

TRANSACTIONS  
OF THE  
ROYAL SOCIETY OF NEW ZEALAND  

---

ZOOLOGY

---

Vol. 10

No. 25

JULY 15, 1968

Composition and Distribution of the New Zealand Brachyuran  
Fauna

By R. K. DELL

[Received by the Editor, January 8, 1968.]

*Abstract*

ANALYSIS of the composition and distribution of the New Zealand Brachyura shows that the number of species, distribution within genera and within families are more characteristic of an oceanic island than of a continental area. A large group of crabs is distributed throughout New Zealand, with another major group predominantly northern, and a relatively small group southern in distribution. There is a general falling off in the number of species towards the southern islands and to a lesser extent towards the far north. A high percentage of the species (53 percent) are endemic, 16 percent show Malayo-Pacific, 17 percent Australian, 4 percent Austral, and 6 percent Cosmopolitan affinities. Three genera, *Jacquintia*, *Eurynolambus* and *Heterozius* are endemic.

INTRODUCTION

DURING the last ten years or so considerable advances have been made in our knowledge of the composition, distribution and systematics of the New Zealand crab fauna. Much more intensive collecting by the New Zealand Oceanographic Institute, by the museums and by private collectors has supplied a better basis for faunal work. The publication by Richardson (1949, a, b, c) of keys to the crab fauna stimulated interest and provided a means of identification. Intensive study of the Majidae by Griffin culminated in the publication of a large bulletin on the family (1966). Bennett's revision of the whole fauna published in 1964 (although completed in 1936) has also put a wealth of material into print. Other work by Griffin, Yaldwyn, Richardson, and the writer, has added new species and new records to the fauna. The material in collections from the east coast of the mainland of New Zealand, the Chathams and the southern islands, even from deep water down to 300 fathoms or so, is now sufficient to give a reasonable picture of the geographic and benthic distribution of the fauna. Records from the west coast of the main islands are too sparse for proper analysis. In addition the members of one family, the Hymenosomidae, are so poorly known systematically that it seems best to ignore them in any discussion although they are an abundant and highly characteristic element in the New Zealand fauna. In all subsequent discussions in this paper, when the "crab fauna" of New Zealand is mentioned it should be read as, "excluding the Hymenosomidae". A recent checklist of New Zealand crabs has been published by the writer (Dell, 1967). This paper was originally prepared for the Australian/New Zealand meeting on Decapod Crustacea held in Sydney in October, 1967.

---

*Published by the Royal Society of New Zealand, c/o Victoria University of Wellington, P.O. Box 196, Wellington.*

## COMPOSITION OF THE FAUNA

Evaluation of the New Zealand crab fauna has suffered in the past from the inclusion in lists of a relatively large number of species of doubtful occurrence. The better collections now available, and more concentrated collecting and study over the last 20 years or so has shown that many of these records should be removed from the faunal list, while the sporadic occurrence of other species is better documented. At the same time other species have been added, especially from deeper water. Thus it is only in recent years that representatives of the families Raninidae, Homolidae and Atelecyclidae have been shown to occur in New Zealand, and the presence of the Dromiidae properly authenticated.

Most writers have stressed the relatively small number of species in the fauna, and the poor representation of some major families. These general comments still apply. Some major families such as the Dorippidae, Corystidae, Calappidae and Parthenopiidae are not known from New Zealand.

The total number of species in the fauna (excluding the Hymenosomidae) is 51. Comparative numbers for other areas are given in Table I. Thus compared with Chile (77 species) and South Australia (93 species) the fauna is relatively restricted. Even the relatively poorly known crab fauna of the small isolated Kermadec group can muster a list of 27 species. Tropical areas such as the Society Islands with 178 species and West Africa with 206 species are not strictly comparable with south temperate New Zealand, but Sakai (1965) was able to list 337 species from Sagami Bay (by no means the whole Japanese fauna). It seems very probable that southern areas have a reduced crab fauna but the figures required for analysis are not available. Barnard (1950) gives a figure of 255 species for South Africa but this includes several distinct faunal areas including an Indo-Pacific element.

When the numbers of species in each genus are compared, the nature of the New Zealand fauna is better appreciated. Thus 32 (82 percent) of the genera of New Zealand crabs are represented by only one species, compared with 74 percent for South Australia, 71 percent for Chile, 64 percent for West Africa and 54 percent for the Society Islands. The Kermadecs with 92 percent is the only area amongst those analysed with a higher figure. This perhaps emphasises the oceanic nature of the New Zealand fauna.

Any naturalist or ecologist who has studied the intertidal faunal zone in New Zealand as well as in some comparable area, especially one in the Indo-Pacific, will have a vivid impression of the relative paucity of crab species in the former. Many niches in New Zealand are not filled by crabs, and in many cases a wide variety of niches are filled by the same species. For example only one species (and that a portunid) occurs on sandy beaches.

