

For Alison, Melissa and Cara

Coastal Fishes

OF NEW ZEALAND

MALCOLM FRANCIS

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Introduction

From the Kermadec Islands in the north to Campbell Island in the south, New Zealand spans 2600 kilometres of the Pacific Ocean. The main land masses are long and narrow, and the coastline is rugged and indented. All New Zealanders live close to the sea, so it is not surprising that we use it extensively for recreation and food. More and more people scuba dive as a way of exploring the sea. Divers are now able to observe and interact with marine life in its natural habitat, even if only for a short time.

Fishes are the most visible and striking of the sea's living inhabitants. Their abundance, colours, graceful movements and interesting behaviour attract attention. About 17,000 species of marine fishes are known worldwide, and around 1400 of them have been found within New Zealand's 200-mile Exclusive Economic Zone (EEZ). About 360 species occur in our coastal waters out to the edge of the continental shelf, excluding oceanic migrants such as large sharks, marlins and tunas. The main aim of this book is to provide a comprehensive guide to the fishes that divers are likely to see. It covers 219 species, including all the common reef fishes found between the Kermadec Islands and the subantarctic islands. It also includes many of the rare fishes, and some which live over sand or mud seabed. For species which have different colour forms, or where the two sexes look different, each form is illustrated, and for some species distinct juveniles are shown as well.

Nearly all images in this book are of live fishes and most were taken underwater; aquarium shots are used for some fish that are difficult to photograph underwater. Most of the images were taken using electronic flash, which restores the warm red and orange colours filtered out by seawater. Fishes seen in dim light, in deep water, or after death do not necessarily appear the same as in the images. Colour pattern and body shape should still enable accurate identification of these fishes.

The text supplements the images by highlighting the physical features, and for some species the behaviour, that make each species distinct. A map of the geographic distribution within New Zealand, maximum length and habitat type are given for all species, and may also assist identification.

Another important aim of this book is to provide sufficient information about fishes to stimulate greater interest in them as living animals. We know what many fishes eat and how they catch their prey; we also know whether they are diurnal (active by day) or nocturnal, and often we have some idea of their growth rates and spawning seasons. Some species are hermaphrodites and individuals may spawn first as females, then later as males. Many reef fishes live in the same small area for

most of their lives, and may defend their territories. Information like this can add an extra dimension to diving, by helping to explain unusual observations.

The information given here should answer many of the questions divers commonly ask about fishes. More importantly, I hope it will stimulate curiosity and interest so that divers will actively look for various types of fish behaviour. For best results, you have to be patient and focus your attention on one species at a time in one place – but the results can be rewarding. We still know virtually nothing about some of our fishes, so there remains great scope for amateur divers to make significant new discoveries.

If you see a fish that you cannot find in this book, it may be a very rare or even new species. If you see a fish outside the geographic ranges given here, you can add to our knowledge of its distribution. Readers are invited to contact me if they make any interesting observations, or would like help in identifying fishes. If possible, send an image, a drawing or even a specimen of the fish to make the job easier. Organisations with the expertise to help are the Museum of New Zealand Te Papa Tongarewa, Auckland War Memorial Museum Tamaki Paenga Hira, National Institute of Water and Atmospheric Research (NIWA), university marine laboratories and the Ministry for Primary Industries (MPI).

DISTRIBUTION OF FISHES WITHIN NEW ZEALAND

The wide latitudinal range of New Zealand's islands greatly affects the distribution of our fishes. The average summer water temperature ranges from about 24°C at the Kermadec Islands to about 9°C at Campbell Island/Motu Ihupuku, creating a variety of marine environments. Four of our coastal species (white shark, sandfish, sea perch and hapuku) occur throughout this range of latitude, and blue moki (Kermadec Islands to Auckland Islands) comes close. But most species have much more limited distributions.

New Zealand is bathed by two major water masses – one subtropical and the other subantarctic. Subtropical water extends from the Kermadec Islands to the Snares Islands /Tini Heke, and subantarctic water occurs south of the Snares Islands (Fig. 1). The two water masses meet at the Subtropical Front, a relatively narrow boundary zone where water temperature changes by several degrees. The position of the Subtropical Front varies seasonally, but it usually passes near the Snares Islands before turning north along the east coast of the South Island, and then east towards the Chatham Islands. In the far north, the Kermadec Islands are influenced by tropical water that moves southward during summer.

These water masses influence the fish faunas found in different parts of New Zealand; the Kermadec Islands have a diverse subtropical to tropical fauna, whereas the subantarctic islands have a distinct subantarctic fauna. In mainland New

Zealand, many coastal fishes range from the Manawatāwhi/Three Kings Islands to Stewart Island/Rakiura, but they are not usually abundant throughout their range. Some species are distinctly northern (e.g. snapper, parore, red moki and kingfish) and decline in abundance towards the south; others are distinctly southern (e.g. girdled wrasse, telescopefish and sea perch) and decline in abundance towards the north. A few species, such as spotties and banded wrasse, are equally abundant throughout mainland New Zealand. Surprisingly, spotties have not been seen at the Three Kings Islands or at the Snares Islands, though banded wrasse are abundant at both.

This general pattern of fish distributions is modified by ocean currents. The offshore islands of eastern Northland and the Bay of Plenty support populations of a number of subtropical fishes that are very rare or absent elsewhere in New Zealand. The East Auckland Current meanders southeast between North Cape and East Cape (Fig. 1), bringing clear warm water (about 1–2°C warmer than on the adjacent mainland coast) to the offshore islands, and some of the mainland peninsulas and headlands (e.g. Cape Karikari, Cape Brett). The East Auckland Current transports larval and juvenile fishes to New Zealand from subtropical areas like Lord Howe Island and Norfolk Island. Many of these immigrant fishes do not survive the low water temperatures during their first winter here; some survive but are unable to reproduce, so their numbers decline steadily unless replenished by a fresh influx of larvae. Subtropical species tend to appear in New Zealand during particularly warm summers, and disappear during cold El Niño conditions. Many of the subtropical species that are rare around coastal headlands and offshore islands are abundant at the Kermadec Islands (e.g. orange wrasse, rainbowfish, toadstool grouper and gold-ribbon grouper).

