, but increase in abundance to approximately 15–25% cover between depths of 18 m and 25 m in some areas. Coral cover decreases to less than 1% below 25–30 m depth. The majority of hermatypic species present have encrusting growth forms, but a few form massive colonies, and one species (*Turbinaria frondens*) forms large foliaceous colonies. The only branching scleractinian present, *Pocillopora damicornis,* occurs exclusively as compact low clumps (Schiel et al. 1986; F.J.B. unpubl. data).

Other prominent sessile benthic invertebrates on rocky reefs and boulder substrata include antipatharian corals, soft corals, zoanthids and vermetid gastropods in the intertidal (e.g. Cole et al. 1992; Morton & Miller 1973; Oliver 1915; Schiel et al. 1986). Shaded rock surfaces in subtidal caves, tunnels and overhangs have diverse invertebrate biotas that typically include homotremid foraminiferans, sponges, gorgonians, soft corals, ahermatypic scleractinian corals, hydroids, bryozoans, the brachiopod *Thecidellina maxilla*, serpulid worms and tunicates (pers. obs.).

METHODOLOGY

This study deals with fossil molluscan assemblages and the present-day benthic molluscan fauna occurring between the intertidal zone and 50 m depth around Raoul and adjacent islets, at the northern end of the Kermadec chain. It does not cover modern oceanic pelagic molluscs (e.g. in families Atlantidae, Carinariidae, Janthinidae, Cavoliniidae, Spiratellidae, Glaucidae, Onychoteuthidae, Cranchiidae, Enoploteuthidae, Ommastrephidae, Argonautidae), or rafted exotic benthic species associated with driftwood and coconut husks (e.g. in families Hiatellidae, Teredinidae – see Oliver 1915 for records). Coastal marine molluscan faunas of the southern Kermadec Islands (Macauley, Curtis, Cheeseman, L'Esperance) and deeper-water faunas from the region are excluded because their composition and zoogeographic relationships are as yet poorly known.

A checklist of modern benthic coastal marine chiton, bivalve, gastropod and cephalopod species compiled by the author and B A Marshall from Oliver (1915) and later taxonomic studies, and from examination of Kermadec Islands collections held at the Auckland Institute and Museum, and the Museum of New Zealand, is given as an Appendix The majority of previously published species records were checked by re-examination of specimens, and in some instances names were changed because of re-identifications and later taxonomic revisions Records which could not be confirmed because specimens proved unlocatable are indicated in the species list and a postscript to it

A large number of new records are reported in this study Most are based on collections made during a dredging programme carried out by Mr A J Black from the r v 'Acheron' in 1975 and 1976, which sampled 10 sites shallower than 50 m around Raoul and adjacent islands (Table 1), and collections made down to 45 m depth using SCUBA in May-June 1991 by G L F Carlin and the author at 10 sites on rocky reefs and fringing gravel substrata around eastern Raoul Island and the offshore islets The location of these dredge stations and SCUBA collecting sites is shown in Fig 2

A list of fossil molluscan taxa from the northern Kermadec Islands was compiled from Marshall's (1981c) records, re-examination of Oliver's collections held at the Museum of New Zealand, and new collections made by the author between 1988 and 1991 The fossil faunas are from two stratigraphic units of different ages Collections from Napier, Nugent Dayrell and southeastern Raoul islands (including KE/f44 and f46 of Marshall 1981) are all from the Herald Group of Early Pleistocene age (Brook 1998) A fossil collection made by Oliver from a fallen block at the base of cliffs in Coral Bay, northeastern Raoul Island (see description in Oliver 1911, p 531), was also tentatively assigned to the Boat Cove Formation in Marshall (1981, KE/f45) However, that correlation is unlikely as there are no in-situ Boat

Table 1 List of stations shallower than 50 m depth dredged by r v 'Acheron' around Raoul and adjacent islands Numbers with a BS prefix are Museum of New Zealand station numbers Latitudes and longitudes are based on chart NZ 2225 of the Hydrographic Office, Royal New Zealand Navy (1994)

BS 436	29°18 3′S 177°55′W 25 Oct 75	43 m	Southeast of D'Arcy Point, Raoul Island
BS 443	29°14 6′S 177°53′W 28 Oct 75	22–27 m	West of Boat Harbour, Meyer Island
BS 567	29°15 9′S 177°52 1′W 9 Sep 76	42–47 m	East Anchorage, Raoul Island volcaniclastic-bioclastic sandy gravel
BS 569	29°13 6′S 177°58 3′W 10 Sep 76	29–36 m	Northeast of Hutchison Bluff, Raoul Island hard bottom with algae
BS 573	29°14 8′S 177°51 3′W 11 Sep 76	31–45 m	Between Dayrell and North Chanter islands rhodolith gravel
BS 574	29°14 7′S 177°52 4′W 11 Sep 76	25–29 m	East side of Meyer Island coarse gravel with corals and foliose algae
BS 575	29°18 2′S 177°55 9′W 12 Sep 76	29 m	West of D'Arcy Point, Raoul Island hard bottom with encrusting algae
BS 576	29°18 2′S 177°56 8′W 12 Sep76	40–47 m	East of Smith Bluff, Raoul Island hard bottom with encrusting algae
BS 577	29°17 1′S 177°57 6′W 12 Sep 76	27–29 m	East end of Denham Bay, Raoul Island plate-like corals
BS 579	29°13 9′S 177°59 7′W 12 Sep 76	38 m	Northwest of Hutchison Bluff, Raoul Island sand and fine gravel

Cove Formation strata in the vicinity of Coral Bay. Instead it is most probable that the block, described by Marshall (1981) as comprising grey cemented tuff and lapilli tuff, was in fact eroded from adjacent cliff exposures of flat-lying, planar-bedded tuff, lapilli tuff and tuff breccia mapped as Hutchison Formation (Middle-Late Pleistocene) by Lloyd & Nathan (1981).

The wider distribution of Kermadec Islands molluscan species in the Pacific Ocean was determined from published records (quoted in the References), the author's field data, and examination of collections held at the Auckland Institute and Museum, and the Museum of New Zealand. Further information was obtained from unpublished partial species lists kindly provided by I. Loch for Lord Howe and Norfolk islands (based mainly on material held at the Australian Museum, Sydney), and by R. C. Willan for Norfolk Island (based on personal collecting and observations).

Zoogeographic areas referred to in the text are defined as follows: the tropical Pacific Ocean category refers to latitudes north of 24°S; the Southwest Pacific Ocean (SWP) category includes the east Australian coast south of 24°S, Elizabeth and Middleton reefs (29.3°S, 29.6°S), Lord Howe Island (31.3°S), Norfolk Island (29°S), New Zealand and Kermadec Islands; and the central and eastern South Pacific Ocean category (SEP) includes Pitcairn Islands (24°–25°S) and Easter Island (27°S). The term subtropics is used to refer to latitudes between 24°S and 33°S. Northern and southern New Zealand coasts are classified as 'warm temperate' and 'cold temperate' respectively following Briggs (1974).

Zoogeographic relationships of the Kermadec Islands coastal molluscan fauna were determined from analysis of information on species distribution. Species known or inferred to be restricted to the Kermadec Islands were classed as endemic, and non-endemic species were categorised according to known distribution across tropical, subtropical, warm temperate and cold temperate latitudinal classes, and known longitudinal distributions within the subtropical-temperate South Pacific Ocean. The relative diversity and zoogeographic relationships of a tropical component within the Kermadec Islands fauna were assessed using species distribution data for 11 families and one subfamily of prosobranch gastropods. They were chosen because the taxonomic composition and zoogeography of shallow-water faunas in the tropical-subtropical western and central Pacific Ocean are relatively well known, and they contain species that are typically (although not exclusively) reef-associated. Only wide-ranging species were used in the analysis; local endemics were excluded. Information on regional species distribution and faunal diversity was obtained from published records (all listed in the References), and for Lord Howe and Norfolk Islands, from species lists supplied by I. Loch and R. C. Willan (see above).

RESULTS

An annotated checklist of 358 species of modern coastal marine molluscs from the northern Kermadec Islands, comprising 9 polyplacophorans, 45 bivalves, 302 gastropods and 2 cephalopods, is given in the Appendix. That list includes 153 new records for the Kermadec region, many of which are of undescribed species.

At a higher taxonomic level the coastal benthic fauna includes a total of 116 families, comprising 4 families of polyplacophorans, 27 of bivalves, 82 of gastropods and 1 of cephalopods. Most families are represented by only one to a few species, with diversity greatest in Rissoidae (12 spp.), Ranellidae (11 spp.), Cerithiopsidae (15 spp.), Triphoridae (26 spp.), Muricidae (12 spp.), Conidae (28 spp.) and Pyramidellidae (16 spp.). Some widespread families not represented in the benthic coastal fauna at the Kermadecs include Acanthochitonidae, Glycymerididae, Carditidae, Tridacnidae, Haliotidae, Lottiidae, Cancellariidae, Turbinellidae, Aglajidae, Elysiidae, Stiligeridae, Polyceridae, Gymnodorididae, Dendrodorididae, Aeolidiidae, Tergepedidae, Tritoniidae and Bornellidae.

Zoogeographic relationships of the fauna are summarised in Tables 2–4. Characteristic

Table 2 Zoogeographic affinities of coastal benthic molluscan fauna of the northern Kermadec Islands.

	No. of species of				Totals of all classes combined
	Polyplacophora	Bivalvia	Gastropoda	Cephalopoda	
(1) Species ranging from the tropics south to:					
A. Subtropical latitudes (i.e. between 24° S and 33° S)		20	112	1	133
B. Northern New Zealand		2	30		32
C. Southern New Zealand			2		2
(2) Species present at the Kermadec Islands and elsewhere in the south Pacific Ocean, and which are not known north of 24° S					
A. Apparently restricted to subtropical latitudes (i.e. 24° S – 33° S)	1	3	17		21
B. Ranging south to northern New Zealand		2	23		25
C. Ranging south to southern New Zealand	2	1	6		9
(3) Species known only from the Kermadec Islands					
A. Endemic	5	10	27	1	43
B. Probably endemic	1	2	22		25
(4) Range unknown		5	63		68
Totals:	9	45	302	2	

Table 3 Numbers of tropical and eurythermic tropical species (excluding local endemics) of 12 family groups of gastropod molluscs recorded from some tropical, subtropical and warm temperate areas in the South Pacific. Abbreviations and data sources: GBR-Great Barrier Reef (Wilson 1993, 1994); F-Fiji (Cernohorsky 1964a, 1964b, 1965, 1967, 1969, 1971, 1984; Cernohorsky & Jenning 1966; Houbrick 1978, 1985, 1992; Tucker Abbot 1960a, 1960b); NI-Niue (Cernohorsky 1970); EM-Elizabeth and Middleton reefs (Iredale 1937; Loch & Rudman 1992); LH-Lord Howe Island (I. Loch pers. comm. 1995); N-Norfolk Island (Paul 1980, I. Loch & R. C. Willan pers. comm. 1995); K-Kermadec Islands; NZ-New Zealand (Powell 1979; Spencer & Willan 1995); P-Pitcairn Islands (Paulay 1989; A. G. Beu pers. comm. 1997); E-Easter Island (Di Salvo et al. 1988; Osorio 1991; Rehder 1980;).

	Tropical SWP			Subtropical SWP				Temperate SWP	Subtropical SEP	
	GBR	F	NI	EM	LH	N	K	NZ	P	E
Cerithiidae	43	32	3	10	13	4	8	0	9	9
Strombidae	27	20	7	2	7	5	4	0	3	1
Cypraeidae	61	57	36	10	25	26	8	2	21	4
Naticidae	36	21	1	1	9	8	4	3	3	2
Ranellidae	27	18	5	1	5	6	7	5	2	1
Bursidae	10	8	5	3	5	2	3	1	2	1
Thaidinae	30	21	13	12	13	14	1	1	14	5
Nassariinae	39	43	3	1	3	3	2	0	2	0
Mitridae	69	75	21	6	7	0	5	0	9	2
Costellariidae	57	60	15	2	5	3	1	0	1	1
Coninae	72	70	36	21	19	16	16	1	18	4
Terebridae	50	55	5	3	10	1	3	1	5	2
Totals:	521	480	150	72	121	88	62	14	89	32

Table 4 Numbers of tropical and eurythermic tropical species (excluding local endemics) of nine family groups of gastropod molluscs occurring at the Kermadec Islands that are also present elsewhere in the subtropical South Pacific. Species diversities at the Kermadec Islands are listed in parentheses. Data sources and locality abbreviations as in Table 3.

		No. of Kermadec species also recorded elsewhere in the subtropical South Pacific						
		(i) Islands and island groups					(ii) Regions	
		EM	LH	N	P	E	SWP	SEP
Cerithiidae	(8)	6	4	2	6	4	7	6
Strombidae	(4)	0	3	3	0	0	3	0
Cypraeidae	(8)	4	4	7	4	2	8	5
Naticidae	(4)	0	4	3	1	1	4	1
Ranellidae	(7)	1	3	5	2	1	5	2
Bursidae	(3)	1	3	2	2	1	3	1
Mitridae	(5)	0	0	0	2	1	0	2
Coninae	(16)	6	8	8	7	1	10	7
Terebridae	(3)	0	3	0	1	1	3	1
Totals	(57)	18	32	30	25	12	43	25

features include a high degree of endemism, the presence of a large number of subtropical-temperate species, a predominance of wide-ranging tropical species, and low overall species diversity. Five bivalve and 63 gastropod species recorded from Kermadec Islands have unknown ranges, and thus species percentages quoted below for zoogeographic components within the fauna represent minimum possible values.

At least 68 mollusc species, comprising 19% of the fauna, are known or inferred to be endemic to the Kermadec Islands. The total includes 27% of bivalve species, 16% of gastropod species and 67% of the polyplacophorans. The majority of endemic species are prosobranch gastropods. High levels of endemism occur within families Trochidae, Turbinidae, Eatoniellidae, Rissoidae, Anabathridae, Triphoridae, Columbellidae and Pyramidellidae in the Gastropoda, and Philobryidae in the Bivalvia. Families represented in the Kermadec Islands coastal fauna by a single endemic species include Spondylidae, Ungulinidae, Crassatellidae, Cardiidae, Cuspidariidae, Nacellidae, Patellidae, Calliostomatidae, Phasianellidae, Rastodentidae, Vanikoridae, Xenophoridae and Olividae.