The numbers of genera and species occurring in the crab families in New Zealand are as follows:

	Numbers of genera	Numbers of species
Leucosidae	2	3
Raninidae	1	1
Homolidae	3	3
Dromiidae	1	1
Majidae	11	18
Atelecyclidae	1	1
Cancridae	1	1
Portunidae	5	5
Xanthidae	4	5
Goneplacidae	2	2
Pinnotheridae	1	1
Grapsidae	6	9
Ocypodidae	1	1
Total	<u>39</u>	<u>51</u>

The Majidae are thus well represented with 11 genera and 18 species. But the only two genera with any considerable number of species are *Leptomithrax* with six species and *Notomithrax* with three species. In such a widespread family as the Xanthidae, however, New Zealand's representation is relatively slight in comparison with other areas:

New Zealand	5 species
Chile	13 species
South Australia	17 species
West Africa	42 species
South Africa	57 species
Japan	69 species
Society Islands	101 species



FIG. 1.—Known distribution of 38 species of intertidal and shelf crabs.

TABLE I.—Comparison of Number of Species per Genus for Various Areas.

	Species per genus												Total Number of genera	% of genera with only one species
	1	2	3	4	5	6	7	8	9	10	11	12		
New Zealand	32	5	1	0	0	1							39	82%
Kermadec Islands	22	1	1										24	92%
South Australia (Hale, 1927)	50	12	3	1	0	1							67	74%
Chile (Garth, 1957)	40	12	3	1									56	71%
West Africa (Monod, 1956)	70	16	9	8	1	3	2	1					110	64%
South Africa (Barnard, 1950)	87	30	7	8	1	2	1	0	1	1	0	1	139	63%
Sagami Bay (Sakai, 1965)	110	36	10	8	8	5	1	2					180	61%
Society Islands (Forest and Guinot, 1962)	45	15	9	8	3	0	1	0	0	1	0	1	83	54%

## INTERNAL DISTRIBUTION

In spite of much more intensive recent collecting detailed ranges of crabs are still not accurately known, particularly for subtidal and shelf forms. The east coast distribution of the commoner species seems reasonably well documented except on the periphery of ranges, but information for the west coast is very sketchy. The known ranges of 38 intertidal and shelf species is plotted on Figure 1. The general pattern which emerges from an analysis of ranges shows four main groups of species.

1. A large group ranges over most of the North and South Islands, the majority extending as far south as Stewart Island, with three species reaching as far south as the Auckland Islands or Campbell Island. Many are not known to extend to the far north, although the collections available for study from the northern shelf are relatively sparse. However, a similar falling off in the number of species present in the north does have some validity when intertidal species are considered, and the same diminution in numbers may also be present in shelf forms.

The group includes *Ebalia laevis*, *Naxia*, the endemic genus *Eurynolambrus*, *Notomithrax peronii*, *N. minor*, *N. ursus*, *Leptomithrax longimanus*, *Chlorinoides*, *Cancer*, *Nectocarcinus*, *Ovalipes*, *Heterozius*, *Pilumnus novaezealandiae*, *P. lumpinus*, *Pinnotheres*, *Hemigrapsus crenulatus*, *H. edwardsi*, *Cyclograpsus lavauxi*, *Helice* and *Hemiplax*. All are endemic except for *Notomithrax minor* and *N. ursus* which occur also in Australia and *Hemigrapsus crenulatus*, known also from Chile. They may all be presumed to be species which have been in the New Zealand area for some considerable time, or in some cases even to have developed here. They have distributed themselves along most of the suitable coastlines and when more than one species of the genus is concerned, as in *Notomithrax* and *Pilumnus*, have developed biological isolating mechanisms.

2. Another major group is predominantly northern in distribution, the species extending to a varying degree to the south. These include *Scylla*, *Portunus*, *Pilumnopeus* and *Cyclograpsus insularum*, which may be considered to be either very recent introductions, or species of occasional occurrence. Another group which does not extend much further south than Cook Strait includes *Merocryptus*, *Achaeus*, *Ozius*, *Petalomera*, *Macropipus*, *Lyreidus* and *Leptograpsus*, all of which occur also in Australia. *Plagusia*, also in this category, extends somewhat farther to the south. The only other member of this northern group is *Leptomithrax tuberculatus mortenseni*, which also occurs at the Kermadecs, and which is a subspecies of an Australian form.

3. A relatively very small group has a southern distribution pattern within the New Zealand area. It includes the endemic genus *Jacquiniotia*, and *Leptomithrax australis*. *Cancer*, *Nectocarcinus* and *Chlorinoides* which also occur in the southern islands cannot really be considered to be predominantly southern. Except for *Cancer novaezealandiae* whose presence in south-eastern Australia and Tasmania may be due to self- or accidental introduction, none of these species can be considered to show external southern affinities.

4. The species of another very small group show restricted distribution ranges which do not coincide but which are grouped towards the centre of the mainland. These compromise *Leptomithrax longipes*, *Eurynome* and perhaps *Ommatocarcinus*.