The Three Kings Islands, situated northwest of Cape Reinga, are influenced by an upwelling of cold water from the deep layers of the Tasman Current, and their fish fauna is quite unusual for the latitude. Several common northern species (e.g. hiwihiwi, yellow moray and red pigfish) have not been recorded from the Three Kings, and several species more abundant in southern waters (e.g. blue moki, scarlet wrasse and common roughy) are often seen there. Girdled wrasse, which is otherwise known only from Hawke Bay southward, have been seen at the Three Kings. Other peculiarities include the absence of spotties and butterfish (the latter is replaced by the abundant blue-finned butterfish), and the presence of large numbers of crimson cleanerfish.

Many of the warm-water fishes common along the northeast coast of the North Island decline rapidly in abundance towards the south. A branch of the warm East Auckland Current flows south as the East Cape Current, but the coast between East Cape and Cook Strait also receives cold-water pulses from the northward-flowing Southland Current. Thus, many northern species do not occur south of East Cape,

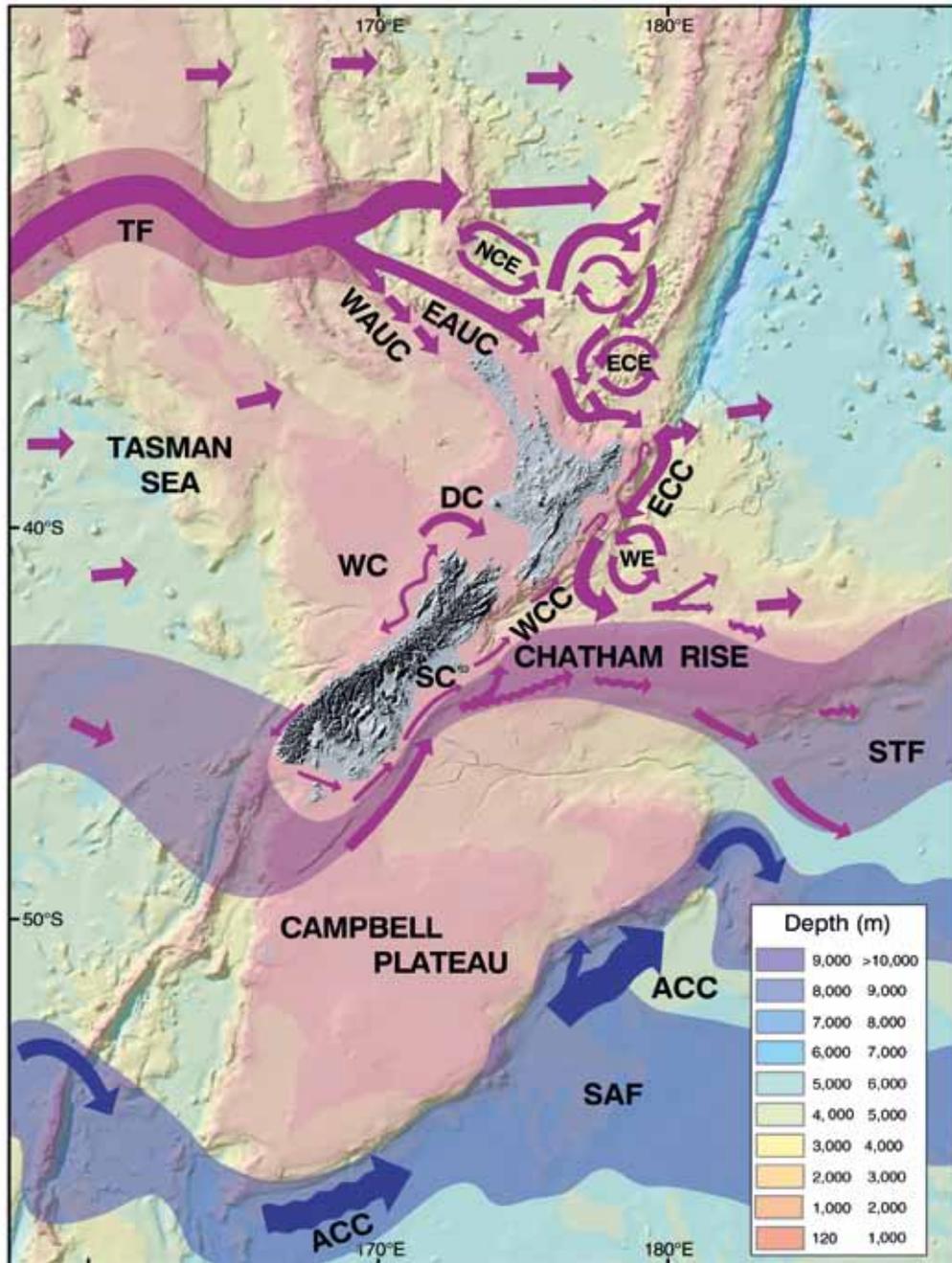


Figure 1 - Ocean currents around New Zealand (clockwise from top left): Tasman Front (TF), West Auckland Current (WAUC), East Auckland Current (EAUC), North Cape Eddy (NCE), East Cape Eddy (ECE), East Cape Current (ECC), Wairarapa Eddy (WE), Wairarapa Coastal Current (WCC), Southland Current (SC), Subtropical Front (STF), Antarctic Circumpolar Current (ACC), Subantarctic Front (SAF), Westland Current (WC), D'Urville Current (DC). Courtesy of NIWA.

though some straggle as far as Hawke Bay (e.g. yellow moray, pink maomao and Lord Howe coralfish) or Castlepoint (e.g. demoiselle). Some southern species (e.g. thornfish and southern pigfish) are not found north of East Cape, and others (e.g. trumpeter, common warehou and copper moki) straggle northward in small numbers.

The west coast of the South Island is washed by the warm Westland Current and the east coast of the South Island is washed by the cold Southland Current. The cold-water notothenid cods (Māori chief, black cod and small-scaled notothenid) occur at the Snares Islands, Otago, and even as far north as Cook Strait, but are rare in Fiordland. Conversely, sweep and goatfish have been seen in Fiordland but not off the Otago coast.