The Kermadec Islands fauna also includes at least 7 bivalve and 46 gastropod species that occur elsewhere in the southern Pacific Ocean, but that do not range into the tropics (i.e. north of 24°S). That group includes 9 species that have distributions extending from subtropical latitudes south to cold temperate coasts of southern New Zealand (i.e. *Eudoxochiton nobilis, Plaxiphora caelata, Gregariella barbata, Nodilittorina antipodum, Cabestana spengleri, Cabestana tabulata, Ranella australasia, Dicathais orbita, Gadinia conica*). Other species are restricted to subtropical latitudes between 24°S and 33°S (21 species comprising 6% of the fauna), or have distributions extending south to warm temperate coasts of northern New Zealand (25 species comprising 7% of the fauna).

The majority of the subtropical-temperate and non-endemic subtropical species in the Kermadec fauna are restricted to the SWP. That group includes species with the following zoogeographic distributions: (i) Australia, subtropical SWP islands and northern New Zealand (e.g. *Nerita atramentosa, Hinea brasiliana, Semicassis royanum, Semicassis sophia, Sassia parkinsonia, Bursa verrucosa, Coralliophila sertata, Nassarius spiratus, Mitra carbonaria*); (ii) as above but extending to southern New Zealand (e.g. *Gregariella barbata, Neolepton antipodum, Cabestana spengleri, Cabestana tabulata, Ranella australasia, Dicathais orbita, Gadinalia conica*); (iii) Australia and subtropical SWP islands only (e.g. *Lyria nucleus, Pugnus parvus*); (iv) subtropical SWP islands only (e.g. *Ischnochiton intermedius, Conus raoulensis*); (v) subtropical SWP islands and New Zealand (e.g. *Morula palmeri, Morula smithi, Polinices tawhitirahia*); and (vi) Kermadec Islands and New Zealand only (e.g. *Eudoxochiton nobilis, Plaxiphora caelata, Assiminea vulgaris, Suterilla neozelanica, Metaxia exaltata, Nototriphora aupouria, Eulima perspicua*). In addition, there are at least four subtropical species that range eastwards to Pitcairn Islands or Easter Island (i.e. *Casmaria perryi, Fusinus genticus, Cancilla cernohorskyi, Stosicia chiltoni* – see Di Salvo et al. 1988; Paulay 1989; Rehder 1980; Sleurs & Preece 1994), of which the first two are also shared with northern New Zealand.

By far the largest component of the coastal molluscan fauna at the northern Kermadec Islands consists of species that are widely distributed in the tropical Pacific Ocean. At least 37% of the Kermadec fauna are tropical species that do not occur south of the subtropics, whereas a further 9% of tropical species occur south to warm temperate coasts of northern New Zealand. The latter have a 'eurythermic tropical' distribution (*sensu* Briggs 1974). The ranellid gastropods *Charonia lampas* and *Cymatium parthenopeum* are the only shallow-water molluscan species at the Kermadecs known to have a distribution extending from the tropics to cold temperate latitudes.

Although the Kermadec Islands coastal molluscan fauna has strong tropical zoogeographic affinities, the total number of species recorded (i.e. 358) is much lower than those determined and estimated for shallow-water faunas at lower latitudes in the western and central Pacific (e g Bouchet 1979, 1994, McManus 1985, Richard 1985, Wells 1990) The attenuated nature of the tropical and eurythermic tropical component in the Kermadec fauna is emphasised by the overall regional diversity differences within the prosobranch families listed in Table 3, and particularly within Cypraeidae, Thaidinae, Mitridae, Costellariidae and Coninae

Data in Table 3 also indicate that the total number of widely distributed tropical and eurythermic tropical species within those family groups at the Kermadec Islands is lower overall than at Elizabeth and Middleton reefs and at Lord Howe, Norfolk and Pitcairn islands (i e 16%, 95%, 42% and 44% fewer species respectively), the greatest attenuation being within Cypraeidae and Thaidinae However, species diversity in some families at the Kermadec Islands is comparable with that at other subtropical south Pacific islands, and in the Cerithiidae, Mitridae and Terebridae, is higher than at Norfolk Island (note that it is not known whether the low diversity recorded for some families at Elizabeth and Middleton reefs is real, or merely reflects a paucity of collecting effort at those sites) The diversity of tropical and eurythermic tropical species at the Kermadecs is substantially higher than at Easter Island or around New Zealand (94% and 343% more species respectively), although diversity within some families is similar (e g Naticidae, Costellariidae, Terebridae)

An analysis of distributions within the subtropical South Pacific of Kermadec tropical and eurythermic tropical species from some of the prosobranch families listed in Table 3 is given in Table 4 It shows that of the 57 species recorded from the Kermadec Islands, 32% are shared with Elizabeth and Middleton reefs, 56% with Lord Howe Island, 53% with Norfolk Island, 44% with the Pitcairn Islands, and 21% with Easter Island A total of 25% of the Kermadec species are not known from other SWP islands, whereas 56% are not known from either Pitcairn or Easter islands Species present at SEP islands that are not known from other SWP islands include *Pseudovertagus clava, Cymatium nicobaricum, Mitra coronata, Neocancilla takiisaoi* and *Conus magnificus* Species not known from any of the other listed subtropical South Pacific islands include *Strombus haemostoma, Cymatium iredalei, Phos textilis, Mitra mitra, Mitra fastigium, Mitra typha, Conus bruuni, Conus coelinae, Conus nielseni, Conus obscurus* and *Conus striatus*

Fossil molluscan species known from the northern Kermadec Islands are listed in Table 5 A total of 26 species (14 bivalve, 12 gastropod) are recorded from Early Pleistocene sequences, and 9 species (1 bivalve, 8 gastropod) from the single Middle-Late Pleistocene collection Despite the low number of species in the fossil faunas as compared with present-day species diversity, the following points can be made

1 Only 65% of the known Early Pleistocene species occur in the modern fauna whereas 5 (83%) of the 6 positively identified Middle-Late Pleistocene species are still living around the Kermadec Islands As noted by previous authors (e g Oliver 1911, 1915, Marshall 1981c) the list of locally extinct species includes some that are still extant in the tropical Pacific Ocean (e g *Trochus (Infundibulum)* sp , *Turbo argyrostomus*)

2 A nucleus of the present-day fauna, including some local and regional endemics and widespread tropical species, was present in the Kermadec area during Early Pleistocene time It included the Kermadec endemics *Chama* sp A, *Talabrica iredalei, Patella kermadecensis,* southwest Pacific Ocean endemics *Neolepton antipodum Lutraria bruuni*, and widely distributed tropical species *Barbatia ?decussata, Septifer* sp cf *bryanae, Chlamys coruscans Nemocardium bechei, Globivenus toreuma, Euchelus foveolatus, Antisabia* sp cf *foliacea, Cypraea cernica, Bursa granularis, Coralliophila bulbiformis* and *Willamia radiata nutata*

3 The relative proportions of the various biogeographic elements in the Early Pleistocene fauna broadly parallel those of the modern fauna (i e predominance of tropical species, lower diversity of locally endemic and subtropical-temperate species)

4 Reasonably thorough searching of a number of fossiliferous shallow marine Early Pleistocene sequences has failed to turn up many of the macromollusc species that are among the most common and distinctive components of the modern coastal fauna That group

includes widely distributed tropical taxa such as *Chama plinthota, Angaria delphinus, Cerithium* spp. and *Strombus* spp., the endemic bivalve *Spondylus raoulensis* and endemic gastropods *Monilea incerta* and *Tectus royanus*. The last two species are, however, represented in the sole Middle-Late Pleistocene fauna.

Table 5 List of fossil molluscan taxa recorded from the northern Kermadec Islands. Endemic species denoted by an asterisk. The Early Pleistocene fauna is from Herald Group (Brook 1998) sequences and includes collections from Raoul, Napier, Nugent and Dayrell islands. The Middle-Late Pleistocene fauna is from a fallen block on the northeastern coast of Raoul Island that is here considered to have been eroded from a Hutchison Formation (Lloyd & Nathan 1981) sequence. Identifications in Marshall (1981) that could not be checked because the specimens are missing are given in quotation marks.

		Early Pleistocene	Middle-Late Pleistocene	Present day
BIVALVIA				
ARCIDAE	*Acar* sp.	x		
	Barbatia ?decussata (Sowerby)	x		x
	Barbatia sp.	x		
MYTILIDAE	*Septifer* sp. cf. *bryanae* (Pilsbry)	x		x
PECTINIDAE	*Chlamys coruscans* (Hinds)	x		x
SPONDYLIDAE	*Spondylus* sp.	x		
ANOMIIDAE	*Pododesmus* sp. cf. *zelandica* (Gray)	x		x
UNGULINIDAE	*"Felaniella* sp."		x	?
CHAMIDAE	**Chama* sp. A[1]	x		x
	Chama sp. B	x		
NEOLEPTONIDAE	*Neolepton antipodum* (Filhol)	x		x
CRASSATELLIDAE	**Talabrica iredalei* (Powell)	x		x
CARDIIDAE	*Nemocardium bechei* (Reeve)[2]	x		x
MACTRIDAE	*Lutraria bruuni* Powell	x		x
VENERIDAE	*Globivenus toreuma* (Gould)	x		x
GASTROPODA				
PATELLIDAE	**Patella kermadecensis* Pilsbry	x		x
TROCHIDAE	*Clanculus* sp.	x		
	Herpetopoma foveolata (A. Adams)	x		x
	sp. aff. *Micrelenchus*	x		
	**Monilea incerta* Iredale		x	x
	**Tectus royanus* Iredale		x	x
	Trochus sp.	x		
	Trochus (Infundibulum) sp.	x		
TURBINIDAE	*Turbo argyrostomus* Linnaeus	x		
RISSOIDAE	**"Alvania kermadecensis* (Oliver)"		x	x
	"Alvania aff. *kermadecensis* (Oliver)"		x	
	**"Onoba kermadecensis* (Powell)"		x	x
	"Rissoina sp."		x	?
ANABATHRIDAE	*"Amphithalmus sundayensis* Oliver"		x	x
CAPULIDAE	*Antisabia* sp. cf. *foliacea*	x		x
CYPRAEIDAE	*Cypraea cernica* Sowerby	x		x
BURSIDAE	*Bursa granularis* (Roeding)	x		x
MURICIDAE	*Coralliophila bulbiformis* (Conrad)	x		x
PHILINIDAE	*"Philine* sp."		x	?
SIPHONARIIDAE	*Williamia radiata nutata* (Hedley)	x		x

DISCUSSION

The species composition of the modern intertidal molluscan fauna at the northern Kermadec Islands is reasonably well known (e g Oliver 1915, Morton & Miller 1973), but the list of subtidal species (Appendix) is likely to be far from comprehensive given the relatively small amount of dredging and SCUBA collecting that has been done around the islands Two points to note in that regard are, first, that there has been a collection bias towards shelled molluscs, such that some opisthobranch groups (i e Sacoglossa, Notaspidea, Nudibranchia) are probably substantially under-represented in the list, and second, that spatially and/or temporally rare species and cryptic species are probably also under-represented

Zoogeographic analysis of the Kermadec molluscan fauna is also hampered by a lack of comprehensive information on species distribution and the composition of coastal faunas elsewhere in the southern Pacific Ocean The range of many species, particularly micromolluscs, is either unknown or poorly known, and some of those listed here as being endemic to the Kermadec Islands or the subtropical SWP may prove to be more widely distributed

Given these limitations in the data set it is inevitable that future taxonomic and biogeographic studies of molluscan faunas at the Kermadec Islands and elsewhere in the Pacific Ocean will alter the details of the zoogeographic analyses given above However, the overall findings of this study are unlikely to change substantially, namely that (1) the coastal molluscan fauna at the northern Kermadec Islands contains a mix of species of tropical, subtropical and temperate affinities, (2) in terms of species diversity the fauna is dominated by tropical species, although that component is depauperate (at the species/genus level) as compared with faunas in the tropical western and central Pacific Ocean, (3) there is a considerable endemic component, estimated here at 19% of the total fauna, (4) the overall diversity of tropical and eurythermic tropical molluscan species at the Kermadec Islands is substantially lower than at Lord Howe and Norfolk islands, paralleling trends shown by hermatypic corals (F J B unpubl data) and coastal fish faunas (Francis 1993)

A zoogeographic analysis by Oliver (1915) identified essentially the same basic subdivision of the benthic molluscan fauna into endemic, tropical and subtropical-temperate components, allowing for the fact that his "Polynesian" and "New Zealand" categories equate respectively with combined 1A, 1B, 1C, 2A and 2B, 2C categories of Table 2 Dell (1957) re-analysed Oliver's data set but did not adequately differentiate between subtropical-temperate and tropical species, and consequently failed to recognise the proportional dominance of the latter group within the Kermadec Islands fauna Both Oliver's (1915) and Dell's (1957) analyses identified much higher levels of endemism than the present study

The proportion of endemic species in the molluscan fauna is higher than in other taxonomic groups at the Kermadec Islands For example, only one of 23 (4%) coastal scleractinian coral species is endemic (F J B unpubl data), and the coastal fish fauna comprises 145 species of which only 3 (2%) are endemic (Francis 1993)

Factors influencing faunal diversity and composition

The benthic coastal molluscan fauna at the northern Kermadec Islands is similar to faunas at other subtropical southern Pacific islands in having a high proportion of wide-ranging tropical and eurythermic tropical species, and lower overall species diversity than tropical Pacific faunas Diversity of tropical and eurythermic tropical species at the northern Kermadec Islands is apparently lower than at all other subtropical South Pacific islands except Easter Island Conversely, the number and proportion of endemic species in the Kermadec fauna are much higher than at all the other subtropical south Pacific islands except Easter Island The latter has 48 putatively endemic species and subspecies, comprising approximately 42% of the coastal molluscan fauna (Rehder 1980 – but see also Di Salvo et al 1988), as compared with the 68 species comprising 19% of the northern Kermadec fauna

Clearly then, some aspects of the diversity and composition of the coastal molluscan fauna of the northern Kermadec Islands are attributable to factors operating on a Pacific-wide scale (e.g. the latitudinal diversity gradient), whereas others have resulted from regional and local factors. Factors likely to have influenced the Kermadec fauna will be discussed under the headings biogeographic isolation, environmental limitations, and geological and paleoceanographic history.