The problems of analysing the internal distribution of New Zealand crabs may be illuminated by considering the detailed patterns in three peripheral areas.

## THE FAR NORTH

The two strongest external elements in the crab fauna are the Australian and Malayo-Pacific, the two appearing in practically equal strength. In spite of the undoubted strong influence on the fauna from the north, the distribution of shore

crabs in the extreme north shows a number of anomalies. Many of the shelf species extend from North Cape southwards but the intertidal crabs on the east coast do not extend equally to the far north. Habitats for sheltered-water and mud-flat crabs are available in the harbours of Awanui, Hohoura and Parengarenga, though there are few suitable habitats available for exposed rocky shore species between Cape Kari Kari and the North Cape block. It cannot really be supposed, however, that absence of the right ecological niche is the limiting factor. Some of the mud flat crabs, *Helice*, *Hemigrapsus crenulatus* or *Hemiplax* may in future be collected in some part of the very extensive Parengarenga Harbour, but sample collections have not as yet brought them to light.

From the Bay of Islands northwards there is a steady falling off in both the presence and abundance of intertidal crab species. *Heterozius* has not, as yet, been recorded further north than the Bay of Islands, which also seems the most northerly locality recorded for *Hemiplax*. At least in recent years, the otherwise common and conspicuous intertidal *Hemigrapsus edwardsi* has not been observed commonly north of the Bay of Islands; a single specimen has been collected from Hohoura Harbour but in this locality and at Whangaroa Harbour and Doubtless Bay, its niches are filled by *Cyclograpsus lavauxi* and small specimens of *Leptograpsus variegatus*. In New Zealand, as elsewhere, *Leptograpsus* is a common crab of open, surf-washed rocky coasts, where it shelters in deep crevices or under large boulders. In the harbours of the far north, especially Hohoura and Parengarenga, young specimens are abundant in sheltered habitats under stones or gravelly areas and even on firm mud flats, from about half tide mark upwards. This is just the habitat in which *Hemigrapsus edwardsi* is common further south. Such a very definite filling of a different niche by another species indicates that the lack of *Hemigrapsus edwardsi* in the far north is real, rather than the product of inadequate collecting. On the west coast suitable habitats for *H. edwardsi* are lacking in the far north but at Opononi, on the Hokianga Harbour it is again abundant in its usual niche.

The apparent lack of some of the typical New Zealand intertidal crabs in suitable habitats in the far north is difficult to account for if indeed it is not due to collecting failure. If the distribution pattern sketched here has any reality it shows that species fall off towards the north, as they do towards the south. It is quite certain that many niches in the far north are not filled by crabs.

	<i>Eurynolambrus</i>	<i>Ozius</i>	<i>Leptograpsus</i>	<i>Hemigrapsus crenulatus</i>	<i>Hemigrapsus edwardsi</i>	<i>Helice</i>	<i>Hemiplax</i>	<i>Cyclograpsus insularum</i>	<i>Cyclograpsus lavauxi</i>
North Cape	x	x						x	
Parengarenga	x	x	x						
Hohoura	x	x	x	x	rare	x			x
Awanui							x		
Doubtless Bay	x	x	x						x
Whangaroa	x	x	x						x
Bay of Islands	x	x		x	x	x	x		x

#### SOUTHERN ISLANDS

The Southern Islands of New Zealand, especially Campbell Island, approach the southern limit for *Brachyura* in the South Pacific and South Indian Oceans. Only the hymenosomid, *Haliscarcinus planatus* is found further south at Kerguelen and

Macquarie Islands. As would be expected the crab fauna decreases from Stewart Island to the Aucklands and then to Campbell Island. Some 21 species have been recorded from Stewart Island, and Foveaux Strait.

Seven species are known from the Auckland Islands (including *Halicarcinus planatus* which is not known from the mainland). It seems certain that the deep water *Leptomithrax richardsoni*, known from the Chatham Rise and other areas of the mainland and from off Campbell Island, will also be collected from off the Aucklands. This would make eight species for this group.

The marine fauna of Campbell Island is now fairly fully known so that the total of six crabs including *Halicarcinus planatus* and the deep water *Leptomithrax richardsoni* is probably the complete fauna.

The occurrences of *Chlorinoides*, *Leptomithrax*, *Cancer* and *Nectocarcinus* in the southern islands are extensions of range of typically mainland forms. *Halicarcinus planatus* has a wide distribution on the widely separated islands of the Southern Ocean, and is the only southern high latitude species of crab. *Jacquiniotia* is an endemic genus, possibly derived from the American *Mithrax*, but very distinct. It grows to an extremely large size and is very abundant around Campbell and Auckland Islands. It extends north to the mainland having been recorded at low water mark at Stewart Island, and off the eastern Otago coast in a relatively small growth form down to 300 fathoms. It seems very likely that *Jacquiniotia* evolved in southern New Zealand. In the Early Pleistocene it extended its range north to Cook Strait but this occurrence can be correlated with a northern extension of cold water indicated by other evidence. The development of an endemic genus in the southern islands is paralleled by the apparent evolution of a second species of *Nectocarcinus* (as yet undescribed) in the same area.