The diversity of coastal fishes is greatest in the north, where subtropical species mingle with cooler-water species. Of the 219 species described here, 86% occur along the northeast coast of the North Island, but only about 43% are known from Fiordland. The diversity of coastal fishes at the subantarctic islands is very low – about 25 species occur there.

As a consequence of the water masses and currents, the fish communities of northern and southern New Zealand are quite different. In the north, parore, silver drummer and marblefish are the main herbivores, and red moki and porae can be seen grubbing in the sediment on or near reefs for their food. In the south, butterfish and marblefish are the main herbivores, and blue moki, copper moki and tarakihi are the bottom-grubbers. Schools of trevally, koheru and jack mackerel may swirl around a northern diver, while a southern diver may be surrounded by telescopefish. At the Kermadec Islands and the subantarctic islands, fishes rare elsewhere in New Zealand may be the most abundant.

FAMILY AND SPECIES ACCOUNTS

Species accounts form the bulk of this book. The images and text will assist with the identification of fish species, and provide information about their biology and behaviour.

Families

Species of fishes are grouped by scientists into Families, members of which share many features and are thought to have a common evolutionary history. Family names always end in '-idae'. For Families that have multiple New Zealand species, features common to all species are described to avoid repetition in the species accounts. Families are arranged in taxonomic order following the online Catalog of Fishes (Eschmeyer, W. N. ed., accessed 09 Apr 2012, <http://research.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>).

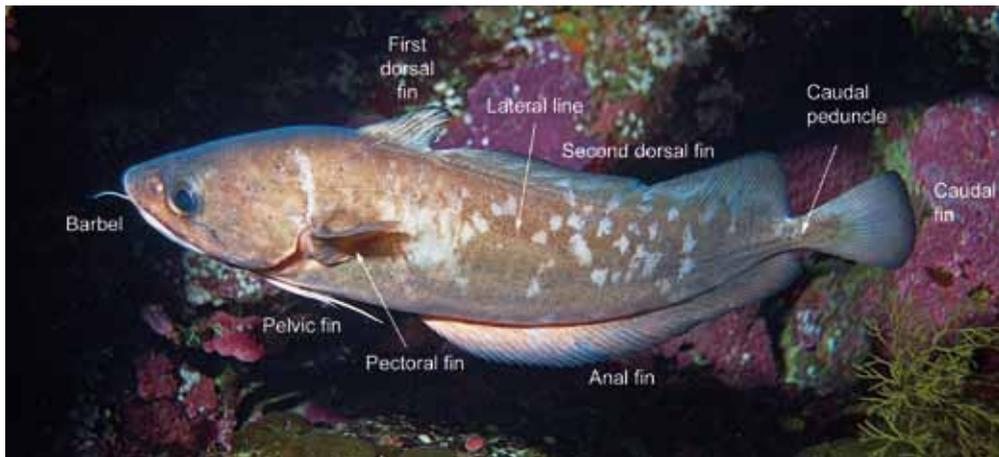


Figure 2 - Technical terms used to describe parts of a fish.

Species

The species accounts are arranged alphabetically by scientific name within each Family. Common, Māori and scientific names are provided. Common and Māori names often vary regionally. The name given first is the name most commonly used in the region where the species is most abundant. Other widely used names are also given, but no attempt has been made to include all or even most of the known names.

Scientific names are in two parts: the first is the generic name and the second is the specific name. Every species has a unique combination of generic and specific names. Species belonging to the same genus, for example blue moki and copper moki which belong to the genus *Latridopsis*, are very closely related. Red moki and painted moki, although similar to blue and copper moki, are not so closely related to them and are placed in a different genus, *Chirodactylus*.

Fish names may change through time. This is a result of closer study of the species, and comparison of specimens from New Zealand with those from overseas. If research shows that two fish which had previously been thought to be different species are in fact one species, the older of the two names takes precedence. Conversely, if one species is split into two, a new name is required for one of them. The names used here are the most recent, but they may change as our knowledge improves. Some New Zealand species have not yet been described by scientists and have no specific name, for example half-banded perch, *Hypoplectrodes* sp. ('sp.' is an abbreviation for 'species').

Identification and size

Most fish species that divers are likely to encounter can be identified by browsing through the images. The text supplements the images by describing each species' colour pattern and body shape; the main features are italicised for emphasis. In these descriptions, bands are vertical colour bars whereas stripes are horizontal bars. Patches of colour are referred to as dots (small), spots (medium-sized) or blotches (large and often diffuse or irregular in shape). If the species being described is likely to be confused with others, the differences among them are highlighted. Terms used to describe the parts of a fish are shown in Fig. 2; see also the glossary.

The approximate maximum length is given. This refers to the length from the snout to the 'V' in the tail for species that have forked tails; otherwise it is total length. Some species may grow longer than the lengths given here but most fish will be considerably smaller.

Habitat

Habitats occupied by each species are listed. Information on depth ranges is provided only where species are restricted to the upper or lower part of the depth range accessible to divers (0–50 m).

Distribution

The known distribution of each species in New Zealand waters is shown on a map. Broken lines on the maps indicate that the presence of the species in that region is likely, but unconfirmed. The Bounty and Antipodes islands are grouped under the latter name. Many fishes are rare at the extremes of their distributions, and this is noted where known. Stray fish have a habit of appearing in the most unexpected places (e.g. spotted black grouper off Westport) but the distributions given will usually help you to decide whether an identification is likely to be correct. Species that occur only in New Zealand are noted as endemic. Most non-endemic species also occur in Australian waters, including those around Lord Howe and Norfolk islands. Some species have worldwide distributions.

General

General information on the biology and behaviour of the species is provided. This may include food and feeding, swimming and schooling behaviour, night-time behaviour and colour changes, spawning and reproductive biology, growth rates, maximum known age, and whether the species is a subtropical immigrant. Information in this section may not always apply throughout New Zealand.

Glossary

Benthic Living on the seabed.

Caudal peduncle Slender part of rear body just in front of tail (caudal) fin.

Claspers A pair of rod-like structures, made of cartilage, which are attached to the pelvic fins of male sharks and rays (see p. 25). They are used for transferring sperm during mating.