Biogeographic isolation

The Kermadec Islands are physically isolated from other landmasses in the South Pacific by wide areas of open ocean that lack shallow marine habitats. The fact that they can (now) be colonised only by species capable of transoceanic dispersal presumably has a strong influence in limiting both the species diversity and taxonomic composition of the coastal molluscan fauna.

Oceanic circulation patterns in the SWP define three possible source areas for immigrant propagules of benthic coastal marine molluscs. (1) The return flow of the anticyclonic subtropical gyre could carry propagules from sources to the west and northwest of the Kermadec Islands (i.e. New Caledonia, Coral Sea, Great Barrier Reef, Elizabeth and Middleton reefs, Lord Howe Island, Norfolk Island). Of those localities, Norfolk Island is the most likely source of larvae because of its position closest to the Kermadecs (1350 km). (2) Cooler subtropical-warm temperate watermasses moving north to NNE from northeastern New Zealand as offshoots of the East Auckland Current could also transport propagules to the Kermadec Islands. (3) During summer months, propagules could possibly be carried to the northern Kermadec Islands in south and southwestward-moving tropical watermasses associated with the Trade Wind Drift. Minerva Reefs 590 km north of the Kermadec Islands, and Tonga are the most likely source areas in this instance.

The species composition of the coastal molluscan fauna at the northern Kermadec Islands provides circumstantial evidence for the operation of the first two of these dispersal routes. Zoogeographic distribution of subtropical SWP endemics with ranges extending from Kermadec Islands to Norfolk Island (e.g. *Ischnochiton intermedius, Conus raoulensis*) and southeastern Australia (e.g. *Lyria nucleus, Pugnus parvus*) are indicative of eastwards dispersal of colonising propagules in subtropical gyre watermasses. Similarly, the distribution of the northeastern New Zealand-Kermadec Islands endemics *Eudoxochiton nobilis, Plaxiphora caelata, Assiminea vulgaris, Suterilla neozelanica, Metaxia exaltata, Nototriphora aupouria* and *Eulima perspicua* are indicative of north to NNE dispersal of colonising propagules to the Kermadec Islands from northeastern New Zealand. Subtropical-warm temperate species common to both northeastern New Zealand and other subtropical SWP islands (e.g. *Divarilima sydneyensis, Bursa verrucosa, Casmaria perryi, Fusinus genticus, Hinea brasiliana, Morula palmeri, Neothais smithi, Nerita atramentosa, Polinices tawhitirahia, Sassia parkinsonia*) could have dispersed to the Kermadec Islands in either north to NNE or eastward-flowing watermasses.

There is no direct evidence at present to indicate whether propagules have also dispersed south to the Kermadec Islands in Trade Wind Drift watermasses, although the relatively high proportion of tropical molluscan species in the Kermadec Islands fauna that are not shared with other subtropical SWP islands (e.g. Table 4) suggests that it is likely.

Populations of all the endemic mollusc species at the Kermadec Islands are clearly being maintained at present by self-recruitment, and it is likely that populations of common non-endemics there are also wholly or largely maintained by self-recruitment. However, a number of species have been recorded only from single or few individuals, and some species that were recorded by Oliver (1915) and earlier workers have not been collected again subsequently. This suggests that there is also a faunal component at the Kermadecs that is contingent upon chance settlement of propagules from external source areas. The Littorinidae are of particular interest in this regard. The subtropical-temperate species *Nodilittorina antipodum* was found to be extremely rare in 1908 (Iredale 1910 – as *Litorina mauritania*; Oliver 1915) and 1991 (pers. obs.), and is unlikely to be self-maintaining at the northern Kermadec Islands. Of the two tropical species recorded from the Kermadec Islands, *Nodilittorina novaezelandiae* occurred in small colonies on northeastern Raoul Island in 1908 (Iredale 1910; Oliver 1915) but has not been recorded subsequently anywhere in the group, whereas *Nodilittorina millegrana* is known only from two specimens collected on Meyer Island in 1995. Examples of other rare and ephemeral species in the Kermadec molluscan fauna include the tropical *Pteria avicula, Streptopinna saccata, Acteon variegatus, Conus chaldeus, Conus flavidus, Conus obscurus, Cypraea isabella, Cypraea poraria* and *Mitra mitra*, and the subtropical-temperate *Gregariella barbata, Cabestana tabulata, Mitra carbonaria, Sassia parkinsonia* and *Semicassis royanum*. The role of larval dispersal and chance recruitment events in influencing species composition and abundance at subtropical SWP islands has previously also been recognised for other coastal taxa including corals (Veron & Done 1979), echinoderms (Hoggett & Rowe 1988) and fishes (Allen et al. 1976; Francis 1993).

As well as being a limiting factor in terms of immigration of propagules, the physical isolation of the Kermadec Islands is presumably also a key factor favouring the relatively high degree of endemism in the coastal benthic molluscan fauna. The nearest areas of shallow marine habitat downstream in the return flow of the subtropical gyre lie 3300 km and more to the east in southern Polynesia (Reid 1986). The distribution of the subtropical species *Cancilla cernohorskyi* and *Stosicia chiltoni* suggests that dispersal of propagules from the Kermadec region eastwards to central South Pacific islands can occur, but as for coastal fish (Francis 1993), it is probably rare and limited to species with long larval duration.

Records of single individuals of two endemic Kermadec coastal fish species in northeastern New Zealand coastal waters (M. P. Francis unpubl. data) provide evidence that net southwestward dispersal of propagules from the Kermadec region can also occur, albeit rarely. Such dispersal events possibly result from anticyclonic transport of propagules, initially in southwestward flowing tropical water masses, and subsequently southeastwards in the return flow of the subtropical gyre.

Environmental limitations

Physical environmental factors that are inferred to have a strong influence on the taxonomic composition and diversity of the Kermadec Islands coastal molluscan fauna include the marine climate and the low diversity of habitat types present. The subtropical location of the islands, and the consequent cooler sea temperatures and greater seasonality in temperature range than at tropical latitudes to the north and northwest, have presumably been key factors allowing the establishment and survival of subtropical and subtropical-temperate species in coexistence with tropical and eurythermic tropical species. Conversely, the fact that sea temperatures are cooler and warmer respectively than at tropical and temperate latitudes in the SWP has probably also precluded establishment of many other planktonically dispersed, stenothermal, tropical and temperate species. However, although the low diversity of the tropical component in the Kermadec fauna may in part be owing to temperature limitations, the fact that faunas of higher diversity occur at the other subtropical SWP islands (e.g. Table 3) suggests that other factors are also important. Dispersal limitations consequent upon the Kermadec Islands being 'downstream' from Elizabeth and Middleton reefs and Lord Howe and Norfolk islands presumably also have an influence, as does the range of physical habitat types present at the Kermadec Islands.

The Kermadec Islands differ from the other subtropical SWP islands in having a much lower diversity of habitat types, and in particular in lacking fringing coral reefs, lagoons and intertidal and subtidal limestone reefs. Species diversity and percentage cover of hermatypic corals are also much lower at the Kermadec Islands, and there are no coral frameworks such as occur at the other subtropical SWP islands. In short, the Kermadec Islands lack many of the habitat types that are characteristic of tropical Pacific coastal environments, including sheltered hard and soft substratum macro- and microhabitat types associated with coral reefs and lagoons. The exposed nature of coastal habitats around the Kermadecs and the absence of fine-grained sediment substrata is also reflected in the high gastropod:bivalve ratio (i.e. 7:1) and the predominance of epifaunal, nestling and boring species in the bivalve fauna (see Kay 1979 and Paulay 1990 comparative data).

Geological and paleoceanographic history

Although the taxonomic composition of the extant coastal molluscan fauna at the Kermadec Islands is influenced by the present-day geographic and environmental setting of the islands (in terms of their effects on immigration and survival of species), it is also in part an inheritance of the geological and paleoceanographic history of the region. Two lines of evidence indicate the importance of the latter in shaping the fauna, namely: (1) the high number and proportion of endemics relative to other subtropical SWP islands, and the known and inferred phylogenetic relationships of the endemic taxa; and (2) paleontological evidence for faunal turnover.

The fact that the fauna contains so many endemics suggests that geographic isolation and dispersal limitations have had an important influence historically, assuming that the present-day Kermadec endemics arose either through *in situ* allopatric speciation following genetic isolation of populations, or are surviving relict populations of formerly more widespread species.

Marshall (1979) suggested that the endemic Kermadec Islands coastal trochid species *Clanculus atypicus, Monilea incerta* and *Tectus royanus* could have evolved from isolated ancestral stock of the morphologically similar and widely distributed extant tropical congeners *Clanculus thomasae, Monilea belcheri* and *Tectus pyramis*. Similarly, some Kermadec endemics are morphologically similar to extant temperate New Zealand endemics, and likely evolved allopatrically from ancestral stock that was originally common to both regions. Examples, with related New Zealand taxa listed in parentheses, are *Chiton themeropis (C. aorangi), Onithochiton oliveri (O. neglectus), Rhyssoplax exasperata (R. aerea)* and *Xenophora neozelanica kermadecensis (X. neozelanica neozelanica)*. There are also Kermadec endemics that are apparently most closely related to other subtropical SWP endemics, e.g. *Leptochiton norfolcensis subtropicalis* (Kaas & van Belle 1985a). *Patella kermadecensis*, in contrast, is possibly a relictual endemic at the Kermadec Islands, given that its closest known relatives are the extant Melanesian endemic species *Patella tucopiana*, and the extinct *Patella aurorae* from the Oligocene of the northern South Island, New Zealand (Fleming 1973; Powell 1973).

The fossil faunas described above provide information on the stratigraphic range of some locally and regionally endemic macromollusc species. *Chama* sp. A, *Lutraria bruuni, Talabrica iredalei* and *Patella kermadecensis* were all present at the northern Kermadec Islands by Early Pleistocene time, whereas the earliest record of the trochids *Monilea incerta* and *Tectus royanum* is in a Middle-Late Pleistocene fauna. The absence of the last two species from Early Pleistocene faunas suggests the possibility that some Kermadec endemic lineages may extend back only to Middle-Late Pleistocene time. If the endemic component in the Kermadec biota is in fact of composite temporal origin then it clearly cannot be attibuted to a single vicariance event.

The fossil assemblages also provide direct, albeit limited evidence indicating that, although the Early Pleistocene Kermadec coastal fauna was essentially subtropical in character with a broadly comparable biogeographic composition and some of the species of the modern fauna, it also contained a high proportion (35%) of species that are no longer living in the Kermadec region. At least part of the subsequent faunal turnover involved local extinction of widespread species as indicated by the modern occurrence of *Trochus* (*Infundibulum*) sp. and *Turbo argyrostomus* in wave-exposed reef habitats in the tropical Pacific Ocean. The contrasting survival of the endemic limpet *Patella kermadecensis*, which is at present restricted to intertidal to immediate subtidal reef and boulder substrata in areas of moderate to high wave exposure, indicates that shallow, hard-bottom habitats have existed in the Kermadec region since at least Early Pleistocene time. Thus macrohabitat loss is unlikely to have been a sole causal factor in the local extinction of the two trochacean species mentioned above. All of the other Early Pleistocene species that are no longer extant at the Kermadec Islands were also hard-bottom dwellers (i.e. with epifaunal and nestling habitat) but their habitat requirements in terms of other environmental parameters are unknown.

Given the history and degree of endemism, and evidence for faunal turnover, what is known about the geological and paleoceanographic history of the Kermadec region in particular and the southwestern Pacific Ocean in general? As noted in the Introduction, the present-day Kermadec Islands are of Pleistocene and Holocene age, the oldest rock units exposed at the northern Kermadec Islands being of Early Pleistocene age. However, the fact that the Kermadec and Colville ridges both consist predominantly of coalescing arc-type volcanoes (Du Pont 1988), and that both ridges have a geological history extending back to at least Early Miocene time (P. F. Ballance pers. comm. 1997), suggests the likelihood that ephemeral volcanic islands also existed along the ridge system before Pleistocene time. That in turn raises interesting possibilities concerning the development of the Kermadec coastal molluscan fauna, namely: (1) that the fauna, and in particular the endemic component, may in part be of pre-Pleistocene origin; and (2) depending on the particular paleogeographic history of island formation and foundering along the ridges during the Neogene, that dispersal of propagules to the Kermadec region from New Zealand and tropical islands to the north may at times have been enhanced by the existence of ephemeral 'stepping stone' islands. The latter would certainly have existed between New Zealand and the Kermadec Islands as recently as the last glaciation at 18 000 years BP, when the present shallowly submerged volcanic edifices on the Kermadec Ridge at 32.4°S, 33°S and 35.7°S (Hydrographic Office, Royal New Zealand Navy 1992a) became emergent as a result of sea-level fall during glaciation. Similarly, shallow submarine mountains on the Kermadec Ridge between Raoul Island and Tonga (i.e. between 22.6°S and 28.9°S: Hydrographic Office, Royal New Zealand Navy 1992a) presumably also formed ephemeral islands during that and earlier Pleistocene glaciations. Pleistocene sea-level changes would also have resulted in substantial temporal variation in the areal extent and physical setting of coastal marine habitats around the Kermadec Islands, as did dynamic processes of volcanism and coastal erosion (e.g. Lloyd & Nathan 1981, figs 21, 52). Those geomorphological changes may in turn have influenced faunal composition through creation or loss of particular physical habitat types around the islands (i.e. in terms of substratum type and hydrodynamic stress).

The pre-Pleistocene paleogeographic history of the southwestern Pacific Ocean is known only in general terms. The continental landmasses of New Caledonia, Australia and New Zealand, and the intervening ocean basins and ridge systems, have existed in more-or-less their present configuration throughout late Neogene time (Weissel et al. 1977). Similarly, there were also arc-related volcanic ridges and islands at tropical latitudes to the north and northwest of the Kermadec region throughout the late Neogene, albeit with changing geography as a consequence of a complex history of rifting and subduction along and adjacent to the Indian-Pacific plate margin (e.g. Rodda 1994).