	<i>Jacquiniotia</i>	<i>Leptomithrax australis</i>	<i>Cancer</i>	<i>Nectocarcinus antarcticus</i>	<i>Nectocarcinus</i> n.sp.	<i>Chlorinoides</i>	<i>Leptomithrax richardsoni</i>	<i>Halicarcinus planatus</i>
Mainland	x	x	x	x		x	x	
Auckland Islands	x	x	x	x	x	x		x
Campbell Island	x	x		x	x		x	x

#### CHATHAM ISLANDS

Few additions to our knowledge of the crabs of the Chatham Islands have been made since the writer's (1960) summary. Bennett (1964) examined the systematics of *Pilumnus* and recorded both *P. novaezelandiae* and *P. lumpinus*. The writer (Dell, 1967) has shown that the specimens of *Planes* recorded by Bennett as *P. minutus* are in fact *P. marinus*.

The crabs at present known from the Chatham Islands are:

- Ebalia laevis* (Bell)
- Chlorinoides filholi* (Milne Edwards)
- Leptomithrax longipes* (Thomson)
- L. australis* (Jacquinot)
- Notomithrax peronii* (Milne Edwards)
- N. ursus* (Herbst)
- Naxia huttoni* (Milne Edwards)

*Eurynolambrus australis* Milne Edwards and Lucas  
*Cancer novaezelandiae* (Jacquinot)  
*Ommatocarcinus macgillivrayi* (White)  
*Pilumnus novaezelandiae* Filhol  
*P. lumpinus* Bennett  
*Nectocarcinus antarcticus* (Jacquinot)  
*Ovalipes catharus* (White)  
*Pinnotheres* sp.  
*Planes marinus* Rathbun

The main characteristics of the crab fauna (Dell, 1960) are:

1. The general paucity of species.
2. The absence of graspid crabs (except for the oceanic *Planes*).
3. The lack of intertidal crabs except near low water.

No crabs are endemic to the Chathams. Of the 16 species known, one is oceanic and widely spread in the Pacific, and one (*Notomithrax ursus*) is also found in Australia, but is also widely distributed along the New Zealand mainland. The rest (88 percent) are species endemic to the New Zealand area. The Chathams are separated from the rest of New Zealand by over 400 miles of ocean. Distances three times this separate New Zealand from Australia, yet presumably species common to both countries have covered this 1,200 miles. Currents between New Zealand and the Chathams are much more direct and flow over a shorter distance than the Tasman current, and hence should be far more effective in transporting larvae than the latter.

Some of the species absent from the Chathams reach their southern limit on the mainland roughly about the latitude of the Chathams, but there seems no reason why the following species, including some of the commonest and presumably the most successful mainland species, should not occur at the Chatham Islands:

*Notomithrax minor*  
*Heterozius rotundifrons*  
*Cyclograpsus lavauxi*  
*Hemigrapsus edwardsi*  
*H. crenulatus*  
*Helice crassa*  
*Hemiplax hirtipes*

Except for *Notomithrax minor* (also in Australia) and *Hemigrapsus crenulatus* (also in Chile), the species listed are endemic to the New Zealand region.

#### EXTERNAL RELATIONSHIPS OF THE NEW ZEALAND CRAB FAUNA

More critical knowledge of systematics allows a better analysis of the relationships of the fauna. Fleming (1963) has recently put forward a scheme of nomenclature for the biogeographic elements in New Zealand biota. The relationships of the crab fauna are discussed in terms of these elements with the addition of a small subgroup of the Malayo-Pacific, "Lord Howe-Norfolk", whose significance will be discussed later. These elements are:

Endemic  
 Malayo-Pacific (a) Lord Howe-Norfolk  
 Australian  
 Austral (divided by Fleming into Neoaustral and Paleoaustral)  
 Holarctic (not recognised as such in the crab fauna)  
 Cosmopolitan



## ENDEMIC ELEMENT

Of the 51 species occurring in New Zealand waters no less than 27 (53 percent) are now believed to be endemic. These are:

- Ebalia laevis* (Bell)  
*Paramola spinimana* Griffin  
*Platymaia maoria* Dell  
*Naxia huttoni* (Milne Edwards)  
*Eurynome bituberculata* Griffin  
*Eurynolambrus australis* Milne Edwards and Lucas  
*Notomithrax peronii* (Milne Edwards)  
*Leptomithrax australis* (Jacquinot)  
*L. longimanus* Miers  
*L. garricki* Griffin  
*L. richardsoni* Dell  
*L. longipes* (Thomson)  
*Chlorinoides filholi* (Milne Edwards)  
*Jacquinotia edwardsi* (Jacquinot)  
*Trichopeltarion fantasticum* Richardson and Dell  
*Cancer novaezelandiae* (Jacquinot) (later introduced into Australia)  
*Ovalipes catharus* (White)  
*Nectocarcinus antarcticus* (Jacquinot)  
*Heterozius rotundifrons* Milne Edwards  
*Pilumnus lumpinus* Bennett  
*P. novaezelandiae* Filhol  
*Ommatocarcinus macgillivrayi* (White) (Mr R. Jenkins considers that the New Zealand form is separable from the Australian)  
*Pinnotheres novaezelandiae* Filhol  
*Hemigrapsus edwardsi* (Hilgendorf)  
*Helice crassa* Dana  
*Cyclograpsus lavauxi* Milne Edwards  
*Hemiplax hirtipes* (Jacquinot)