Crustaceans An extremely important group of invertebrate animals which have hard, jointed, external skeletons. There are numerous marine species, including minute planktonic animals, krill, shrimps, barnacles, crabs and crayfish.

Demersal Living on or near the seabed.

Fish(es) I use the words ‘fish’ and ‘fishes’ here to include sharks, rays and bony fishes. The plural of ‘fish’ can be either ‘fish’ or ‘fishes’ in everyday language. I have used ‘fishes’ for more than one species of fish, and ‘fish’ for more than one individual fish of the same species.

Home range An area inhabited by a fish for a reasonable period of its life.

Invertebrates Animals without backbones. In the sea, this term applies to all animals except fishes, turtles, sea snakes and marine mammals (whales, dolphins and seals).

Pelagic Living in open water, away from the seabed.

Plankton Microscopic to small plants and animals that live in open water, and have limited powers of locomotion. Many fishes go through planktonic stages as eggs or larvae, but fishes that live in open water as adults are usually considered pelagic rather than planktonic.

Shellfish Invertebrates (molluscs) with a hard external shell. They fall into two main types: snails (gastropods) and clams (bivalves). Crustaceans also have a hard external shell and are sometimes called shellfish, but they are a very different group of animals.

Species A group of animals or plants capable of interbreeding, and of producing fertile offspring. (Hybrids between species are usually sterile.) The word ‘species’ is both singular and plural.

Spiracles The openings of a pair of tubes that connect the back of the head (behind the eyes) with the throat in sharks and rays (see pp. 32, 37). They are used for taking in water for breathing while the mouth is closed. They are large in rays, which spend much of their lives lying on the seabed.

Territory A home range that is actively defended, usually against other fish of the same species and sex.

Fish families

FAMILY	DESCRIPTION
MYXINIDAE Hagfishes	Medium-sized, carnivorous, demersal, eel-like fishes without true jaws, bones or fins.
HEXANCHIDAE Cowsharks	Large carnivorous sharks with 6 or 7 pairs of gills and a single dorsal fin set towards the rear of the body.
LAMNIDAE Mackerel sharks	Large carnivorous sharks with pointed snouts, spindle shaped bodies, large first dorsal and small second dorsal fins, a large lateral keel on the caudal peduncle, and a tail with almost equally sized upper and lower lobes.
SCYLIORHINIDAE Catsharks	Small, carnivorous, demersal sharks with two small dorsal fins towards the rear of the body.
TRIAKIDAE Houndsharks	Small to medium-sized sharks with two large dorsal fins that lack fin spines, an anal fin, and small lower tail lobes.
CARCHARHINIDAE Requiem or whaler sharks	Medium-sized to large sharks with the first dorsal fin large relative to the second, and a tail with an upper lobe that is 2–3 times longer than the lower lobe.
SPHYRNIDAE Hammerhead sharks	Large carnivorous sharks with a hammer-shaped head.
SQUALIDAE Spiny dogfishes	Small to medium-sized dogfishes with a strong spine in front of each dorsal fin, and lacking an anal fin.
TORPEDINIDAE Electric rays	Small to large, carnivorous rays with round to oval bodies, short broad tails, and electric organs in the wings.
RAJIDAE Skates	Medium-sized to large, carnivorous, demersal rays with an oval to diamond-shaped disk, narrow tail, and one or two dorsal fins.
DASYATIDAE Stingrays	Large, carnivorous, demersal rays with diamond-shaped bodies, no dorsal fins and barbed spines on the tail.
MYLIOBATIDAE Eagle rays	Large, carnivorous, demersal rays.
CALLORHINCHIDAE Elephantfishes	Large, carnivorous demersal fishes with a cartilaginous skeleton and a plough-shaped snout.
MURAENIDAE Moray eels	Medium-sized to large, carnivorous, demersal eels without pelvic or pectoral fins, and with dorsal fins that start in front of the small gill opening. The skin is scaleless and covered in mucus. They have several rows of sharp teeth, some of which are hinged so that they fold backwards when prey is swallowed, but lock vertically if prey tries to escape. The array of teeth, and the opening and closing of the mouth required to oxygenate the gills, make morays appear aggressive. However, they are usually shy and are dangerous only if provoked. Morays are most active at night, and are usually seen in holes during the day. Nothing is known about their reproduction.

FAMILY	DESCRIPTION
OPHICHTHIDAE Snake eels and worm eels	Small to large, carnivorous, demersal eels that burrow in mud or sand.
CONGRIDAE Conger eels	Medium-sized to large, carnivorous, demersal eels with pectoral fins but no pelvic fins. The dorsal fin starts above or just behind the pectoral fin, and the skin is scaleless. They can be confused with freshwater eels (Family Anguillidae), which are occasionally seen in the sea, but the dorsal fin starts well behind the pectoral fin in freshwater eels.
GONORYNCHIDAE Sand fishes	Elongated, carnivorous, eel-like fishes with a pointed snout and undershot jaws.
SYNODONTIDAE Lizardfishes	Small, carnivorous, demersal fishes usually seen propped up on the bottom on their pelvic fins, or half-buried in sand. Their heads are lizard-like and their snouts are pointed.
MORIDAE Morid cods	Small to large, carnivorous, demersal fishes.
ANTENNARIIDAE Frogfishes	Small, squat, carnivorous fishes with a 'fishing lure' above the mouth which acts as bait to attract prey.
GOBIESOCIDAE Clingfishes	Small, carnivorous, demersal fishes that cling to the substrate (including seaweed fronds) using a suction pad on the belly derived from modified pectoral and pelvic fins.
HEMIRAMPHIDAE Halfbeaks	Medium-sized, surface-schooling fishes with very long lower jaws.
TRACHICHTHYIDAE Roughies	Small to large, planktivorous, demersal or midwater fishes with large bony heads and large eyes. Some species have a row of bony scales along the belly.
BERYCIDAE Alfonsinos	Medium-sized to large, planktivorous, demersal or midwater fishes.
ZEIDAE Dories	Small to medium-sized, carnivorous, demersal or midwater fishes with deep, compressed bodies and highly protrusible jaws.
AULOSTOMIDAE Trumpetfishes	Large, elongated, slender, carnivorous fishes with a tubular snout.
FISTULARIIDAE Flutemouths	Large, carnivorous, demersal fishes with extremely elongated bodies and tubular snouts.
SYNGNATHIDAE Sea horses and pipefishes	Small to medium-sized, carnivorous, demersal fishes with an external covering of ridged bony plates. Swimming ability is limited, and many species have a prehensile tail for gripping seaweed.
SEBASTIDAE Rockfishes	Small to large, carnivorous fishes, many of which have internal fertilisation and give birth to live young.
NEOSEBASTIDAE Gurnard perches	Small to medium-sized, carnivorous fishes.

