

The Composition, Distribution and Origin of the New Zealand Fish Fauna

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It is proposed to present here a summary, based largely on the literature, of knowledge to date of a number of aspects of the fauna which may be of interest to zoogeographers, ecologists and marine biologists in general.

New Zealand's geographic position, extending through 1,000 miles of latitude, results in relatively warm northern and cool southern oceanic conditions which, not surprisingly, are reflected in the character of the fish fauna. This statement, however, applies only to the shore fishes and is in some other respects also a very general statement.

The composition of the fauna based on an analysis of the 413 currently accepted species according to their known geographical distribution is as follows:

Endemic species			
Marine	.....	.....	approx. 22%
Freshwater	.....	.....	7%
Species shared with S.E. Australia	.....	.....	31%
Deepwater species	.....	.....	19%
South temperate species	.....	.....	7%
Cosmopolitan species	.....	.....	8%
Indo-Pacific species	.....	.....	5%
Bipolar species	.....	.....	2%

Separate treatment and elucidation is given each of these elements below.

ENDEMIC MARINE FAUNA

There is only one endemic marine family (Hemerocoetidae with 5 spp.) and this may not warrant separate family status. Less than half (41%) of the 103 families represented in our waters have endemic species and although many of these are very distinct other closely allied species occur in other parts of the world.

Of the larger families present such as the morwongs (Cheilodactylidae), trevallies (Carangidae), pipefishes (Syngnathidae), true cods (Gadidae), flounders (Pleuronectidae), perches (Serranidae), rudder fishes (Stromateidae) and

the parrotfishes (Labridae), only 10% of the species are endemic. Most of the non-endemic species in the shore families occur in S.E. Australia and so are largely Australasian in distribution.

The greatest degree of endemism is shown by the fishes of the littoral and sublittoral rocky shore and throughout New Zealand where this habitat occurs the families Acanthoclinidae, Gobiesocidae and Tripterygiidae are dominant. These share some 20 species between them, all endemic and all but one widespread throughout coastal waters.

ENDEMIC FRESHWATER FAUNA

Except for one galaxiid all the species of this group are endemic and there is one endemic family (Cheimarrichthyidae) containing only one species, a perch of uncertain relationship.

There are no primary or secondary true freshwater fishes, and as a result there is nothing to indicate a connection with either Australia or South America since at least the Cretaceous. If there ever was a connection it must have been further back in the Mesozoic.

The dominant family in New Zealand (Galaxiidae) is, except for one species which enters the tropics at New Caledonia, confined to south temperate areas. Only one species (*G. attenuatus*) is known to regularly spend part of its life cycle in the sea and occurs in S.E. Australia and southern South America as well as in New Zealand. Two other New Zealand species (*G. campbelli* and *G. fasciatus*) are known to tolerate seawater, the former for some hours, the latter for some days without apparent ill effects, although neither is known to occur regularly in a marine environment or to have a marine stage in the life history. A Tasmanian species does, at least on some occasions, reach the mouths of rivers and some young of this species have been observed in river estuaries

near seawater. That the family shows some salt tolerance is evident, and, as Myers has pointed out, it is probable that marine wandering is the key to the family's distribution. The distribution of Retropinnidae and Aplochitonidae can be similarly explained. In contrast to the above primitive Isospondylid families are two families of specialised perches, Eleotridae and Cheimarrichthyidae. The Eleotrids are a widespread Indo-Pacific marine family (at least two New Zealand species enter sea water) and have probably invaded freshwater comparatively recently. *Cheimarrichthys* seems to have developed locally from a fully marine but unknown ancestor.

FAUNA SHARED WITH S.E. AUSTRALIA

This is the largest single element of the shore fauna. It includes many common species widespread from north to south and most if not all of those restricted to the warm Bay of Plenty and North Auckland areas. Included here are most of the dogfishes and rays as well as various species of herring (Clupeidae), true cods (Gadidae), boarfishes (Histiopoteridae), Roughies (Trachichthyidae), Red snappers (Berycidae) scorpionfishes (Scorpaenidae), rudderfishes (Stromateidae), morwongs (Cheilodactylidae), pigfishes (Congiopodidae), and 4 species of gurnard (Triglidae).

Altogether well over half this element belongs to numerous and widespread Indo-Pacific families.

DEEPSEA FAUNA

This element of the fauna shows a marked similarity to deepsea faunas from other parts of the world, and most New Zealand species are widely distributed. There is subspeciation of forms between northern and southern hemispheres and some endemism in the southern hemisphere, particularly in the Myctophidae (lanternfishes). Members of this family regularly rise to surface waters during hours of darkness and their dispersal may be controlled by surface water temperatures.