## MALAYO-PACIFIC ELEMENT

Nine of the species found in New Zealand are also known from various localities from Japan to the Indian Ocean and in the south-west Pacific. The two species of *Planes* are oceanic crabs. Of the rest, six of the seven are also known from Australia. These may well have been derived from Australia direct but even so their ultimate origin may be supposed to be the Malayo-Pacific.

## LORD HOWE-NORFOLK ELEMENT

The islands of Lord Howe, Norfolk and the Kermadecs form an interesting series of outliers to the widespread Indo-Pacific marine fauna. The fauna can hardly be considered to be an independent element in itself. Their small size, wide separation from one another and from other land masses, and their southern position at about the limit of tropical marine distributions makes them anomalous in any biogeographical scheme. The writer (Dell, 1958) considered the biogeography of the Kermadec marine mollusca and showed that these islands have a basic Indo-Pacific fauna with smaller Australian and endemic elements. Although the nearest group to New Zealand, the Kermadecs appear to have had very little effect upon the New Zealand molluscan fauna, most of the relatively small number of species which they share, also occurring in Australia. Much the same seems true of the crab fauna. Two crab species restricted to New Zealand and to the Kermadec Islands show that there is a slight relationship.

*Leptomithrax tuberculatus mortenseni* Bennett, which has a restricted distribution in northern New Zealand is known elsewhere only from the Kermadecs. The nominate form is, however, Australian so that although the Kermadecs share a subspecies with New Zealand, the ultimate relationship is with Australia.

The case of *Cyclograpsus insularum* Campbell and Griffin is of more significance. Campbell and Griffin recently described the species (previously known as *whitei* in New Zealand), recording it from Lord Howe, Norfolk, the Kermadecs and New Zealand. The writer has recently documented its occurrence in New Zealand more critically. It is probably a recent arrival in New Zealand since it shares essentially the same ecological niche as the related *C. lavauxi* in New Zealand, but is by far the rarer. It may well have originated somewhere in the Lord Howe-Norfolk-Kermadec area, from which it has reached New Zealand.

#### AUSTRALIAN ELEMENT

Eight species of New Zealand crabs are known elsewhere only from Australia, and are the only species which may properly be claimed as certainly Australian in immediate origin. However, most of the crabs which are considered as Malayo-Pacific also occur in Australia and it seems very probable that New Zealand acquired them by trans-Tasman dispersal rather than directly from the north or north-west. This applies especially to *Merocryptus lambriformis*, *Lyreidus tridentatus*, *Petalomera wilsoni* and *Achaeus fissifrons*.

The species which are known elsewhere only from Australia are:

- Latreillopsis petterdi* (Grant)
- Latreillia australiensis* Henderson
- Achaeopsis ramusculus* (Baker)
- Notomithrax minor* (Filhol)
- N. ursus* (Herbst)
- Ozius truncatus* Milne Edwards
- Pilumnopeus serratifrons* (Kinahan)
- Carcinoplax victoriensis* Rathbun

In addition the New Zealand subspecies of *Leptomithrax tuberculatus* probably originated from Australia.

#### AUSTRAL ELEMENT

Only two species can be considered as Austral in origin in Fleming's (1963) use of the term. The two species grouped in this Austral category are:

- Hemigrapsus crenulatus* (Milne Edwards)
- Plagusia chabrus* (Linnaeus)

*Hemigrapsus crenulatus* is known elsewhere only from Chile. The specific identity of the New Zealand and Chilean forms has been queried, but Garth (1957, 1967) has compared specimens and found no significant differences. The very low Austral element in the New Zealand crab fauna contrasts with the situation in other groups of animals. It may be explained in part by the lack of crabs in the southern part of the Southern Hemisphere and the marked fall off in crab species along land masses which extend into comparatively high latitudes.

Although *Plagusia chabrus* fits into this category, it does not extend far to the south in New Zealand, its southernmost record being Lyttelton. Elsewhere it is known from southern Australia, Tasmania, South Africa, Juan Fernandez and doubtfully from Chile.

COSMOPOLITAN ELEMENT

Three species, known elsewhere from well outside the Malayo-Pacific area, warrant inclusion in a wider biogeographic element. *Ebalia tuberculosa* (Milne Edwards) has been recorded from New Zealand only from a *Challenger* Station, and its identification has not since been checked. *Portunus pelagicus* (Linnaeus) has been recorded from only one recent specimen, and cannot be considered to be an established member of the fauna. The other species included in this group is *Macropipus corrugatus* (Pennant).