FAMILY	DESCRIPTION
SCORPAENIDAE Scorpionfishes	Small to medium-sized, carnivorous, demersal fishes with large spiny heads. Most species are sedentary, well camouflaged, and have venomous dorsal fin spines. Scorpionfishes fertilise their eggs internally, and most give birth to live young.
CONGIPODIDAE Pigfishes	Small to medium-sized, carnivorous, demersal fishes with long snouts and high dorsal fins.
TRIGLIDAE Gurnards	Small to medium-sized, carnivorous, demersal fishes with a covering of strong bony plates on the head. The first 3 rays of their pectoral fins are modified as sensory feelers, and are also used for 'walking'. The rest of the pectoral fin forms a large, brightly coloured fan.
PSYCHROLUTIDAE Toadfishes	Small to medium, carnivorous, demersal fishes.
POLYPRIONIDAE Wreckfishes	Large, carnivorous, demersal fishes.
SERRANIDAE Groupers	Small to large, carnivorous fishes ranging in behaviour from demersal predators to schooling planktivores. Many (possibly all) groupers are hermaphrodites, having both male and female gonad tissue at some stage of their lives.
CALLANTHIIDAE Goldies	Small to medium-sized, planktivorous, schooling fishes.
PLESIOPIDAE Longfins	Small to medium-sized, cryptic, carnivorous, demersal fishes.
APOGONIDAE Cardinalfishes	Small, carnivorous or planktivorous, demersal fishes that typically aggregate in caves or under overhangs by day, and emerge to feed at night.
CARANGIDAE Jacks	Medium-sized to large, planktivorous or carnivorous, pelagic species.
ARRIPIDAE Kahawai	Medium-sized to large, planktivorous and carnivorous, schooling fishes.
SPARIDAE Breams and porgies	Medium-sized to large, carnivorous, mainly demersal fishes.
MULLIDAE Goatfishes	Small to medium-sized, carnivorous, demersal fishes with a pair of sensory barbels under the chin.
PEMPHERIDAE Bullseyes	Small, planktivorous, demersal and midwater fishes with large eyes.
KYPHOSIDAE Drummers	Medium-sized to large, herbivorous reef fishes.
GIRELLIDAE Nibblers	Medium-sized to large, omnivorous fishes.

FAMILY	DESCRIPTION
MICROCANTHIDAE Mados	Small to medium-sized, carnivorous, demersal fishes.
SCORPIDAE Stonebreems	Small to medium-sized, planktivorous, schooling fishes.
CHAETODONTIDAE Butterflyfishes	Small to medium-sized, carnivorous, demersal fishes.
PENTACEROTIDAE Boarfishes	Medium-sized to large, carnivorous, demersal fishes with large bony heads. Body and dorsal fin shapes usually change with age; in particular, the snout may elongate greatly.
CIRRHITIDAE Hawkfishes	Small, carnivorous, demersal fishes that spend most of their time perched on rocks, corals and sea fans.
CHIRONEMIDAE Kelpfishes	Small to medium, carnivorous, demersal fishes.
APLODACTYLIDAE Marblefishes	Medium-sized to large, herbivorous, demersal fishes.
LATRIDAE Morwongs and trumpeters	Medium-sized to large, carnivorous, demersal or pelagic fishes. Most species have thick fleshy lips which they seal around the substrate when they are feeding. Small invertebrates and sediment are sucked into the mouth, and sand and mud are ejected out of the gills before the food is crushed and swallowed. Morwongs have one or more elongated pectoral fin rays; these extend only slightly beyond the fin edge in some species, but are very long in tarakihi and porae.
MUGILIDAE Mulletts	Small to medium-sized, schooling fishes which eat plankton and organic matter in seabed sediments.
POMACENTRIDAE Damselfishes	Small to medium-sized, mainly planktivorous or herbivorous reef fishes. Many species lay eggs in nests on the bottom, where they are guarded by the males until they hatch.
LABRIDAE Wrasses and parrotfishes	Small to large, carnivorous or herbivorous, demersal fishes which swim with a sculling action of their pectoral fins, and use their tails only for rapid swimming. Wrasses pick invertebrates from seaweed or rocks with their large canine teeth. The juveniles of some species act as cleanerfish, removing parasites from the bodies of larger fishes. Most wrasses develop first into females when they mature, and some eventually change sex to become males. Males often defend territories against each other and attract and defend harems of females, so females generally outnumber males. When a male dies, a large female changes sex and takes over his territory. Wrasses usually have two or three distinct colour patterns: male, female and sometimes juvenile. Intermediate stages are rarely seen because the transitions between colour phases are rapid.
BOVICTIDAE Thornfishes	Small, demersal, carnivorous fishes.
NOTOTHENIIDAE Antarctic cods	Medium-sized to large, carnivorous, mainly demersal fishes with large flattened heads. Some species have pelagic juveniles.