The western subtropical SWP islands have existed since Late Miocene and Pliocene time. Norfolk Island comprises eroded remnants of subaerial volcanoes that erupted from about 3 Ma to 2.3 Ma (Jones & McDougall 1973), although the presence of reworked clasts of lower Miocene bioclastic limestone in the volcanics points to the earlier existence of shallow marine environments in that region (Coleman & Veevers 1971). Lord Howe Island is a remnant of a large subaerial volcano that erupted from about 6.9 Ma to 6.4 Ma, whereas the emergent carbonate platforms of Elizabeth and Middleton reefs are inferred to have been constructed on volcanos that erupted between about 10 Ma and 11 Ma (McDougall et al. 1981). If the conclusions of McDougall et al. (1981) concerning the origin and age of the Lord Howe seamount chain are correct, it follows that shallow marine environments have probably also existed on carbonate-capped seamounts north of Elizabeth and Middleton reefs throughout the late Neogene. Similarly, there is also a possibility that shoaling parts of the submarine ridge extending between Norfolk Island and northern New Zealand (i.e. southern Norfolk Ridge in the vicinity of 167.5°E 32.5°S: Hydrographic Office, Royal New Zealand Navy 1992b) may have formed islands and shallow banks at times during the Neogene. Finally, lowered sea-levels during Pleistocene glaciation would have substantially increased the surface area of Lord Howe and Norfolk islands, transformed Elizabeth and Middleton reefs into high limestone islands, and led to the formation of ephemeral islands and banks further north along the Lord Howe seamount chain and on the southern Norfolk Ridge.

Having established that present-day continental landmasses and oceanic islands in the southwest Pacific have existed since late Neogene time, and that some presently submerged banks also formed islands at times during the late Neogene, what is known about the paleoceanography of the region?

The paleocirculation history of the tropical to temperate Pacific Ocean is poorly understood, but it is probable that an anticyclonic subtropical gyre giving rise to predominantly eastwards flow in the Kermadec region has existed throughout late Neogene time (Kennett et al. 1985). Data in Moore et al. (1980) indicate that the flow paths and intensity of gyral circulation during the last glaciation differed from the present-day situation, and such long-term variation was presumably a feature of earlier Plio-Pleistocene glacial-interglacial cycles as well. It follows that patterns of propagule dispersal in the southwest Pacific would have been affected, and that the biogeographic provenance of propagules reaching the Kermadec region would consequently have varied temporally. That has obvious historical implications for both immigration and maintenance of gene flow between populations at the Kermadec Islands and elsewhere.

Patterns of establishment and extinction of coastal marine species in the Kermadec Islands biota during Plio-Pleistocene time were presumably also influenced at least in part by changes in sea temperature regimes during successive glacial-interglacial cycles. Reconstructions of Pacific Ocean sea surface temperatures for the last glacial maximum (Moore et al. 1980) suggest that the seasonal range in the Kermadec region was greater than at present, with winter temperatures of the order of 1–2°C cooler. Conversely there is a likelihood that sea temperatures during some interglacials may have been slightly warmer than at present (see Burckle 1993). Such temperature changes presumably had a profound influence on faunal turnover in the Kermadec region, and directly and indirectly affected the evolution of genetic isolates there.

To summarise, factors contributing to the high levels of endemism and faunal turnover in the Kermadec molluscan fauna would likely have included the following.

(1) The biogeographic isolation and subtropical location of the Kermadec Islands.

(2) Temporal variation in patterns of dispersal of transoceanic propagules within the southwest Pacific Ocean resulting from changes in oceanic circulation patterns and intensity, the biogeography of source areas, and the paleogeographic history of island formation. Such variation would have affected the dispersal of species into the Kermadec region and the subsequent maintenance of gene flow between Kermadec region populations and those in upstream source areas, and presumably also resulted in ancestral stock of present-day allopatric endemics becoming genetically isolated in the Kermadec region. The occurrence of a probable relictual species (*Patella kermadecensis*), in the present-day Kermadec molluscan fauna, and the fact that some local endemics have a fossil record extending back to the Early

Pleistocene whereas others are known only from the Middle-Late Pleistocene, suggests that the present-day endemic component in the fauna is of composite origin (i e is not attributable to a single vicariance event)

(3) Environmental changes in the Kermadec region during Plio-Pleistocene time, particularly of marine climate, the range of physical coastal habitat types present, and their ecology would have affected the ability of immigrant propagules to colonise in the first instance, would have determined whether established populations persisted or became extinct, and probably also influenced the evolution of genetic isolates there

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APPENDIX: Checklist of benthic coastal marine chitons, bivalves, gastropods and cephalopods of the northern Kermadec Islands

F. J. Brook[1] & B. A. Marshall[2]
[1]Department of Conservation, PO Box 842, Whangarei, New Zealand
[2]Museum of New Zealand Te Papa Tongarewa, PO Box 467, Wellington, New Zealand

The following list includes species known from between the intertidal zone and 50 metres depth around Raoul and adjacent islets. It does not include pelagic oceanic gastropod and cephalopod species, nor rafted exotic benthic species associated with driftwood.

The checklist was compiled from Oliver's (1915) records and later taxonomic studies, and from examination of collections of Kermadec Islands molluscs held at the Auckland Institute and Museum, and the Museum of New Zealand. The majority of previously published species records were checked by re-examination of specimens, and in some instances names were changed because of re-identifications and later taxonomic revisions. Records that could not be confirmed because we were unable to locate specimens are indicated in the species list and a postscript to it.

Information in the checklist is set out as follows. Records by Oliver (1915) and in subsequent publications on the Kermadec Islands fauna are given in square brackets. New records are indicated by an asterisk. Numbers with AK, M and C prefixes refer respectively to collections held at the Auckland Institute and Museum, the Museum of New Zealand, Wellington, and the Australian Museum, Sydney.

Distributions of species in the Pacific Ocean, where known, are listed according to the following area categories: tropical Pacific Ocean north of latitude 24°S (TP); southwest Pacific Ocean (SWP), including eastern Australia south of 24°S (A), Elizabeth and Middleton reefs (EM), Lord Howe Island (LH), Norfolk Island (N), New Zealand (NZ), and the Kermadec Islands (K); central and eastern South Pacific Ocean (SEP), including Pitcairn Islands (P) and Easter Island (E). Species endemic to the Kermadec Islands (endemic) or probably restricted to the Kermadecs (?endemic) are listed accordingly.

Class POLYPLACOPHORA

ISCHNOCHITONIDAE

Eudoxochiton nobilis (Gray, 1843) SWP(NZ,K)
[Oliver 1915 – as *E. perplexus*; Kaas & van Belle 1985b] AK.28731, M.216932
At shallow subtidal depth on boulders and reefs.

Ischnochiton intermedius Hedley & Hull, 1912 SWP (N, K)
[Oliver 1915 – as *I. kermadecensis*; Kaas & van Belle 1994] AK.80659, M.214566
Intertidal to 10 m under stones.

LEPTOCHITONIDAE

Leptochiton norfolcensis subtropicalis (Iredale, 1914) endemic
[Oliver 1915 – in *Lepidopleurus*; Kaas & van Belle 1985a]
Intertidal to shallow subtidal under stones.

Leptochiton (Parachiton) mestayerae (Iredale, 1914) endemic
[Oliver 1915 – in *Parachiton*; Kaas & van Belle 1985a] M.203087
Intertidal to 45 m under stones.

MOPALIIDAE

Plaxiphora caelata (Reeve, 1847) SWP(NZ,K)
[Oliver 1915 – as *P. mixta*; Kaas & van Belle 1994] AK.80662, M.217055
Intertidal to shallow subtidal in crevices on reefs.

**Plaxiphora* sp. ?endemic
M.217056
One specimen collected by R. S. Bell in 1910 (no habitat data).

CHITONIDAE

Chiton themeropis (Iredale, 1914) endemic
[Oliver 1915 – in *Sypharochiton*, Creese & O'Neill 1987] AK 10645, M 217067
Intertidal and immediate subtidal in rock crevices

Onithochiton oliveri Iredale, 1914 endemic
[Oliver 1915, O'Neill 1985] AK 28103, M 217063
Intertidal in rock crevices

Rhyssoplax exasperata Iredale, 1914 endemic
[Oliver 1915 – as *R corypheus*, O'Neill 1989] AK 80661, M 217060
At shallow subtidal depths under stones

Class BIVALVIA

NUCULIDAE

Pronucula kermadecensis Oliver, 1915SWP(N,K)
[Oliver 1915] AK 83454, M 212465
Immediate subtidal to 20 m, dead specimens to 40 m

ARCIDAE

Acar plicata (Dillwyn, 1817) TP,SWP(A,EM,LH,N,K),SEP(P)
[Oliver 1915 – as *Arca reticulata*, Iredale 1939 – as *A dubia kerma*] AK 78574, M 213895
Low tidal to 130 m, in crevices and under stones, dead specimen to 274 m

**Barbatia* sp cf *nuttingi* (Dall, Bartsch & Rehder, 1938) TP,SWP(N,K),SEP(P)
AK 78475, M 214614
Shallow subtidal in crevices on reefs, dead specimens to at least 40 m

Barbatia decussata (Sowerby, 1823) TP,SWP(A,LH,N,K)
[Oliver 1915 – as *Arca foliata*] AK 78581, M 214630
Dead specimens washed up on beaches, and to 35 m

PHILOBRYIDAE

Cosa sp endemic
[Oliver 1915 – as *Philobrya costata*] AK 83555, M 214621
Dead specimens at 10–146 m

Philobrya sp endemic
[Oliver 1915 – as *P meleagrinella*] AK 83546, M 2320777
Low tidal to immediate subtidal on rocky shores, dead specimens to 40 m

MYTILIDAE

Crenella sp ?
AK 83584, M 225435
Dead specimens at 30–219 m

**Dacrydium* sp aff *pelseneeri* Hedley, 1906 ?endemic
AK 78468, M 226795
At 80–274 m in gravel, one dead specimen collected at 15 m

**Gregariella barbata* (Reeve, 1858) SWP(A,NZ,K)
M 214622
One specimen collected intertidally by R S Bell in 1910, intertidal

Lithophaga sp indet ?TP,SWP(K)
[Oliver 1915 – as *L straminea*] M 213891
Dead specimens washed up on beaches

Musculus cumingiana (Reeve, 1857) TP,SWP(A,LH,N,K)
[Oliver 1915 – as *M impacta*] AK 79540, M 214378
Dead specimens washed up on beaches

Modiolus auriculatus Krauss, 1848 TP,SWP(A,LH,N,K),SEP(P)
[Oliver 1915] AK 78577, M 222078
Intertidal reefs in rock pools and crevices

Septifer sp cf *bryanae* (Pilsbry, 1921) TP,SWP(A,EM,LH,N,NZ,K),
[Oliver 1915 – as *S bilocularis*] AK 83568, M 213928 SEP(E)
Low tidal to 110 m under stones and in crevices on reefs, dead specimens to 200 m

PINNIDAE

**Streptopinna saccata* (Linnaeus, 1758) TP,SWP(A,K),SEP(P)
AK.77750
One dead specimen at 20 m (1991).

PTERIIDAE

Pinctada maculata (Gould, 1850) TP,SWP(A,LH,N,K),SEP(P)
[Oliver 1915 – as *Pinclada vulgaris*] AK.67726, M.214627
Intertidal rock pools, to immediate subtidal depths on reefs.

**Pteria avicula* (Holten, 1802) TP,SWP(A,N,NZ,K)
AK.77749
One dead specimen at 15 m (1991).

ISOGNOMONIDAE

Isognomon (Parviperna) sp. cf. *nucleus* (Lamarck, 1836) TP,SWP(A,K),SEP(P)
[Oliver 1915 – in *Melina*] AK.64293, M.214626
In crevices on intertidal reefs.

PECTINIDAE

Annachlamys iredalei (Powell, 1958) TP, SWP(LH,N,K)
[Powell 1958 – in *Aequipecten (Corymbichlamys)*; Dijkstra & Marshall 1997] AK.78572, M.222016
At 15-60 m attached to algae and cnidarians; dead specimens to 420 m.

Chlamys coruscans (Hinds, 1845) TP,SWP(A,EM,LH,N,K),SEP(P)
[Oliver 1915 – as *C. cellularis;* Dijkstra & Marshall 1997] AK.79528, M.214629
Dead specimens washed up on beaches, and to 30 m.

Pecten raoulensis Powell, 1958 endemic
[Oliver 1915 – as *P. medius*; Powell 1958; Dijkstra & Marshall 1997] AK.78573, M.222134
Dead specimens at 30–130 m, living at 50-146 m.

PROPEAMUSSIIDAE

Cyclochlamys lemchei (Powell, 1958) endemic
[Powell 1958 – as *Chlamydella favus lemchei*; Dijkstra & Marshall 1997] M.226973
Dead specimens at 27–348 m, living at 82-165 m.

SPONDYLIDAE

Spondylus raoulensis Oliver, 1915 endemic
[Oliver 1915, Lamprell 1992] AK.94430, M.226603
At 5–40 m on reefs, generally under overhangs; dead specimens washed up on beaches, and to 274 m.

ANOMIIDAE

Pododesmus (Monia) sp. cf. *zelandius* (Gray, 1843) ?
[Oliver 1915 – as *Placunanomia zelandica*] AK.78584, M.222022
At 5–160 m attached to rock and bioclasts.

LIMIDAE

Divarilima sydneyensis Hedley, 1904 SWP(A,N,NZ,K)
[Powell 1958] M.22636
Dead specimens at 38–215 m.

Limatula (Limatuletta) insularis Oliver, 1915 endemic
[Oliver 1915; Powell 1958; Fleming 1978] AK.64187, M.212479
Dead specimens at 22–130 m.

Limatula (Stabilima) oliveri Powell, 1958 TP,SWP(K)
[Oliver 1915 – as *L. bullata*; Powell 1958; Fleming 1978] M.221478
Dead specimens at 30–274 m.

OSTREIDAE

**Saccostrea* sp. indet. ?
M.226969
One dead specimen at 31–45 m (1976).

LUCINIDAE

Ctena bella (Conrad, 1834) TP,SWP(A,EM,N,K),SEP(P,E)
[Oliver 1915 – in *Codakia*] AK.78575, M.213897
Immediate subtidal to 30 m in shelly sand; dead specimens to 45 m.