*Analysis of External Relationship at the Specific Level.*

	Number of Species	Percentage
Endemic	27	53%
Malayo Pacific	8	16%
(a) Lord Howe-Norfolk	2	4%
Australian	9	17%
Austral	2	4%
Cosmopolitan	3	6%

The endemic element is by far the strongest, the Australian and Malayo-Pacific roughly equal in influence and next in importance, but not together equalling the endemic. Other influences are relatively minor.

ORIGINS OF THE ENDEMIC ELEMENT

Twenty-seven species (53 percent of the fauna) have been listed as endemic. Three species are classed in three monotypic endemic genera, while the remaining species are accommodated in 19 more widespread genera. The derivation of the 22 genera to which the endemic species belong must now be considered. Their relationships have been analysed as follows:

*Relationships of Genera with Endemic Species*

	Number of genera	Percentage
Endemic	3	14%
Malayo-Pacific	6	27%
Australian	2	9%
Austral	2	9%
Cosmopolitan	9	41%

These relationships in general follow much the pattern of species relationships except that with the use of a higher taxonomic category—i.e., genera rather than species—a larger proportion of the relationships fall into wider biogeographic elements. Thus the Malayo-Pacific and Cosmopolitan elements account for half the genera with endemic species.

ENDEMIC GENERA

The three endemic genera, *Jacquiniotia*, *Eurynolambrus* and *Heterozius* form an interesting group. All three genera are monotypic, and all three are very distinct. *Heterozius*, although usually included in the family Xanthidae, does not seem related to any other xanthid genus and is unique. *Eurynolambrus* has proved difficult to fit into a family. It has been placed in the Parthenopidae, and has been considered better placed in the Brachyrhyncha rather than the Oxyrhyncha. Study of the larval stages demonstrated its true relationships and it is now classed in the Pisinae (Griffin, 1966). The other majid genus *Jacquiniotia* is not closely related to any other form and there has been considerable divergence of opinion regarding its sub-family position. It is now believed to have some relationship with the American

*Mithrax*, *Eurynolambrus* and *Heterozius* occur throughout the main islands of New Zealand but do not occur in the southern islands. *Jacquinotia* is most abundant and reaches its largest size at Campbell Island and the Aucklands but extends up the east coast of the South Island in considerable depths.

		Cancer novaezelandiae	Ovalipes	Leptomithrax	Paramithrax minor	Jacquinotia	Lyreidus	Ommatocarcinus	Hemiplax
PLEISTOCENE	Castlecliffian	X	X	X	X				
	Nukumaruan	X				X			X
PLIOCENE	Waitotaran		X	X					X
	Opoitian	X							
MIOCENE	Kapitean								
	Tongaporutuan								
	Waiauian								
	Lilburnian								
	Clifdenian								
	Altonian					X			
OLIGOCENE	Awamoan							X	

FIG. 2.—Fossil occurrences of Recent crab genera with known fossil histories in New Zealand.

Of these three genera only *Jacquinotia* is as yet known fossil. Fleming (1962) records a specimen in the cold water element that invaded the North Island in the Hautawan (early Pleistocene). However, the fossil history of crabs in New Zealand is not well documented and it seems highly probable that all three genera have existed in the area for a considerable period.

#### GEOLOGICAL HISTORY

The known geological history of the New Zealand crab fauna, although rather sparse (Glaessner, 1960), gives some indication of the length of time some genera have existed in this area (Figure 2). In some, e.g., *Leptomithrax*, *Lyreidus* and *Ommatocarcinus* there is no evidence that the Recent species have descended directly from the fossil forms. Indeed in *Lyreidus* and *Ommatocarcinus* there is fairly conclusive proof that the Recent species are relatively recent arrivals.

## BENTHIC DISTRIBUTION

Enough evidence has now been collected to enable some generalisation to be drawn concerning the benthic distribution of New Zealand crabs. In analysing benthic distribution the fauna has been divided into the following groups:

1. Species confined to the intertidal zone.
2. Species confined to the upper shelf (0–50 fathoms).
3. Species with wider distribution on the shelf (0–100 fathoms).
4. Species confined to depths greater than 100 fathoms.
5. Species found on the shelf but extending deeper than 100 fathoms.

## 1. INTERTIDAL

Fifteen species are now known to be confined to the intertidal zone. A few species included in the following list have also occasionally been recorded from depths less than 10 fathoms, but the species listed are essentially the littoral crabs of New Zealand. Many other species have been found in the intertidal zone but these have a wider distribution on the shelf. Where species are known below low tide mark, the range in fathoms is given in parentheses.