FAMILY	DESCRIPTION
URANOSCOPIDAE Armourhead stargazers	Medium-sized to large, carnivorous, demersal fishes with flat bony heads, eyes on top of the head, and upward-pointing mouths.
CREEDIIDAE Sandburrowers	Small, slender, carnivorous, sand-dwelling fishes.
PERCOPHIDAE Opalfishes	Small, carnivorous, demersal fishes.
PINGUIPEDIDAE Weevers	Small to large, carnivorous, demersal fishes.
TRIPTERYGIIDAE Triplefins	Small, carnivorous, demersal fishes (except for the schooling oblique-swimming triplefin) that have three dorsal fins. Males and females usually have similar colour patterns, but during spawning, males of most species adopt distinctive colours. Triplefins lay eggs on the bottom, usually on a sloping rock surface. Each nest, which is guarded by the male against predators, may include eggs laid by several females. The male fans the eggs with his fins to aerate them and prevent silt accumulating. After hatching, the larvae become planktonic for 40–115 days before settling to the bottom at a length of 1.5–2 cm. Most triplefins are short-lived, reaching a maximum age of about 3 years. Many species are home-ranging, and males defend territories, particularly during the spawning season. They are usually seen perched on their pectoral and pelvic fins. When they swim, they move in short hops.
CLINIDAE Weedfishes	Small, carnivorous, seaweed-dwelling fishes. Rarely seen because of their excellent camouflage.
BLENNIIDAE Blennies	Small, carnivorous, demersal fishes, usually with 2 or more feathery tentacles on the top of the head.
ELEOTRIDAE Gudgeons	Small, carnivorous fishes with 2 dorsal fins.
GOBIIDAE Gobies	Small, carnivorous, demersal fishes.
ZANCLIDAE Moorish idol	Medium-sized, omnivorous fish (only one species in family), similar to surgeonfishes but lacking a spine on the caudal peduncle.
ACANTHURIDAE Surgeonfishes	Medium-sized to large, herbivorous or planktivorous, demersal fishes, with sharp spines or bony plates on the caudal peduncle.
SCOMBRIDAE Tunas and mackerels	Small to large, carnivorous, schooling fishes with 2 dorsal fins that fold into grooves and small finlets behind the second dorsal and anal fins.
CENTROLOPHIDAE Warehou and butterfishes	Medium-sized to large, planktivorous, mainly pelagic fishes.

FAMILY	DESCRIPTION
BOTHIDAE Left-eyed flounders	Small to large, carnivorous, demersal fishes with flattened bodies and both eyes on the left side. Larvae are symmetrical, with one eye on each side, and they swim upright. As they transform into juveniles and settle to the bottom, the right eye migrates to the left side of the head, and the right side becomes the under-side. In most species, the under-side is pale and the upper-side adopts the colour and pattern of the surrounding seabed.
PLEURONECTIDAE Right-eyed flounders	Small to large, carnivorous, demersal fishes with flattened bodies and both eyes on the right side.
SOLEIDAE Soles	Small to medium-sized, carnivorous, demersal fishes with flattened bodies and both eyes on the right side. Differ from the right-eyed flounders (Family Pleuronectidae) in having the cheek (pre-operculum margin) covered by skin and scales.
MONACANTHIDAE Leatherjackets	Small to medium-sized, carnivorous, demersal or pelagic fishes with diamond-shaped bodies, strong first dorsal spines and small mouths.
OSTRACIIDAE Boxfishes	Small, omnivorous fishes with bodies mostly encased in a rigid bony carapace.
TETRAODONTIDAE Pufferfishes	Small to medium-sized, carnivorous fishes with a variety of lifestyles. They have a beak of fused teeth, and can inflate themselves with water for protection from predators. All species are poisonous.
DIODONTIDAE Porcupinefishes	Medium-sized to large, carnivorous fishes with a variety of lifestyles. They have numerous spines embedded in the skin; these become erect when they inflate themselves with water as a protection against predators.

Species accounts



HAGFISH BLIND EEL, TUERE *Eptatretus cirrhatus*

FAMILY MYXINIDAE – Hagfishes



Length 83 cm

Body cylindrical with paddle-like tail. Six barbels around mouth. Pink-grey (but appears blue-grey underwater), variably spotted with black and white. No eyes. Inhabits reefs and open bottom.

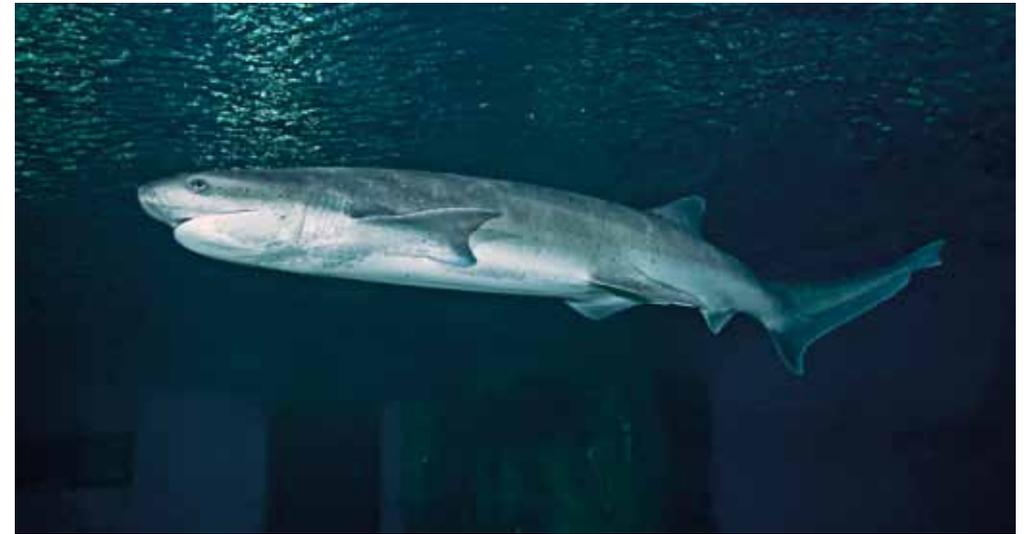
Hagfish prey on dead or live fish, which they locate by smell and with their sensory barbels. They may catch prey at night, when many reef fish rest on the bottom. Hagfish suck onto their prey with their circular mouths, and rasp through the victim's flesh with their tooth-studded tongues. They escape predation themselves by exuding large quantities of mucus from a row of glands along each side of the body. Hagfish are probably hermaphrodites, maturing first as males and then changing sex to become females. They lay eggs enclosed in yellow-brown leathery cases.



also: Chatham, Snares islands

BROAD-NOSE SEVENGILL SHARK TUATINI

Notorynchus cepedianus FAMILY HEXANCHIDAE – Cowsharks



Length 300 cm. Photo QB.