UNGULINIDAE
Diplodonta sp aff *rakiura* (Powell, 1939) ?endemic
[Oliver 1915 – as *D zelandica*] M 266058
Dead specimens washed up on beaches

CHAMIDAE
Chama plinthota Cox, 1927 TP,SWP(A,N,K)
[Oliver 1915 – as *C foliacea*] AK 78576, M 213892
Immediate subtidal to 20 m, attached to rock

ERYCINIDAE
Lasaea sp aff *rubra* (Montagu, 1803) ?
[Oliver 1915 – as *L miliaris*] M 256360
Low tidal on algal-covered rock, dead specimens to 40 m

GALEOMMATIDAE
**Scintilla ?stevensoni* Powell, 1952 SWP(N,NZ,K)
AK 78507, M 212464
Immediate subtidal to 20 m, under stones and in crevices on reefs, dead specimens to 30 m

**Galeommatidae* sp A ?
AK 78479, M 212464
Low tidal to 15 m, under stones

**Galeommatidae* sp B SWP(N,K)
AK 78569
One specimen under stone at 12 m depth (1991)

NEOLEPTONIDAE
**Neolepton antipodum* (Filhol, 1880) SWP(N,NZ,K)
AK 78520, M 226818
Dead specimens from immediate subtidal to 220 m

CRASSATELLIDAE
Talabrica iredalei (Powell, 1958) endemic
[Powell 1958 – in *Salaputium*] M 225823
At 24–274 m, in gravel

CARDIIDAE
Trachycardium sorenseni Powell, 1958 endemic
[Powell, 1958] AK 78566, M 225794
At 15–47 m, in shelly sand, dead specimens washed up on beaches, and to 67 m

MACTRIDAE
Lutraria bruuni Powell, 1967 SWP(N,K)
[Oliver 1915 – as *L magna*, Powell 1967a] AK 78579, M 225758
Dead specimens at 15–85 m

Oxyperas (Pseudoxyperas) belliana (Oliver, 1915)endemic
[Oliver 1915 in *Spisula*] M 226607
At 27–47 m in gravelly sand, dead specimens washed up on beaches

MESODESMATIDAE
Ervilia bisculpta (Gould, 1861) TP,SWP(K),SEP(P)
[Oliver 1915] AK 78472, M 260526
At 20–40 m, in shelly sand and gravel, dead specimens washed up on beaches, and to 274 m

**Ervilia sandwichensis* (Smith, 1885) TP,SWP(K)
AK 78519, M 226777
Dead specimens at 15–274 m

TELLINIDAE
**Tellina (Telinella) radians* Deshayes, 1854 TP,SWP(A,K)
AK 77765, M 202882
At 10–30 m, in shelly fine gravel, dead specimens to 47 m

PSAMMOBIIDAE
Gari pusilla Bertin, 1880 TP,SWP(A,LH,N,K)
[Powell 1958 as *Asaphis nana*, Willan 1993] AK 78583, M 213887
At 15–85 m, in shelly sand and fine gravel, dead specimens to 146 m

**Heteroglypta contraria* (Deshayes, 1833) TP,SWP(A,EM,K)
AK.77797
One dead specimen at 15 m (1991).

VENERIDAE

Globivenus toreuma (Gould, 1850) TP,SWP(A,EM,LH,N,K),SEP(P)
[Oliver 1915 – in *Venus*] AK.79308, M.225795
Immediate subtidal to 35 m, in shelly sand and fine gravel; dead specimens to 66 m.

CUSPIDARIIDAE

Austroneaera raoulensis Powell, 1958 endemic
[Powell 1958] M.225684
At 20–160 m, in shelly sand; dead specimens to 274 m.

Class GASTROPODA

Subclass PROSOBRANCHIA

NACELLIDAE

Cellana craticulatus (Suter, 1905) endemic
[Oliver 1915 – as *C. craticulatus* and *C. craticulatus prolixus, C. hedleyi, C. scopulinus, C. vulcanius*] AK.79525, M.214649
Intertidal reefs and boulders.
Note: In our opinion there is a single morphologically variable species of *Cellana*, namely *C. craticulatus*, at the northern Kermadec Islands.

PATELLIDAE

Patella (Scutellastrea) kermadecensis Pilsbry, 1894 endemic
[Oliver 1915; Powell 1973] AK.22927, M.203100
Intertidal to immediate subtidal, on rock.

SCISSURELLIDAE

**Anatoma* sp. cf. *aupouria* (Powell, 1937) SWP(N,K)
AK.78544, M.227088
Dead specimens at 15–274 m.

Sinezona pacificus (Oliver, 1915) SWP(N,K)
[Oliver 1915 – in *Schismope*] AK.64209, M.212572
Dead specimens from immediate subtidal to 40 m.

FISSURELLIDAE

Diodora bollonsi (Oliver, 1915) endemic
[Oliver 1915 – in *Fissuroidea*] AK.19597, M.214564
Low tidal on algal-covered rock; dead specimens to 20 m.

**Emarginula* sp. ?endemic
AK.79277, M.225687
Dead specimens at 38–200 m.

Emarginula (Subzeidora) connectens Thiele, 1915 SWP(LH,N,K)
[Thiele 1915] AK.78467, M.212571
Dead specimens from immediate subtidal to 45 m.

CALLIOSTOMATIDAE

Calliostoma consobrinum (Powell, 1958) endemic
[Powell 1958; Marshall 1979] M.222039
Dead specimens at 27–274 m.

TROCHIDAE

Clanculus (Clanculopsis) atypicus Iredale, 1912 endemic
[Oliver 1915; Marshall 1979] AK.77772, M.214556
Low tidal to 15 m, under stones.

Herpetopoma foveolata (A. Adams, 1851) TP,SWP(A,K)
[Marshall 1979] M.212576
At 5-30 m, under stones.

Monilea incerta Iredale, 1912 endemic
[Oliver 1915 – in *Solariella;* Marshall 1979] M.225796
Low tidal to 47 m, in gravel; dead specimens to 100 m.

Stomatella (Gena) oliveri (Iredale, 1912) endemic
[Oliver 1915, Marshall 1979] AK 28496, M 226937
Low tidal to 45 m, under stones, dead specimens to 113 metres

Tectus royanus (Iredale, 1912) endemic
[Oliver 1915, Marshall 1979] AK 60949, M 201267
Low tidal to 30 m, on rock

'SKENEIDAE'

Brookula stibarochila Iredale, 1912 endemic
[Oliver 1915] AK 14518, M 225848
Dead specimens at 30–165 m

**Crossea* sp cf *miranda* A Adams, 1865 TP,SWP(K)
M 25470
Dead specimens at 38–348 m

*'*Pareuchelus*' sp ?
M 226877
Dead specimens at 38–274 m

Philorene texturata Oliver, 1915 endemic
[Oliver 1915] M 212577
Dead specimens at 27–135 m

TURBINIDAE

Angaria delphinus (Linnaeus, 1758) TP,SWP(A,N,K)
[Oliver 1915 – as *A tyria* and *A distorta*, Marshall 1979] AK 79333, M 214383
Low tidal to 45 m, on algal-covered rock

**Argalista* sp ?endemic
M 226949
Dead specimens at 27–165 m

Leptothyra kermadecensis Marshall, 1979 endemic
[Oliver 1915 – as *L picta*, Marshall 1979] AK 28484, M 219925
At 5–40 m in gravel and shelly sand

?PHASIANELLIDAE

*Genus unknown ?endemic
M 225701
Dead specimens at 31–274 m

NERITIDAE

Nerita atramentosa Reeve, 1855 SWP(A,EM,LH,N,NZ,K)
[Oliver 1915 – as *N melanotragus*] AK 80124, M 202827
Intertidal reefs and boulders

Nerita plicata Linnaeus, 1758 TP,SWP(A,EM,LH,N,K),SEP(P)
[Oliver 1915] AK 94293
Intertidal reefs and boulders

LITTORINIDAE

Nodilittorina antipodum (Philippi, 1847) SWP(A,LH,NZ,K)
[Oliver 1915 – as *Melaraphe unifasciata*] M 214380
Rare on intertidal reefs and boulders

**Nodilittorina millegrana* (Philippi, 1848) TP,SWP(A,LH,K)
AK 98043
Rare on intertidal reefs

Nodilittorina novaezelandiae (Reeve, 1857) TP,SWP(K)
[Oliver 1915 – as *Tectarius feejeensis*] AK 20509, M 214379
Intertidal reefs and boulders

EATONIELLIDAE

Eatoniella iredalei (Oliver, 1915) endemic
[Oliver 1915 – in *Cerostraca*] AK 98047, M 212409
At immediate subtidal depths on alga-covered reefs, dead specimens to 30 m

Eatoniella sp. ?endemic
M.225862
One dead specimen at 22–27 m (1975).

RISSOIDAE

Alvania kermadecensis (Oliver, 1915) endemic
[Oliver 1915 – in *Haurakia*] AK.78515, M.214554
Dead specimens from immediate subtidal to 40 m.

Manzonia (Simulamerelina) sp. aff. *longinqua* (Rehder, 1980) SWP(N,K)
[Oliver 1915 – as *Merelina pisinna*] AK.78525, M.212370
Dead specimens from immediate subtidal to 45 m.

**Manzonia (Simulamerelina)* sp. ?
AK.78521
Dead specimens at 15–40 m.

Onoba kermadecensis (Powell, 1927) endemic
[Oliver 1915 – as *O. candidissima*; Powell 1927 – in *Austronoba*; Ponder 1985] AK.78561, M.214538
Dead specimens at 10–40 m.

Pusillina (Haurakia) wallacei (Oliver, 1915) endemic
[Oliver 1915 – in *Cithna*] AK.78550, M.212371
Dead specimens at 10–100 m.

**Rissoina (Apataxia) miltozona* Tomlin, 1915 TP,SWP(A,K)
AK.78516
Dead specimens at 30–40 m.

**Rissoina (Rissoina)* sp. ?
AK.78517
One dead specimen at 40 m (1991).

Rissoina (Rissolina) costata A. Adams, 1851 TP,SWP(A,LH,N,K),SEP(P,E)
[Oliver 1915 – as *R. plicata* and *R. angasi*; Sleurs & Preece, 1994] AK.78543, M.227022
Low tidal to 15 m, under stones; dead specimens to 40 m.

**Schwartziella (Pandalosia) scalariformis* (Watson, 1886) TP,SWP(K)
AK.78503, M.227071
Dead specimens at 30–40 m.

Stosicia (Isseliella) chiltoni (Oliver, 1915) SWP(K),SEP(P,E)
[Oliver 1915; Rehder 1980; Ponder 1985; Sleurs & Preece 1994] AK.64194, M.212404
Dead specimens at 10–40 m.

**Stosicia (Isseliella) polytropa* (Hedley, 1899) TP,SWP(K)
AK.79454, M.212385
Dead specimens at 15–40 m.

Zebina bidentata (Phillipi, 1845) TP, SWP(A,K),SEP(P)
[Oliver 1915 – as *Z. cooperi*; Sleurs & Preece 1994] AK.24571, M.200998
Dead specimens from intertidal to 30 m, in gravel.

ELACHISINIDAE ?

*'*Elachisina*' sp.
AK.83551
One dead specimen at 40 m (1991).

ANABATHRIDAE

Amphithalmus (Notoscrobs) sundayensis Oliver, 1915 SWP(N,K)
[Oliver 1915] AK.64196, M.214553
At immediate subtidal depths on algal-covered reefs; dead specimens to 30 m.

**Anabathron (Scrobs)* sp. aff. *ovatus* (Powell, 1927) ?endemic
AK.78496, M.227089
Dead specimens from the immediate subtidal to 45 m.

Fictonoba oliveri (Powell, 1927) endemic
[Oliver 1915 – as *Onoba carnosa*, Powell 1927 – in *Austronoba*, Ponder 1983]
AK 43121, M 212415
Dead specimens from immediate subtidal to 30 m

CINGULOPSIDAE

*'*Eatonina*' sp ?
M 227090
Dead specimens at 30–100 m

Rufodardanula sp ?
AK 78509, M 227101
Dead specimens at 15–40 m

Tubbreva sp ?
M 227097
Dead specimens at 30–45 m

RASTODENTIDAE

Rastodens electra (Oliver, 1915) ?endemic
[Oliver 1915 – in *Notosetia*] AK 83557
Dead specimens at 10–30 m

VITRINELLIDAE

**Cyclostremiscus* sp ?
M 226735
One dead specimen at 38 m (1976)

*sp cf *Mareleptopoma* ?
M 227082
One dead specimen at 31–45 m (1976)

ASSIMINEIDAE

Assiminea vulgaris (Webster, 1905) SWP(NZ,K)
[Oliver 1915 – as *A nitida*, Rehder 1980] M 212376
Supratidal on rock

**Suterilla neozelanica* (Murdoch, 1899) SWP(NZ,K)
M 212452
Supratidal on rock

CAECIDAE

Caecum (*Brochina*) *solitarium* Oliver, 1915 ?
[Oliver 1915] M 212483
Dead specimens at 20–274 m

DIALIDAE

**Finella* sp A ?
M 227070
Dead specimens at 31–45 m

**Finella* sp B ?
M 227074
Dead specimens at 22–45 m

**Finella* sp C ?
AK 83583, M 227075
Dead specimens at 31–100 m

**Finella* sp D ?
M 225872
Dead specimens at 22–27 m

CERITHIIDAE

Cerithium atromarginatum Dautzenberg & Bouge, 1933 TP,SWP(A,LH,K),SEP(P,E)
[Oliver 1915 – as *C bavayi*] AK 24573, M 212459
At shallow subtidal depths on weed-covered reefs, dead specimens washed up on beaches, and to 20 m

***Cerithium citrinum* (Sowerby, 1855) TP,SWP(A,EM,K)
AK.77789
At 10–30 m, on alga-covered rock.

***Cerithium columna* Sowerby, 1834 TP,SWP(A,LH,N,K),SEP(P,E)
AK.77794, M.202799
At 15–25 m, on algal-covered rock.

***Cerithium echinatum* (Lamarck, 1822) TP,SWP(A,K),SEP(P,E)
AK.77761
At 10–30 m, on alga-covered rock.

***Cerithium ?interstriatum* Sowerby, 1855 TP,SWP(EM,LH,K),SEP(E)
AK.79285, M.227025
Dead specimens at 5–45 m.

***Cerithium nesioticum* Pilsbry & Vanatta, 1906 TP,SWP(A,LH,N,K),SEP(P)
AK.77795
At 15–25 m, on rock.

***Pseudovertagus clava* (Gmelin, 1791) TP,SWP(A,K),SEP(P)
AK.94509
Dead specimens at 10–20 m.

Royella sinon (Bayle, 1880) TP,SWP(A,EM,LH,N,K),SEP(P)
[Oliver 1915; Houbrick 1986] AK.23511, M.226957
Dead specimens washed up on beaches, and to 40 m.