*Naxia huttoni*  
*Scylla serrata* (0–2)  
*Portunus pelagicus*  
*Heterozius rotundifrons*  
*Pilumnus lumpinus*  
*Pilumnopeus serratifrons*  
*Ozius truncatus*  
*Cyclograpsus lavauxi*  
*Cyclograpsus insularum*  
*Leptograpsus variegatus*  
*Hemigrapsus crenulatus*  
*Hemigrapsus edwardsi*  
*Helice crassa* (0–9)  
*Plagusia chabrus* (0–2)  
*Hemiplax hirtipes*

Of these 15 species, eight are predominantly northern in distribution, extending to varying degrees to the south but not reaching much farther south than Banks Peninsula. The other seven are distributed throughout most of the main islands. Considering the overseas relationships of the group, by far the highest percentage (47 percent) is endemic, 20 percent also occur in the Malayo–Pacific region and 13 percent are found elsewhere only in Australia. Thirteen percent are considered to be Austral in derivation and one species is known elsewhere only from Lord Howe, Norfolk and the Kermadecs.

## 2. SPECIES CONFINED TO THE UPPER SHELF (0–50 FATHOMS)

Fourteen species are found only on the upper levels of the continental shelf, many of them extending into the intertidal zone. In the list which follows known benthic distribution in fathoms is shown in parentheses:

*Merocryptus lambriformis* (35–40)  
*Petalomera wilsoni* (0–50)  
*Eurynolambrus australis* (0–50)  
*Notomithrax peronii* (0–30)  
*Notomithrax minor* (0–50)  
*Notomithrax ursus* (0–40)

*Leptomithrax australis* (0-50)  
*Leptomithrax tuberculatus mortenseni* (35-40)  
*Paramola spinimana* (50)  
*Ovalipes catharus* (0-25)  
*Macropipus corrugatus* (7-55)  
*Pilumnus novaezealandiae* (0-11)  
*Pinnotheres novaezealandiae* (0-32)  
*Cancer novaezealandiae* (0-40)

Of these five are predominantly northern and one southern, while eight are found throughout the mainland. Again a high percentage (57 percent) is endemic, with Malayo-Pacific (15 percent) and Australian (15 percent) elements well represented. A single species belongs to the Cosmopolitan element.

### 3. SPECIES WITH WIDER DISTRIBUTION ON THE SHELF (0-100 FATHOMS)

Three species have a benthic range which spans 50 fathoms on the shelf:

*Cyrtomaia hispida* (40-100)  
*Nectocarcinus antarcticus* (2-92)  
*Achaeus fissifrons* (2-100)

Only one of these species is endemic, while the other two belong to the Malayo-Pacific element. Two are generally distributed while one is predominantly northern.

### 4. SPECIES CONFINED TO DEPTHS GREATER THAN 100 FATHOMS

Six crabs are now known from New Zealand waters only from depths greater than 100 fathoms:

*Ebalia tuberculosa* (150)  
*Latreillopsis petterdi* (100-296)  
*Leptomithrax richardsoni* (169-330)  
*Leptomithrax garricki* (220-435)  
*Achaeopsis ramusculus* (400)  
*Platymaia maoria* (260-400)

Three of these are endemic, two are found also in Australia, and one (rather doubtfully recorded from New Zealand) is cosmopolitan. In so far as one can determine geographic trends in these deep water crabs, three are northern, two are central and one is southern in distribution.

### 5. SPECIES FOUND ON THE SHELF BUT EXTENDING DEEPER THAN 100 FATHOMS

It would be equally legitimate to consider these species as archibenthic forms which also extend on to the shelf.

*Lyreidus tridentatus* (40-120)  
*Latreillia australiensis* (86-168)  
*Eurynome bituberculatus* (40-140)  
*Trichopeltarion fantasticum* (8-400)  
*Ommatocarcinus macgillivrayi* (3-330)  
*Ebalia laevis* (10-205)  
*Leptomithrax longipes* (10-200)  
*Leptomithrax longimanus* (0-300)  
*Chlorinoides filholi* (15-300)  
*Carcinoplax victoriensis* (70-400)  
*Jacquiniotia edwardsi* (0-300)

For many of the above the bathymetric range is very wide. Eight of the 11 (73 percent) are endemic, 18 percent are also found in Australia and nine percent in the Malayo-Pacific. Two are essentially southern in distribution, two are northern, three are found throughout, while four are known only from central areas.

*Summary of the Faunal Relationships of the Species occurring in various Benthic Groups*

The figures are percentages of the total fauna in each benthic group (depths in fathoms).

	Intertidal	0-50	0-100	0-100+	over 100
Endemic	47	57	33	73	50
Malayo-Pacific	20	15	67	9	0
Norfolk-Lord Howe	7	0	0	0	0
Australian	13	21	0	18	33
Austral	13	0	0	0	0
Cosmopolitan	0	7	0	0	17

It will be readily seen that the endemic element is least represented amongst species with wide benthic ranges on the shelf, amongst which the Malayo-Pacific element is most strongly represented. The Australian and Cosmopolitan elements are most marked amongst archibenthal crabs. The Austral element is confined to the intertidal zone.