Grey or brown above with numerous small black spots and often white spots, mainly white below. Body slender with a single dorsal fin near rear of body, and short lower tail lobe. 7 pairs of gill slits, broad blunt head. Ranges from shallow bays and muddy harbours to depths over 100 m on the continental shelf; usually occurs near the seabed but also seen in midwater.

Broad-nose sevengill sharks are mobile and inquisitive, investigating objects (including divers and surfers) by bumping them with their snouts – they are fearless and if they persist, it is best to leave the water. They have attacked humans in New Zealand. Sevengill sharks feed on a wide variety of prey including octopus, crustaceans, fish, other sharks, carrion, seals and dolphins. They typically hunt and attack by stealth, or in dirty or dark water, but pack hunting of seals has been reported. They have saw-tooth lower teeth that are capable of slicing up large prey. Sevengill sharks tend to migrate into shallow coastal bays and estuaries during spring–summer and depart to open coasts in winter. Some sharks have been tracked for over 1000 km, but tagged animals regularly return to the same locations in subsequent years. Females give birth in shallow bays in spring to live young about 35–45 cm in length. The gestation period is probably about 1 year, followed by a resting year, and litter sizes may be up to 104. Small sharks are rarely seen. Males mature at about 150–160 cm long and 4–5 years old, and females at about 220–250 cm and 11–21 years. Males grow to only about 230 cm, and females considerably larger. They may live for up to 50 years.



also: Three Kings, Chatham, Snares islands

WHITE SHARK MAKŌ TANIWHA, MANGŌ TANIWHA,
MANGŌ UREROA *Carcharodon carcharias* FAMILY LAMNIDAE – Mackerel sharks



Length 600 cm. Photo RA.

Large spindle-shaped body with pointed snout. Near-symmetrical tail, large first dorsal and very small second dorsal fin. Grey above and white below with a sharp demarcation line between the two colours. Large gills. Wide habitat range from shallow bays and muddy harbours to rocky and coral reefs and the open ocean. Ranges from the surf zone and shallow estuaries to depths greater than 1200 m.

White sharks are powerful, mobile swimmers that travel widely in search of prey. They have been responsible for more attacks on humans than any other shark, and are potentially extremely dangerous when encountered underwater. Juveniles smaller than about 180 cm in length occur mainly in shallow coastal waters of the northern North Island, especially in the large harbours of the Auckland region, where they feed mainly on fish. As they grow, they begin to rove widely, and feed on increasingly larger animals. By around 300 cm length, they may feed on large marine mammals such as fur seals and dolphins, and stranded whales as well as fish and squid. White sharks appear to be most abundant around the southern South Island, Stewart Island/Rakiura and the Chatham Islands, possibly because of the large fur seal colonies there. Sharks tagged at Chatham and Stewart islands in autumn remain there in shallow water for up to a few months before departing in winter–spring on migrations of 2500–3000 km to tropical waters from the Great Barrier Reef in Australia to Tonga. During these migrations, the sharks make periodic deep dives to over 800 m (maximum recorded: 1200 m), and on arrival in the tropics, they spend considerable time deeper than 200 m, presumably hunting prey.



The sharks then return to near the New Zealand tagging locations in summer. White sharks are born at a large size (120–150 cm and 12–32 kg). Litter sizes are 2–10, possibly up to 14, but females probably give birth only every second year, so the reproductive rate is low. The young grow rapidly, reaching 300 cm in length in about 4 years and 500 cm in about 15 years. Longevity is not known because the largest animals have not been aged, but may be around 30–40 years. Males mature at about 360 cm and females at 450–500 cm. Females grow larger than males, which rarely exceed 550 cm.

CARPET SHARK PEKAPEKA *Cephaloscyllium isabellum*

FAMILY SCYLIIORHINIDAE – Catsharks



Length 103 cm. Photo MW.

Light brown with irregular, dark brown saddles, spots and blotches. Most abundant in the south. Endemic. Reefs and open bottom.

Carpet sharks are nocturnal. During the day, they rest in caves or under overhangs, where their camouflage makes them almost invisible. At night, they roam widely in search of fish, krill, crabs, crayfish, octopus and squid, which they catch and hold with their large mouths and sharp teeth. Carpet sharks are usually sluggish and are not dangerous, but their teeth deserve respect. As a defence against predators, they inflate their stomachs with air or water, greatly increasing their girth. Carpet sharks lay eggs enclosed in tough leathery cases, about 12 x 4 cm. The egg cases, which are laid in pairs, are yellow or brown and have spiral tendrils at each corner for attaching to seaweed, sea fans or black coral. Eggs are fertilised internally by sperm transferred to the female by the male's claspers (visible in the photograph, behind the pelvic fins). Young carpet sharks are about 16 cm long when they hatch from the eggs. Males mature at about 60 cm and females at 80 cm. Females grow larger than males.



SCHOOL SHARK TUPERE, MAKOHUARAU *Galeorhinus galeus*

FAMILY TRIAKIDAE – Houndsharks



Length 180 cm.

Slender grey body with a long snout. Large first dorsal and small second dorsal fin, both lacking fin spines, and an enlarged flag-like tip to the upper tail lobe. Pointed teeth in upper and lower jaws. Distinguished from other sharks by its small size, tooth shape, colour, snout length and tail shape. Inhabits shallow coastal waters, including estuaries, harbours and surf beaches, the continental shelf, and the continental slope to depths greater than 500 m; also migrates across open ocean.