VERMETIDAE

***Dendropoma* sp. ?
AK.98052, M.224488
Immediate subtidal to 30 m, attached to shells and rock; dead specimens to 140 m.

***Serpulorbis* sp. ?TP,SWP(K)
AK.77742, M.214592
Low tidal to 5 m, on rock.

PLANAXIDAE

Hinea brasiliana (Lamarck, 1822) SWP(A,LH,N,NZ,K)
[Oliver 1915] AK.83580. M.202833
Low tidal, in rock crevices and under boulders.

STROMBIDAE

Strombus haemastoma Sowerby, 1842 TP,SWP(K)
[Oliver 1915 – as *S. elegans*] M.226935
Dead specimens at 15–45 m.

Strombus mutabilis Swainson, 1821 TP,SWP(A,LH,N,K)
[Oliver 1915 – as *S. urceus*] AK.77805, M.202843
Dead specimens washed up on beaches, and to 20 m.

***Strombus thersites* Swainson, 1823 TP,SWP(LH,N,K)
AK.77746, M.226539
At 10–45 m, in shelly sand and gravel.

Strombus vomer (Roeding, 1798) TP,SWP(LH,N,K)
[Oliver 1915 – as *Alata aratrum*] AK.79306, M.247205
Dead specimens washed up on beaches, and to 30 m.

HIPPONICIDAE

***Hipponix conicus* (Schumacher, 1817) TP,SWP(A,LH,N,NZ,K),SEP(P)
AK.77804
At 5–35 m, attached to shells.

VANIKORIDAE

Vanikoro wallacei Iredale, 1912 endemic
[Oliver 1915] AK.28500, M.212417
Low tidal to 20 m, under stones.

CAPULIDAE

Antisabia sp cf *foliacea* (Quoy & Gaimard, 1834) TP,SWP(A,EM,LH,N,NZ,K)
[Oliver 1915 – as *Hipponix foliacea*] AK 64295, M 214533
Low tidal to 15 m in crevices on reefs

XENOPHORIDAE

Xenophora neozelanica kermadecensis Ponder, 1983 endemic
[Oliver 1915 – as *X corrugata*, Powell 1958, Ponder 1983] M 226357
At 30–274 m, on gravel

VELUTINIDAE

'*Lamellaria*' sp ?
[Oliver 1915 – as *L ophione*] AK 132093
Dead specimens washed up on beaches, and to 40 m

TRIVIIDAE

Proterato lachryma (Sowerby, 1832) TP,SWP(A,K)
[Oliver 1915 – in *Erato*] AK 78546, M 226983
Dead specimens at 10–100 m

**Proterato* sp TP,SWP(LH,N,K)
AK 78518, M 226985
Dead specimens at 30–216 m

**Trivia (Trivirostra) oryza* (Lamarck, 1810) TP,SWP(A,EM,LH,N,NZ,K)
M 269692
Dead specimens at 10–45 m

Trivia (Trivirostra) pellucidula (Reeve, 1846) TP,SWP(A,LH,K),SEP(E)
[Oliver 1915 – as *T desirabilis*] AK 78571, M 227017
At 5–30 m, in crevices and under stones, dead specimens to 146 m

CYPRAEIDAE

Cypraea caputserpentis Linnaeus, 1758 TP,SWP(A,EM,LH,N,K),SEP(P)
[Oliver 1915] AK 79261, M 226469
Low tidal to shallow subtidal, in rock crevices

Cypraea cernica Sowerby, 1870 TP,SWP(A,LH,N,NZ,K),SEP(E)
[Oliver 1915 – as *C flaveola*, Powell 1958 – as *Ravitrona tomlini kermadecensis*] M 211683
Dead specimens washed up on beaches, and to 60 m

Cypraea isabella Linnaeus, 1758 TP,SWP(A,EM,N,K),SEP(P)
[Oliver 1915] M 211665
Dead specimens washed up on beaches

**Cypraea moneta* Linnaeus, 1758 TP,SWP(A,LH,N,K),SEP(P)
AK 94597
Dead specimens in immediate subtidal

Cypraea poraria Linnaeus, 1758 TP,SWP(A,N,K),SEP(P)
[Oliver 1915] M 211654
Low tidal, dead specimens washed up on beaches

**Cypraea talpa* Linnaeus, 1758 TP,SWP(A,N,K)
AK 77744
Dead specimens at 10–30 m

**Cypraea teres* (Gmelin, 1791) TP,SWP(A,EM,K)
AK 77806
Dead specimens at 20–30 m

Cypraea vitellus Linnaeus, 1758 TP,SWP(A,EM,LH,N,NZ,K)
[Oliver 1915 – as *C carneola*] AK 77745
Dead specimens washed up on beaches, and to 30 m

OVULIDAE

**Ovula costellata* Lamarck, 1810 TP,SWP(A,K)
AK 77752
One dead specimen at 15 m (1991)

**Ovula ovum* (Linnaeus, 1758) TP,SWP(A,LH,K)
AK.94515
Dead specimens at 15–25 m.

NATICIDAE

**Natica gualteriana* Recluz, 1844 TP,SWP(A,LH,N,NZ,K),SEP(P)
AK.77785
From immediate subtidal to 20 m, in shelly sand.

Natica lemniscata Philippi, 1852 TP,SWP(A,N,NZ,K)
[Oliver 1915 – as *N. sagittata*] AK.77792, M.262679
From immediate subtidal to 20 m, in sand.

Natica orientalis (Gmelin, 1791) TP,SWP(A,LH,K)
[Oliver 1915] M.202797, C.38216
Dead specimens washed up on beaches, and to 55 m.

Polinices (Mamilla) simiae (Deshayes, 1838) TP,SWP(A,LH,N,NZ,K),SEP(P,E)
[Oliver 1915] AK.77790, M.202795
From immediate subtidal to 20 m, in sand.

**Polinices tawhitirahia* Powell, 1964 SWP(N,NZ,K)
AK.77753
One dead specimen collected at 15 m (1991).

CASSIDAE

Casmaria perryi (Iredale, 1912) SWP(A,LH,N,NZ,K),SEP(P,E)
[Oliver 1915] AK.79266, M.225421
Dead specimens washed up on beaches, and to 134 m.

Semicassis royanum (Iredale, 1914) SWP(A,NZ,K)
[Oliver 1915 – in *Cassidea*] AK.22690
Dead specimens washed up on beaches.

Semicassis sophia (Brazier, 1872) SWP(A,NZ,K)
[Oliver 1915 – as *Cassidea pyrum*] AK.79330, M.222101
Dead specimens at 10–144 m.

RANELLIDAE

Cabestana spengleri (Perry, 1811) SWP(A,N,NZ,K)
[Oliver 1915 – in *Cymatium*; Beu 1978] AK.83579, M.211387
Low tidal to 10 m, on rock.

Cabestana tabulata (Menke, 1843) SWP(A,NZ,K)
[Oliver 1915 – as *Cymatium waterhousei*; Beu 1978] M.211389
Dead specimens washed up on beaches.

Charonia lampas (Linnaeus, 1758) TP,SWP(A,N,NZ,K)
[Oliver 1915; Beu 1978] AK.83565, M.211399
Low tidal to 10 m, on rock.

**Charonia tritonis* (Linnaeus, 1758) TP,SWP(A,EM,LH,NZ,K), SEP (P,E)
AK.77741
One dead specimen at 45 m (1991).

Cymatium (Monoplex) exaratum (Reeve, 1844) TP,SWP(A,LH,N,NZ,K)
[Oliver 1915; Beu 1978 – in *Septa*] AK.79267, M.211398
Dead specimens washed up on beaches, and to 20 m.

**Cymatium (Monoplex) nicobaricum* (Roeding, 1798) TP,SWP(A,K),SEP(P)
AK.77754
Dead specimens from intertidal, to 15 m.

Cymatium (Monoplex) parthenopeum (Salis, 1793) TP,SWP(A,N,NZ,K)
[Oliver 1915; Beu 1978 – in *Septa*] AK.79307, M.211391
Low tidal to 10 m, on rock.

Cymatium (Ranularia) iredalei (Beu 1968) TP,SWP(A,K)
[Oliver 1915 – as *Cymatium dunkeri*; Beu 1968, 1978, in press] M.211420
Dead specimens washed up on beaches.

Cymatium (Turritriton) labiosum (Wood, 1828) TP,SWP(A,LH,N,NZ,K)
[Oliver 1915, Beu 1978] AK 79270, M 211405
Immediate subtidal to 20 m, on rock

Ranella australasia (Perry, 1811) SWP(A,EM,LH,N,NZ,K)
[Oliver 1915, Beu 1978] AK 83563, M 211396
Low tidal to 20 m on rock

Sassia parkinsonia (Perry, 1811) SWP(A,LH,N,NZ,K)
[Oliver 1915, Beu 1978] M 211393
Dead specimens washed up on beaches

BURSIDAE

**Bursa granularis* (Roeding, 1798) TP,SWP(A,EM,LH,N,K),SEP(P,E)
AK 77751, M 226967
Dead specimens at 10–30 m

Bursa rosa Perry, 1811 TP,SWP(A,LH,K)
[Oliver 1915 – as *B mammata*] AK 79332, M 211403
At 10–40 m, in sand pockets on reefs, dead specimens washed up on beaches

Bursa verrucosa (Sowerby, 1825) SWP(A,EM,LH,N,NZ,K)
[Oliver 1915 – as *B papilla*] AK 79331, M 211413
Low tidal to 30 m, on rock

Tutufa bufo (Roeding, 1798) TP,SWP(A,LH,N,NZ,K)
[Oliver 1915 – as *Bursa siphonata*, Powell 1967a] AK 83567, M 224476
At 5-30 m, on rock, dead specimens washed up on beaches, and to 144 m

TONNIDAE

Malea pomum (Linnaeus, 1758) TP,SWP(A,EM,N,K),SEP(P)
[Oliver 1915 – in *Cadium*] AK 79541
Dead specimens washed up on beaches, and to 15 m

**Tonna melanostoma* (Jay, 1839) TP,SWP(EM,LH,N,NZ,K)
AK 77743
Dead specimens at 10–20 m

Tonna perdix (Linnaeus, 1758) TP,SWP(A,EM,N,K),SEP(P)
[Oliver 1915] AK 79262, M 211347
Dead specimens washed up on beaches, and to 20 m

ACLIDIDAE

**Larochella* sp ?
AK 79280, M 226768
Dead specimens at 30–100 m

CERITHIELLIDAE

**Ataxocerithium* sp endemic
AK 79279, M 227011
Dead specimens at 15–274 m

CERITHIOPSIDAE

**Cerithiopsis powelli* Marshall, 1978 SWP(NZ,K),SEP(E)
AK 83552, M 227063
Dead specimens at 22–45 m

Sundaxa tuberculata Oliver, 1915 endemic
[Oliver 1915] M 212405
Dead specimens at 10–30 m

*Cerithiopsidae sp A ?endemic
M 262498
Dead specimens at 40 m

*Cerithiopsidae sp B ?
M 223360
Dead specimens at 22–146 m

*Cerithiopsidae sp C ?
AK 83554, M 223363
Dead specimens at 31–274 m

Cerithiopsidae sp. D ?
[Oliver 1915 – as *Joculator pinea*] M.223371
Dead specimens at 10–30 m.

Cerithiopsidae sp. E ?
[Oliver 1915 – as *Joculator aelomitres*] AK.83553, M.212406
Dead specimens at 10–30 m.

*Cerithiopsidae sp. F ?
M.225736
Dead specimens at 31–165 m.

*Cerithiopsidae sp. G ?
M.227060
Dead specimens at 31–45 m.

*Cerithiopsidae sp. H ?
AK.83577, M.223366
Dead specimens at 10–30 m.

*Cerithiopsidae sp. I ?
AK.83547, M.223367
Dead specimens at 10–30 m.

*Cerithiopsidae sp. J ?
M.225880
Dead specimens at 22–27 m.

*Cerithiopsidae sp. K ?
M.262497
Dead specimens at 40 m.

*Cerithiopsidae sp. L ?
AK.83560, M.223361
Dead specimens at 30–100 m.

*Cerithiopsidae sp. M ?
AK.83586, M.223368
Dead specimens at 10–45 m.

TRIPHORIDAE

Bouchetriphora pallida (Pease, 1870) TP,SWP(A,LH,N,NZ,K)
[Marshall 1983] AK.79292, M.223379
Dead specimens from the immediate subtidal to 100 m.

**Euthymella* sp. ?
M.262681
Dead specimens at 10–100 m.

Iniforis sp. cf. *chaperi* (Jousseaume, 1884) TP,SWP(K)
[Oliver 1915 – as *Triphora jousseaumi*] M.212388
Dead specimens at 10-30 m.

**Mastonia* sp. cf. *evanida* Laseron, 1958 TP,SWP(A,K)
AK. 79290, M.230810
Dead specimens at 10–45 m.

**Mesophora granosa* (Pease, 1870) TP,SWP(A,K)
M.262680
Dead specimens at 10–30 m.

**Metaxia exaltata* (Powell, 1930) SWP(NZ,K)
AK.79283, M.227061
Dead specimens at 10–274 m.

Metaxia kermadecensis Marshall, 1977 endemic
[Marshall 1977] AK.79291, M.227064
Dead specimens at 10–274 m.

**Nototriphora aupouria* (Powell, 1937) SWP(NZ,K)
AK.79294, M.223378
Dead specimens at 10–165 m.

Nototriphora sp. aff. *aupouria* (Powell, 1937) endemic
AK.79296, M.223741
Dead specimens at 10–45 m.

Sagenotriphora ampulla (Hedley, 1903) SWP(A,NZ,K)
[Oliver 1915 – in *Triphora;* Marshall 1983] M.212390
Dead specimens at 10–30 m.