DISCUSSION

Consideration of the composition, internal distribution and external relationships of the New Zealand crab fauna brings out a number of generalisations.

First, the fauna is "unbalanced". With few exceptions each genus is represented by only one or two species.

Comparison with other areas shows a close similarity in faunal composition with oceanic island faunas. There is a very strong endemic element, but there is also evidence that species are still being acquired (e.g., *Scylla serrata*, *Portunus pelagicus*, *Cyclograpsus insularum*). There are strong Australian and Malayo-Pacific elements, but it seems highly probable that the major migration route has been from Australia across the Tasman Sea. This process is most likely a continuing one. It is very likely that additional species reach New Zealand from time to time but are not documented by collections. Despite the evidence for continuing immigration the unbalanced nature of the crab fauna and the strong endemic element indicate that trans-oceanic dispersal to New Zealand is not easy. For crabs New Zealand is isolated, with a migration route available across the Tasman Sea which some species can use (perhaps intermittently). Relatively weak Austral and Cosmopolitan elements are present.

The internal distribution of crabs follows the pattern seen in other animal groups, with a northern and a southern group of species, each one extending southwards or northwards in an apparently independent fashion. In the crabs the northern element is overwhelmingly stronger. In the extremities of the New Zealand region (the Chatham Islands, the southern islands and to a lesser extent the far north) the fauna becomes impoverished.

LITERATURE CITED

BARNARD, K. H., 1950. Descriptive Catalogue of South African Decapod Crustacea (Crabs and Shrimps). *Ann. S. Afr. Mus.*, 38: 1-837.  
 BENNETT, E. W., 1964. The Marine Fauna of New Zealand: Crustacea Brachyura. *N.Z. Dept. Sci. Ind. Res. Bull.*, 153.

- CAMPBELL, B. M.; GRIFFIN, D. J. G., 1966. The Australian Sesarmine (Crustacea: Brachyura): Genera *Helice*, *Helograpsus*, nov., *Cyclograpsus*, and *Paragrapsus*. *Mem. Queensland Mus.*, 14: 127-174.
- DELL, R. K., 1958. The Marine Mollusca of the Kermadec Islands in Relation to Molluscan Faunas in the South West Pacific. *Proc. 8th Pac. Sci. Congr.*, III: 499-503.
- 1960. Crabs (Decapoda, Brachyura) of the Chatham Islands 1954 Expedition. *N.Z. Dept. Sci. Ind. Res. Bull.*, 139: 1-7.
- 1968. Notes on New Zealand Crabs. *Rec. Dominion Mus.*, 6: 13-28.
- DELL, R. K.; MARSHALL, B. A., 1967. The Rediscovery of the Crab *Cyclograpsus insularum* Campbell and Griffin in New Zealand. *Rec. Dominion Mus.*, 6: 1-3.
- FLEMING, C. A., 1962. New Zealand Biogeography. *Tuatara*, 10: 53-108.
- 1963. The Nomenclature of Biogeographic Elements in the New Zealand Biota. *Trans. R. Soc. N.Z., Gen.*, 1: 13-22.
- FOREST, J.; GUINOT, D., 1961. Crustaces Decapodes Brachyours de Tahiti et des Tuamotu. *Exped. Franc. Rec. Cor. de la Nouvelle-Caledonie, volume preliminaire*: 1-195.
- GARTH, J. S., 1957. The Crustacea Decapoda Brachyura of Chile. *Lunds Universit. Arssk.*, 53: 1-130.
- GARTH, J. S.; HAIG, J.; YALDWYN, J. C., 1967. The Decapod Crustacea of the Royal Society Expedition to Southern Chile, 1958-59. *Trans. R. Soc. N.Z., Zool.*, 8: 169-186.
- GLAESSNER, M. F., 1960. The Fossil Decapod Crustacea of New Zealand and the Evolution of the Order Decapoda. *N.Z. Geol. Sur. Pal. Bull.*, 31.
- GRIFFIN, D. J. G., 1966. The Marine Fauna of New Zealand: Spider Crabs Family Majidae (Crustacea, Brachyura). *N.Z. Dept. Sci. Ind. Res. Bull.*, 172.
- HALE, H. M., 1927. *The Crustaceans of South Australia Pt. 1*. Govt. Printer, Adelaide, 201 pp.
- MONOD, T., 1956. Hippidea et Brachyura ouest-africains. *Mem. de L'Inst. Franc. d'Afr. Noire*, No. 45.
- RICHARDSON, L. R., 1949a. A guide to the Brachyrhynchous Crabs. *Tuatara*, 2: 29-36.
- 1949b. A Guide to the Oxyrhyncha, Oxystoma, and Lesser Crabs. *Tuatara*, 2: 58-69.
- 1949c. Corrections and Additions for the Guides to the Brachyura. *Tuatara*, 2: 130.
- SAKAI, T., 1965. *The Crabs of Sagami Bay*. Tokyo, 206 pp.

R. K. DELL,  
Dominion Museum,  
Wellington, New Zealand.