SOUTH TEMPERATE FAUNA

Only a very few New Zealand shore fishes are distributed throughout the south Temperate Zone; most are restricted to S.E. Australia and southern South America, including the island of Juan Fernandez. Species such as our so-called barracouta (*Thyrsites atun*) and two rubyfishes (Emmelichthyidae), all strong swimmers, occur throughout. A ling (*Genypterus*), a cyttid and

a macrurid, (*Coelorhynchus fasciatus*) are not so important as they inhabit moderately deep water, but their distribution as far as is known is austral.

Relatively feeble swimmers of shallow water such as the morwongs (Cheilodactylidae) and the pigfishes (Congiopodidae) are important endemic southern families, the species endemic to South Africa, Australasia and southern South America. The rudderfishes (Stromateidae) are a large family with many species widespread in southern waters.

The greatest number of species are shared by Australasia and South America, the majority belonging to widespread and often bipolar families. Three Australasian species, groper (*Polyprion oxygenios*), pink maomao (*Caprodon longimanus*), and a gurnard (*Pterygotrigla picta*) have been recorded from Juan Fernandez but apparently not from the coast of Chile. The Antarctic family Nototheniidae enters this fauna with two species common to southern coasts of New Zealand and South America.

COSMOPOLITAN FAUNA

This is not a clearly defined element of the fauna. Many of the species which appear to be cosmopolitan in all but the coldest seas may in fact be bipolar when their distribution patterns are better known, while others are probably circumtropical. A mullet (*Mugil cephalus*), and a dory (*Zeus faber*), are widely distributed.

INDO-PACIFIC FAUNA

Characteristic of this element are globefishes (Tetraodontidae), a wide-ranging triggerfish (*Aleuterus*), muraenid eels, and other tropical marine eels. A large pelagic fauna includes flying fishes (Exocoetidae), tunnies (Thunnidae), marlins (Istiophoridae), together with a number of large tropical sharks. Most members of these families are restricted to the warm surface water of the north-eastern coast although some straggle south to Cook Strait during late summer months.

BIPOLAR FAUNA

A gurnard (*Chelidonichthys kumu*), a so-called hake (*Jordanidia solandri*) and a dory (*Xenopsis nebulosus*) also occur in Japan. A pelagic saury or skipper (*Scomberesox saurus*) occurs elsewhere in the North Atlantic and a flying fish (*Cypselurus lineatus*) is found in warm temperate waters of both hemispheres but is absent from intervening tropical seas. The

frostfish (*Lepidopus caudatus*) and the sunfish (*Mola mola*) are both widespread in temperate seas.

DISTRIBUTION OF SHORE FISHES WITHIN NEW ZEALAND

Of the total number of fishes recorded from New Zealand 253 are marine shore fishes. For the present purpose these are fishes known to regularly inhabit littoral and shelf waters down to about 150 fathoms. Rare species and foreign stragglers are not included.

About half the shore fishes are distributed throughout New Zealand where suitable habitat occurs, the others occur in three overlapping areas of distribution, two in the north and one in the south of the country. Pelagic species are noted only in relation to the distribution of shore fishes.

WIDESPREAD FAUNA

Many Australian and most of the endemic forms are included here, and number about 124 species plus 5 pelagic forms.

NORTHERN FAUNA

North Cape to the Kaikoura-Banks Peninsula area including a broad mixed zone of stragglers from north and south between Castlepoint and Banks Peninsula. Included in this zone are 41 shore fishes and 7 pelagic species.

SOUTHERN FAUNA

Stewart Island to Banks Peninsula and Kaikoura, mixing with the northern fauna north to about Castlepoint. There are 38 shore fishes and 1 pelagic species, the latter an endemic tunny (*Allothenus fallai*) with probably the most restricted range of any member of this family.

SUBTROPICAL FAUNA

Confined to the far north, south to eastern Bay of Plenty, the southern boundary is rela-

tively sharply defined, none of the 50 shore fishes are as yet known south of East Cape. This fauna contains the Indo-Pacific species mentioned previously, none are endemic and all are known from New South Wales and Queensland coasts, some also occur at Lord Howe, Norfolk, and Kermadec Islands, while others are in addition widespread in other parts of the Indo-Pacific.

In considering the origin of the shore fishes it is clear that more than 75% of the species belong to typically Indo-Pacific families probably derived from the north-west by way of the southward extension of warm water along the Queensland and New South Wales coast. The endemic fauna as it exists today probably represents remnants of a number of successive invasions in earlier warm periods. Many of these elements appear to be phylogenetic and geographic relicts. The remaining elements of the shore fauna are largely south temperate in character with relatives in south-east Australia and southern South America, although emphasis is with South America.

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