**Subulophora rutilans* (Hervier, 1897) TP,SWP(A,K)
AK.79289, M.223376
Dead specimens at 10–70 m.

**Subulophora* sp. endemic
AK. 94761, M.214588
Dead specimens at 10–30 m.

**Viriola cancellata* (Hinds, 1843) TP,SWP(LH,K)
AK.79282
One dead specimen collected at 30 m (1991).

Viriola sp. cf. *intergranosa* (Hervier, 1897) TP,SWP(K)
[Oliver 1915 – as *Sinistroseila incisus*; Marshall 1983] M.227340
Dead specimens at 10–30 m.

**Viriola* sp. cf. *vulpina* (Hinds, 1843) TP,SWP(K)
AK.79293,M.227054
Dead specimens at 10–40 m.

*Triphoridae sp. A ?endemic
[Oliver 1915 – as *Triphora granifera*] AK.79274, M.212380
Dead specimens at 10–549 m.

*Triphoridae sp. B ?endemic
AK.79288, M.227044
Dead specimens at 10–274 m.

*Triphoridae sp. C ?endemic
AK.79273, M.223375
Dead specimens at 10–45 m.

*Triphoridae sp. D ?endemic
M.227047
Dead specimens at 31–45 m.

*Triphoridae sp. E ?
AK.79286, M.214589
Dead specimens at 10–30 m.

*Triphoridae sp. F ?
M.214590
Dead specimens at 10–30 m.

*Triphoridae sp. G ?
M.227052
Dead specimens at 30–45 m.

*Triphoridae sp. H ?
M.214591
Dead specimens at 10–30 m.

*Triphoridae sp. I ?
M.262682
Dead specimens at 30 m.

*Triphoridae sp. J ?
AK.79284
One dead specimen at 30 m (1991).

*Triphoridae sp. K ?
AK.79281
One dead specimen at 30 m (1991).

EULIMIDAE

Eulima perspicua (Oliver, 1915) SWP(NZ,K)
[Oliver 1915 – in *Subularia*] AK.43115, M.212408
Dead specimens from the immediate subtidal to 47 m.

Melanella kermadecensis (Oliver, 1915) ?
[Oliver 1915] AK.83548, M.212403
Dead specimens at 10–45 m.

Melanella perplexa (Oliver, 1915) ?
[Oliver 1915] AK.83541, M.212401
Dead specimens at 10–146 m.

Melanella spinosa (Oliver, 1915) ?
[Oliver 1915]
Dead specimens at 10–30 m.

Pyramidelloides suteri (Oliver, 1915) SWP(N,NZ,K)
[Oliver 1915 – in *Scalenostoma*] AK.64202, M.212482
Dead specimens at 10–30 m.

Stilapex sp. ?
[Warén, 1981] AK.78508, M.232084
At 29 m, on ophiuroid *Ophiothrix oliveri*.

EPITONIIDAE

**Amaea thielei* Boury, 1913 TP,SWP(K)
AK.77801
One dead specimen at 15 m (1991).

**Epitonium billeeana* (Du Shane & Bratcher, 1965) TP,SWP(A,K)
AK.77788
At 10–25 m, on *Tubastrea* and *Rhizopsammia* corals.

**Epitonium* sp. cf. *hyalinum* (Sowerby, 1844) TP,SWP(K)
M.225868
One dead speciment at 21–27 m (1975).

**Epitonium* sp. ?
M.225813
Dead specimens at 21–133 m.

Gyroscala lamellosa (Lamarck, 1822) TP,SWP(A,LH,N,NZ,K)
[Oliver 1915 – as *Epitonium perplexum*] AK.79269, M.214381
Dead specimens washed up on beaches, and to 10 m.

MURICIDAE

Coralliophila bulbiformis (Conrad, 1837) TP,SWP(EM,N,K)
[Oliver 1915 – as *C. nivea*] AK.77762, M.226963
Immediate subtidal to 30 m on hermatypic scleractinian corals.

Coralliophila radula (Adams, 1855) TP,SWP(K)
[Oliver 1915 – as *C. neritoidea*] AK.77763, M.226547
Immediate subtidal to 30 m on hermatypic scleractinian corals.

Coralliophila sertata (Hedley, 1903) SWP(A,N,NZ,K)
[Oliver 1915 – as *C. lischkeana*] AK.28105, M.214615
Dead specimens washed up on beaches; presumably living subtidally on antipatharian corals.

Dicathais orbita (Gmelin, 1791) SWP(A,LH,N,NZ,K)
[Oliver 1915 – as *Neothais succincta*] M.212791
Low tidal to immediate subtidal, on rock.

'Hexaplex' puniceus Oliver, 1915 ?endemic
[Oliver 1915] M.225838
Dead specimens at 10–40 m.

Maculotriton serriale (Deshayes, 1834) TP,SWP(A,EM,LH,N,K),SEP(P)
[Oliver 1915 – as *M. bracteatus*] AK.28493, M.212379
Dead specimens washed up on beaches.

Magilus antiquus Montfort, 1810 TP,SWP(A,EM,N,K)
[Oliver 1915] AK.64296, M.226968
At shallow subtidal depths within hermatypic coral colonies.

Morula nodulifera (Menke, 1829) TP,SWP(A,EM,LH,N,NZ,K)
[Oliver 1915 – as *M. chaidea*] AK.77777, M.214635
Low tidal to 20 m, on rock.

Morula palmeri Powell, 1967 SWP(N,NZ,K)
[Oliver 1915 – as *N. dealbata*] AK.77783, M.227019
Immediate subtidal to 45 m, on rock and gravel; dead specimens to 160 m.

Neothais smithi (Brazier, 1889) SWP(LH,N,NZ,K)
[Oliver 1915] AK.27528, M.214642
Low tidal to 20 m, on rock.

Quoyula monodonta (Blainville, 1832) TP,SWP(A,N,K),SEP(P)
[Oliver 1915 – as *Q. madreporarium*] AK.28517, M.214640
Immediate subtidal to 12 m, on *Pocillopora damicornis* coral colonies.

'Trophon' subtropicalis Iredale, 1912 ?endemic
[Oliver 1915] AK.26580, M.212369
Dead specimens from the immediate subtidal to 40 m.

COLUMBELLIDAE

**Mitrella ligula* (Duclos, 1840) TP,SWP(A,K)
AK.77766
One specimen at 15 m, in sand patch on reef (1991).

Pyrene varians (Sowerby, 1832) TP,SWP(A,EM,LH,N,K),SEP(P)
[Oliver 1915 – as *Columbella varians* and *C. versicolor*] AK.64193, M.212476
Low tidal, under stones.

'Zafra' fuscolineata Oliver, 1915 endemic
[Oliver 1915] M.227035
Dead specimens at 10–45 m.

'Zafra' kermadecensis Oliver, 1915 endemic
[Oliver 1915] AK.78474, M.225835
Dead specimens at 10–146 m.

BUCCINIDAE

**Cantharus (Enginella) spica* (Melvill & Standen, 1895) TP,SWP(N,K)
AK.78549, M.225771
Dead specimens at 15–68 m.

**Cantharus (Prodotia) iostomus* (Gray, 1843) TP,SWP(A,EM,K),SEP(P)
AK.77796
One dead specimen at 15 m (1991).

Fusinus genticus (Iredale, 1936) SWP(N,NZ,K),SEP(P)
[Oliver 1915 – as *F. toreuma*; Powell 1967a – *F. galatheae*] AK.79334, M.247523
At 5-118 m, on reefs and gravel.
Note: Examination of the holotype of *F. genticus* indicates that it is conspecific with *F. galatheae*.

Nassarius gaudiosus (Hinds, 1844) TP,SWP(A,EM,LH,N,K),SEP(P)
[Oliver 1915 – in *Arcularia*; Cernohorsky 1984] AK.77768, M.225819
Immediate subtidal to 47 m, in sand.

Nassarius nodiferus (Powys, 1835) TP,SWP(K)
[Oliver 1915 – in *Arcularia scalaris*; Cernohorsky 1978] M.226562
Dead specimens washed up on beaches, and to 530 m.

Nassarius spiratus A. Adams, 1851 SWP(A,EM,LH,N,NZ,K)
[Oliver 1915 – in *Arcularia*; Cernohorsky 1981] AK.77776, M.219916
Immediate subtidal to 30 m, in sand.

**Phos (Strongylocera) textilis* A. Adams, 1851 TP,SWP(A,K)
AK.77787
One specimen at 15 m, in sand patch on reef (1991).

Pisania (Jeannea) hedleyi (Iredale, 1912) endemic
[Oliver 1915; Cernohorsky 1971b] AK.79271, M.212491
Low tidal to 20 m, under stones.

HARPIDAE

**Harpa amouretta* Roeding, 1798 TP,SWP(A,K)
AK.94043
One dead specimen at 20 m (1995).

OLIVIDAE

Amalda raoulensis (Powell, 1967) endemic
[Powell 1967 – in *Baryspira*; Beu & Maxwell 1990] M.217027
Dead specimens washed up on beaches, and to 274 m.

VOLUTIDAE

Lyria nucleus (Lamarck, 1811)SWP(A,LH,N,K)
[Oliver 1915; Iredale 1940 – as *L. insignita*; Weaver & Du Pont 1970] AK.79543, M.202841
At 10–30 m in sand and fine gravel; dead specimens washed up on beaches.

MITRIDAE

Cancilla (Ziba) cernohorskyi (Rehder & Wilson, 1975) SWP(LH,K),SEP(P)
[Cernohorsky 1978] M.226936
Dead specimens at 30–47 m.

Mitra carbonaria Swainson, 1822 SWP(A,N,NZ,K)
[Oliver 1915] (no specimens sighted during the present study)
Dead specimens washed up on beaches.

Mitra mitra (Linnaeus, 1758) TP,SWP(A,K)
[Oliver 1915] (no specimens sighted during the present study)
Dead specimens washed up on beaches.

**Mitra (Nebularia) coronata* Lamarck, 1811 TP,SWP(K),SEP(P)
AK.77800
One dead specimen at 15 m (1991).

**Mitra (Strigatella)? fastigium* Reeve, 1845 TP,SWP(A,K)
AK.77798
One worn dead specimen at 15 m (1991).

**Mitra (Strigatella) typha* Reeve, 1845 TP,SWP(A,K)
AK.78545
One dead specimen at 40 m (1991).

Neocancilla takiisaoi (Kuroda, 1959) TP,SWP(A,K),SEP(P,E)
[Oliver 1915 – as *Mitra lanceolata*; Cernohorsky 1978] M.225765
At 68 m in gravel; dead specimens washed up on beaches.

COSTELLARIIDAE

Vexillum (Costellaria) angustissimum (E. A. Smith, 1903) TP,SWP(A,N,K)
[Cernohorsky 1978] AK.77769, M.225824
At 20–50 m in gravel.

Vexillum (Costellaria) iredalei (Powell, 1958) endemic
[Powell 1958; Cernohorsky 1978] M.226620
Dead specimens at 38–100 m.

MARGINELLIDAE

Serrata sp. aff. *mustelina* (Angas, 1871) ?endemic
[Oliver 1915 – as *Marginella mustelina*] AK.78502, M.212468
Dead specimens at 10–40 m.

*'*Serrata*' sp. ?endemic
AK.78542, M.227078
Dead specimens at 15–45 m.

CYSTISCIDAE

Cystiscus sp. ?
[Oliver 1915 – as *Marginella angasi*] AK.78470, M.212384
Dead specimens at 15–162 m.

Pugnus parvus Hedley, 1896 SWP (A, K)
[Oliver 1915] AK.78547, M.212457
Dead specimens from immediate subtidal to 274 m.

CONIDAE

Apaturris expeditionis (Oliver, 1915) ?
[Oliver 1915 – as *Mitramorpha*; Iredale 1917; Powell 1966] AK.45615, M.212387
At 31–47 m in gravel.

Conus bruuni Powell, 1955 TP,SWP(K)
[Oliver 1915 – as *C. maculosus*; Powell 1958; Cernohorsky 1976; Walls 1979; Dieter et al. 1995] AK.91251, M.225422
At 15–85 m on reefs and in coarse sand and gravel; dead specimens to 567 m.

**Conus capitaneus* Linnaeus, 1758 TP,SWP(A,EM,LH,N,K)
AK.77774
Dead specimens at 4–15 m.

Conus chaldeus (Roeding, 1798) TP,SWP(A,LH,N,K),SEP(P)
[Oliver 1915 – as *C. vermiculatus*] M.211732
Dead specimens washed up on beaches.

**Conus coelinae* Crosse, 1858 TP,SWP(A,K)
[Oliver 1915 – as *C. virgo*] AK.77758
At 15-30 m on reefs.

Conus coronatus Gmelin, 1791 TP,SWP(A,EM,LH,N,K)
[Oliver 1915 – as *C. minimus*] AK.77767, M.202849
Low tidal to 20 m, on reefs.

**Conus flavidus* Lamarck, 1810 TP,SWP(A,EM,LH,N,K),SEP(P)
M.246852
One dead specimen washed up on beach (1966).

Conus lischkeanus Weinkauff, 1875 TP,SWP(A,LH,N,NZ,K)
[Oliver 1915; Cernohorsky 1976; Marshall 1981; Walls 1979 – as *C. kermadecensis*; Dieter et al. 1995) AK.10064, M.202846
Low tidal to 50 m, on reefs.

**Conus lividus* Hwass in Bruguière, 1792 TP,SWP(A,LH,K),SEP(P)
AK.94042
At 10–20 m, on reefs.

**Conus magnificus* Reeve, 1843 TP,SWP(K),SEP(P)
AK.77759
At 15–30 m, on reefs.

**Conus miles* Linnaeus, 1758 TP,SWP(A,EM,K)
AK.77748
Immediate subtidal to 20 m, on reefs.

**Conus miliaris* Hwass in Bruguière, 1792 TP,SWP(A,EM,LH,N,K),SEP(P)
AK.77775
One specimen at 15 m on reef (1991).

Conus nielseni Marsh, 1962 TP,SWP(A,K)
[Powell 1958 – as *C. planorbis*; Cernohorsky 1976; Walls 1979; Dieter et al. 1995] M.226540
At 29–36 m on gravel; dead specimens to 118 m.

**Conus obscurus* Sowerby, 1833 TP,SWP(A,K)
M.247206
One specimen at 5 m depth on reef (1985).

Conus raoulensis Powell, 1958 SWP(N,K)
[Powell 1958; Cernohorsky 1976; Walls 1979; Marshall 1981; Dieter et al. 1995] M.226632
Dead specimen at 44–146 m.