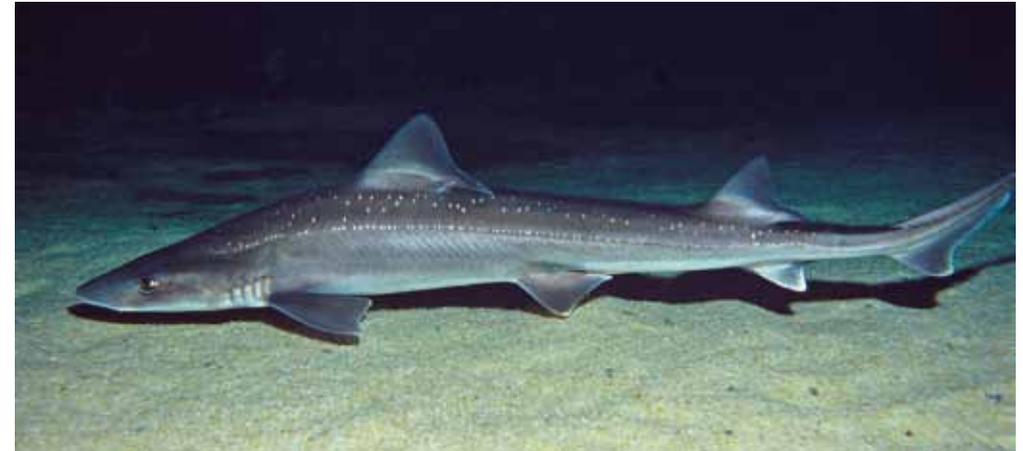
School sharks are abundant, mobile and rove around in small schools. They mainly eat small fish and squid, but also catch fast-swimming tunas. Tagged animals have moved extensively throughout New Zealand, with the distance travelled increasing over time. After more than 5 years at liberty, 8% of males and 19% of females had migrated across the Tasman Sea to Australia, covering distances of 1730–4940 km. Australian school sharks also migrate to New Zealand. School sharks move into shallow coastal waters in spring, and the females give birth to up to 54 (average 30) live young about 30 cm long. The gestation period is about 12 months, and studies in Australia and Brazil suggest that females give birth only every 3 years. Newborn young remain in shallow waters, particularly along sandy surf beaches, for 6–12 months before progressively moving into deeper water. Both sexes grow to about 90 cm after 5 years, and 120 cm after 10 years. Male school sharks mature at 125–135 cm in length and 12–17 years old, and females at 135–140 cm and 13–15 years. Recapture of a tagged Australian school shark after 42 years at liberty indicates that they may live for about 60 years. Unusually, both male and female school sharks reach a similar maximum length.



also: Three Kings, Chatham, Snares, Auckland, Campbell islands

RIG SPOTTED DOGFISH, SPOTTED SMOOTHHOUND, PIOKE, MAKŌ, MANGŌ *Mustelus lenticulatus*

FAMILY TRIAKIDAE – Houndsharks



Length 151 cm.

Body slender, copper-brown to grey above, white below, with numerous small white dots along the lateral line and sprinkled over the upper body. Two large dorsal fins, both lacking fin spines, and an anal fin. Teeth flat and grouped like paving stones to form crushing plates. Distinguished from other sharks by its small size, tooth shape, colour, snout length and tail shape (no flag-like tip on upper lobe). Endemic. Occurs in shallow coastal waters, especially estuaries and harbours, the continental shelf, and the continental slope to depths of about 400 m. Most abundant in water shallower than 50 m.

Rig are abundant in shallow coastal waters during spring–summer. They usually occur in small schools segregated by size and sex. Rig feed mainly on invertebrates that burrow in the mud and sand, particularly crabs, hermit crabs and worms, but they also eat shrimps, crayfish (probably found while migrating over sand), octopus and squid. Most food is swallowed whole. Tagging has shown that females tend to move further than males, with distances up to 1159 km being recorded. However most tagged rig moved less than 100 km. Females give birth to up to 37 (average 11) live young about 25–30 cm long in shallow coastal waters during spring. They then mate with males which also aggregate inshore, and depart for deeper water; males remain inshore during early summer before also moving into deeper water. The autumn–winter habitat of adult rig is unknown. Newborn young remain in estuaries and shallow harbours throughout summer and early autumn. They grow rapidly, reaching a length of 45–55 cm by late autumn, when they depart for the open coast as water temperatures drop. Males mature at about 85 cm long and 5–6 years old, whereas females mature at about 100 cm and 7–8 years. Rig have been aged to a maximum of 12 years, but a 91-cm long male, recaptured almost 14 years after tagging, was estimated to be almost 20 years old at recapture. Males are smaller than females, reaching a maximum length of 126 cm.



also: Three Kings, Chatham, Snares islands

BRONZE WHALER HOROPEKAPEKA *Carcharhinus brachyurus*

FAMILY CARCHARHINIDAE – Requiem or whaler sharks



Length 295 cm. Photo KC.

Grey, brown or bronze above, white below. Large first dorsal and pectoral fins, long upper tail lobe. Difficult to distinguish from Galapagos shark (p. 29), but is heavier bodied and has a less erect first dorsal fin. Penetrates farthest south in summer. Occupies all habitats in shallow coastal waters during summer – reefs, bays, estuaries and surf beaches. Possibly pelagic or offshore in winter.

Bronze whalers are opportunistic predators and will eat any live or dead animal material. They eat mainly fish, preferring schooling species (kahawai, pilchards, yellow-eyed mullet) and stingrays. Large prey are sliced up by the small, serrated teeth, assisted by vigorous head shaking. Bronze whalers rob fish from spearfishers, and although not usually aggressive towards divers they are potentially dangerous. Bronze whalers mature at 220–250 cm long, and females bear up to 23 young 60–70 cm long after a gestation period of about 1 year. As in most sharks and rays, the eggs are fertilised internally; sperm are transferred to the female by the male's claspers.



GALAPAGOS SHARK *Carcharhinus galapagensis*

FAMILY CARCHARHINIDAE – Requiem or whaler sharks



Length at least 300 cm.

Grey above, white below. Large first dorsal and pectoral fins, long upper tail lobe. Fin tips and margins dusky or unmarked. Difficult to distinguish from bronze whaler (p. 28), but is more slender, with a more erect first dorsal fin. Abundant at the Kermadec Islands. Ranges from shallow reefs to the edge of the continental shelf, usually associated with islands.

Juveniles aggregate near the edges of reefs at dusk, and presumably feed on reef fishes in the evening and at night. They mostly retreat to soft bottom habitats or open water during the day. Squid, octopus, crustaceans and pelagic fishes may also be eaten. Galapagos sharks can be inquisitive and aggressive, and so are potentially dangerous to humans. Females produce 6–16 live young about 60–80 cm long. Males mature at 210–230 cm long and females at about 250 cm.