***Conus sponsalis* Hwass in Bruguière, 1792 TP,SWP(A,EM,LH,N,K),SEP(P)
AK.94041
At 15 m on alga-covered reefs.

**Conus striatus* Linnaeus, 1758 TP,SWP(A,K)
AK.77747
Dead specimens at 10–20 m.

**Conus textile* Linnaeus, 1758 TP,SWP(A,EM,N,K),SEP(P)
AK.77760
Dead specimens at 5–15 m.

Etrema hedleyi (Oliver, 1915) ?
[Oliver 1915 – in *Mangilia*] AK.23502, M.212411
Dead specimens at 10–45 m.

Iredalea subtropicalis Oliver, 1915 TP,SWP(EM,LH,K),SEP(E)
[Oliver 1915; Powell 1966] AK.28114, M.226703
Dead specimens at 10–45 m.

Kermia benhami Oliver, 1915 ?
[Oliver 1915; Powell 1966] AK.43119, M.227040
Dead specimens at 10–68 m.

Lienardia roseocincta (Oliver, 1915) ?
[Oliver 1915 – in *Glyphostoma*; Powell 1966] AK.28481, M.212392
Dead specimens at 10–45 m.

**Lienardia (Hemilienardia) apiculata* (Montrouzier, 1864) TP,SWP(K)
AK.78513, M.214607
Dead specimens at 10–40 m.

**Lienardia* sp. ?
M.226701
One specimen at 38 m in gravel (1976).

**Liracraea* sp. ?
M.262684
Dead specimens at 10–47 m.

Macteola interrupta (Reeve, 1846) TP,SWP(K)
[Oliver 1915 – as *Mangilia bella*] AK.78568, M.212412
Dead specimens at 10–30 m.

*Conidae sp. A ?
M.226945
One dead specimen at 27–29 m (1976).

*Conidae sp. B ?
M.226700
One dead specimen at 38 m (1976).

TURRIDAE

Xenoturris cingulifera (Lamarck, 1822) TP,SWP(A,K)
[Oliver 1915 – in *Turris*] AK.77784, M.214551
At 10–20 m on reefs.

TEREBRIDAE

Hastula penicillata (Hinds, 1844) TP,SWP(A,LH,K),SEP(P,E)
[Oliver 1915 – as *Terebra venosa*] AK.79268, M.212475
Dead specimens washed up on beaches, and to 15 m.

Terebra circumcincta Deshayes, 1857 TP,SWP(A,LH,NZ,K)
[Oliver 1915] AK.77791, M.225797
At 10–30 in sand.

**Terenolla pygmaea* (Hinds, 1844) TP,SWP(A,EM,LH,K)
AK.77799
One dead specimen at 15 m (1991).

Subclass HETEROBRANCHIA
ORBITESTELLIDAE
**Boschitestella* sp. ?
AK.78506, M.226888
Dead specimens at 30–100 m.

**Orbitestella* sp. ?
M.212378
Dead specimens at 10–30 m.

OMALOGYRIDAE
**Ammonicera* sp. A ?
M.227092
Dead specimens from the immediate subtidal to 45 m.

**Ammonicera* sp. B ?
AK.78504, M.226891
Dead specimens at 30–100 m.

ARCHITECTONICIDAE
Heliacus variegatus (Gmelin, 1791) TP,SWP(A,EM,LH,N,NZ,K)
[Oliver 1915] C.304342
Dead specimens washed up on beaches.

Heliacus (Torinista) implexus (Mighels, 1845) TP,SWP(A,LH,N,NZ,K),SEP(E)
[Oliver 1915 – as *H. stramineus*] AK.83571, M.214547
Dead specimens washed up on beaches, and to 47 m.

Psilaxis oxytropis (A. Adams, 1855) TP,SWP(A,LH,N,NZ,K)
[Oliver 1915 – as *Architectonica radiata*; Bieler 1993]
AK.28122, M.214548
Dead specimens washed up on beaches, and to 15 m.

RISSOELLIDAE
Rissoella secunda (Iredale, 1912) SWP(LH,K)
[Oliver 1915 – in *Heterorissoa*] AK.78500, M.212375
Dead specimens from the immediate subtidal to 146 m.

**Rissoella* sp. ?
M.225853
At 22–27 m on sand; dead specimens to 146 m.

PYRAMIDELLIDAE
Besla insularis (Oliver, 1915) ?
[Oliver 1915 – in *Pyrgulina*] AK.78563, M.212393
Dead specimens at 10–40 m.

Eulimella inexpectata (Oliver, 1915) ?endemic
[Oliver 1915 – in *Raoulostraca*] AK.28117, M.214561
Dead specimens at 10–50 m.

'Epigrus' gracilis Oliver, 1915 ?endemic
[Oliver 1915] M.212396
Dead specimens at 10–30 m.

'Epigrus' insularis Oliver, 1915 ?endemic
[Oliver 1915] M.212395
Dead specimens at 10–274 m.

*'*Epigrus*' sp. aff. *gracilis* Oliver, 1915 ?endemic
AK.83543, M.214543
Dead specimens at 10–45 m.

Graphis sculpturata (Oliver, 1915) ?
[Oliver 1915 – in *Turbonilla*] M.212484
Dead specimens at 10–30 m.

Herviera sp. cf. *isidella* (Melvill & Standen, 1898) TP,SWP(K)
[Oliver 1915] AK.78478, M.225837
Dead specimens at 10–40 m.

Hinemoa punicea Oliver, 1915 ?endemic
[Oliver 1915] AK.78476, M.227087
Dead specimens at 10–45 m.

Miralda austropacifica Oliver, 1915 SWP(N,K)
[Oliver 1915] AK.78494, M.212416
Dead specimens at 10–274 m.

'*Odostomia*' sp. cf. *clara* Brazier, 1877 SWP(A,K)
[Oliver 1915] M.212407
Dead specimens at 10–30 m.

'*Odostomia*' sp. cf. *metata* Hedley, 1907 SWP(A,K)
[Oliver 1915] M.212398
Dead specimens at 10–30 m.

**Otopleura mitralis* (A. Adams, 1855) TP,SWP(A,LH,K)
AK.77803
One dead specimen at 15 m (1991).

Pyramidella sulcata (A. Adams, 1855) TP,SWP(A,LH,K)
[Oliver 1915 – as *P. terebelloides*] AK.77771
At 10–20 m in sand patches on reefs.

**Pyramidella terebellum* (Mueller, 1774) TP,SWP(A,K)
M.226618
One specimen at 42–47 m on sand (1976).

**Terelimella* sp. ?
AK.98054
Dead specimens in the immediate subtidal.

Turbonilla oceanica Oliver, 1915 ?
[Oliver 1915] AK.83549, M.212485
Dead specimens at 10–40 m.

Subclass OPISTHOBRANCHIA

ACTEONIDAE

Acteon variegatus (Bruguière, 1789) TP,SWP(K)
[Oliver 1915 as *A. flammeus*] M.212467
One specimen at 37 m in gravel, collected by R. S. Bell in 1910.

**Pupa sulcata* (Gmelin, 1791) TP,SWP(A,K)
AK.77793, M.202852
At 15–30 m in sand and fine gravel.

BULLINIDAE

Bullina lineata (Gray, 1825) TP,SWP(A,EM,N,NZ,K)
[Oliver 1915 – as *Bullinula ziczac*] AK.77780, M.212477
From immediate subtidal to 20 m, in sand and fine gravel.

**Bullina vitrea* Pease, 1860 TP,SWP(A,N,K)
AK.77764
One specimen at 4 m in fine gravel (1991).

HYDATINIDAE

**Hydatina physis* (Linnaeus, 1758) TP,SWP(A,N,NZ,K)
AK.77782
At 4–20 m in sand and fine gravel.

**Micromelo undata* (Bruguière, 1792) TP,SWP(A,N,K)
AK.77773
One specimen at 4 m in fine gravel (1991).

CYLICHNIDAE

Cylichna thetidis Hedley, 1903 SWP(A,NZ,K)
[Oliver 1915 – in *Cylichnella*] AK.28489, M.212454
Dead specimens at 10–30 m.

Tornatina sp. cf. *apicina* Gould, 1859 SWP(A,K)
[Oliver 1915] AK.28482, M.212373
At 20–30 m in shelly sand and gravel; dead specimens to 160 m.

PHILINIDAE

**Philine* sp. A ?
AK.78469, M.212480
Dead specimens from immediate subtidal to 30 m.

**Philine* sp. B ?
M.226608
At 42–47 m in gravel, September 1976.

BULLIDAE

Bulla angasi Pilsbry, 1894 TP,SWP(A,EM,LH,N,NZ,K)
[Oliver 1915 – as *Bullaria peasiana*] AK.79263, M.211447
Dead specimens washed up on beaches, and to 43 m.

HAMINOEIDAE

**Haminoea* sp. SWP(N,K)
AK.83561, M.212450
Dead specimens at 10–30 m.

**Limulatys* sp. cf. *muscarius* (Gould, 1859) TP,SWP(K)
AK.78477, M.227014
Dead specimens at 15–45 m.

APLYSIIDAE

**Aplysia dactylomela* Rang, 1828 TP,SWP(A,EM,LH,N,NZ,K)
AK.98044
Low intertidal and immediate subtidal on alga-covered reefs.

**Aplysia extraordinaria* (Allan, 1932) TP,SWP(A,LH,N,K)
Several specimens seen subtidally down to 30 m in sand and fine gravel (1991).

**Aplysia parvula* Guilding in Mörch, 1863 TP,SWP(A,EM,N,NZ,K)
AK.98048
Intertidal rock pools, and immediate subtidal on alga-covered reefs.

Dolabrifera brazieri (Sowerby, 1870) SWP(A,EM,LH,N,NZ,K)
[Morton & Miller 1973] AK.98045
Intertidal and shallow subtidal on reefs and gravel substrata.

OXYNOIDAE

Oxynoe sp. cf. *viridis* (Pease, 1861) TP,SWP(A,NZ,K)
[Morton & Miller 1973; Willan & Morton 1984] AK.94333
Low intertidal and immediate subtidal on alga-covered reefs.

JULIIDAE

Julia exquisita Gould, 1862 TP,SWP(A,N,K),SEP(E)
[Oliver 1915] AK.83558, M.212622
Dead specimens at 10–30 m.

UMBRACULIDAE

Umbraculum umbraculum (Solander, 1786) TP,SWP(A,LH,N,NZ,K), SEP(E)
[Oliver 1915 – as *U. umbellum*] AK.77779, M.22855
Low tidal to 10 m on reefs.

PLEUROBRANCHIDAE

**Berthellina citrina* (Ruppell & Leuckart, 1828) TP,SWP(A,LH,N,NZ,K), SEP(P)
AK.94335
At shallow subtidal depths under boulders and on reefs; shells to 40 m.

DORIDIDAE

**Halgerda willeyi* Eliot, 1903 TP,SWP(A,EM,N,K)
Several specimens seen at 10–30 m on reefs in May-June 1991

CHROMODORIDIDAE
**Chromodoris rufomaculata* Pease, 1871 TP,SWP(A,K)
AK.94334
One specimen at 5 m on reef (1995).

PHYLLIDIIDAE
**Phyllidiella pustulosa* (Cuvier, 1804) TP,SWP(A,LH,N,K),SEP(P)
AK.94337
At 6–38 m on reefs.

FACELINIDAE
**Phyllodesmium magnum* Rudman, 1991 TP,SWP(A,K)
AK.94338
One specimen at 8 m on alga-covered reef (1995).

**Pteraeolidia ianthina* (Angas, 1864) TP,SWP(A,K)
AK.94332
One juvenile at 5 m on reef (1995).

TERGEPEDIDIDAE
**Phestilla melanobranchia* Bergh, 1874 TP,SWP(A,K)
AK.94331
At 10–20 m on reefs, feeding on ahermatypic dendrophylliid corals.

Subclass PULMONATA
TRIMUSCULIDAE
Gadinia conica (Angas, 1867) SWP(A,N,NZ,K)
[Oliver 1915] M.214389
Low tidal under boulders.

SIPHONARIIDAE
Siphonaria raoulensis Oliver, 1915 ?endemic
[Oliver 1915 – as *S. raoulensis* and *S. amphibia, S. cheesemani, S. macauleyensis, S. macauleyensis perplexa*] M.214368
Intertidal reefs and boulders.
Note: In our opinion there is only one morphologically variable species of *Siphonaria*, namely *S. raoulensis*, at the northern Kermadec Islands.

Williamia radiata nutata (Hedley, 1908) TP,SWP(A,LH,N,NZ,K),SEP(E)
[Oliver 1915 – as *Roya nutatus*; Marshall 1981] AK.78565, M.230891
Dead specimens washed up on beaches, and to 146 m.

ELLOBIIDAE
Leuconopsis pacifica Oliver, 1915 ?
[Oliver 1915] M.212397
Dead specimens dredged at 10–30 m; presumably lives intertidally on reefs and amongst boulders.

**Melampus luteus* Quoy & Gaimard, 1832 TP,SWP(A,LH,N,K),SEP(P)
AK.94595
One dead specimen washed up on beach (1995).

'Melampus' albus Gassies, 1865 TP,SWP(K)
[Oliver 1915] M.212458
Dead specimens dredged subtidally; presumably lives intertidally on reefs and amongst boulders.

Class CEPHALOPODA
OCTOPODIDAE
Octopus kermadecensis (Berry, 1914) endemic
[Oliver 1915 – in *Pinnoctopus*]
One specimen washed up on beach (?1908).

Octopus oliveri (Berry, 1914) TP,SWP(K)
[Oliver 1915 – in *Polypus*]
Intertidal on reefs and boulder coasts, and presumably also occurs subtidally.

Note: Additional shallow benthic molluscan taxa listed in Oliver (1915) that were not sighted during the present study, and whose taxonomic identification or occurrence at the Kermadec Islands is here considered to be doubtful, include the bivalves *Perna canaliculus* (Martyn) and *Malleus legumen* Reeve, and the gastropods *Trivia napolina* (Kiener), *Cypraea erosa* Linnaeus, *Cymatium caudatum* (Gmelin) and *Cymatium vespaceum* Lamarck.