thermore, the steep walls of the fiords cast long shadows, again reducing light levels. The low salinities in the top 5 metres restrict this zone to organisms which can live in brackish water for long periods, such as green sea lettuce, blue mussels and barnacles.

In contrast to the sparse life of the deep muddy and inter-tidal habitats, the steep rock walls between 5 and 40 metres support extremely diverse communities, and there is a marked change in species composition with depth, as shown in the accompanying diagram.

Below the light-absorbing low salinity layer, the seawater is still, very clear and relatively warm with annual temperatures of 11–15 °C, the smallest range anywhere on the New Zealand coast. Between 5 and 15 metres deep the rock walls are completely encrusted with tubeworms, sponges, soft corals, colonial sea squirts and file shells, so abundant are the nutrients here. A variety of starfish, urchins, sea snails and colourful sea slugs prey upon these immobile, attached species.

Below 15 m there is perpetual gloom and here the tubeworms are replaced by large sponges, sea squirts, red and pink hydrocorals, soft corals, black coral, horny coral, solitary corals and brachiopods. Even the few patches that appear superficially as bare rock have a thin covering of encrusting pink algal "paint". Fish are abundant; over 50 species have so far been recorded in the top 40 m.

The communities deeper than 40 m on these rock walls have not been examined intensively because they are beyond the range of scuba. However, remote television cameras lowered to around 100 m show colonies of black coral, sponges, and brachiopods, although there appears to be less diversity at these depths.

Unique marine life

The marine communities in the fiords are unique. This is mainly due to a large number of species that are very common there, but generally considered as rare elsewhere in New Zealand, or which live in much deeper water elsewhere. The perpetual gloom beneath the low-salinity layer and the shading caused by the surrounding mountains simulates the conditions usually found at far greater depths in the open ocean and allows species that normally live in deep water to colonise these shallow areas without competition from the faster growing seaweeds, while the lack of wave action permits delicate, branching species to become established without being damaged.

Several animals that had been collected previously only from the continental shelf in depths between 100 and 200 m have been found quite commonly in water less than 30 m deep throughout the fiords. These include the saucer sponge, shrimps, red and pink hydrocorals, starfish, feather stars, sea pens, brachiopods and fish such as the orange-lined perch and spiny sea dragon. Other species, such as the large tube anemone, black coral, and horny coral which have been reported within diving depths only occasionally elsewhere (usually deeper than 30 m) are abundant from 6 m in the fiords.

Since the fiord waters below the low salinity layer have narrow seasonal fluctuations, species which generally occur in either warm or cool water have become established. Warm water species, those considered more at home in water around the northern half of the North Island, include molluscs (for example the large trumpet shell and several sea slugs), and fish (for example the blue-dot triplefin). Cold water species include copper moki, trumpeter, banded wrasse and pigfish. There are also species of fish, sea slugs, snails, anemones, and sponges which have been collected in the fiords for the first time and are new to science.

Living fossils

The southern fiords are now recognised as supporting the largest populations in the world of several brachiopod species. These animals, commonly called lamp shells, superficially resemble bivalved molluscs since they have two shells hinged together. The soft parts of the animal are, however, entirely different. They attach to hard substrates by a pedicle, a horny, stalked structure that protrudes through a hole in the top shell, and they feed with a spiral, ciliated structure called a lophophore.

Brachiopods are known as fossils from rocks dated around 600 million years old and were once the dominant animals in the world's seas, but they are not common today. The presence of large populations of at least five species in shallow water throughout the fiords provides a unique opportunity for scientific study of these living fossils. Brachiopods are the underwater equivalent of Fiordland's best known land-dwelling representative of a former age, the takahe, and they deserve the same study.

Black coral

There are several animals with economic potential living in the fiords, including rock lobsters, scallops, blue cod, and paua. The potential economic rewards from harvesting, polishing and fashioning the skeleton of black coral into jewellery however probably exceed all others. The living population of black coral in water less than 35 m deep in the fiords has been estimated at over 7.5 million colonies, although most are too small to harvest — the largest resource of black coral known in the world. Money can be made from this without harvesting, however. Research is showing that the colonies are extremely slow growing so rather than risk over-fishing, the living colonies may be worth even more as a potential diving/recreational/tourist resource.

Protection needed

At present there is no legislation preserving the underwater habitat of the southern fiords; Fiordland National Park stops at high-water mark. Only the black coral is protected by Fisheries legislation.

The underwater ecology of the fiords is finely balanced by the unique set of environmental conditions above water in the surrounding mountains. Interference to this balance could potentially have disastrous effects; for example, should freshwater be prevented from running through dense forest on its way to the fiords, the major source of nutrient input would be lost. Similarly, if the bush and undergrowth is removed, sediment would be brought into the fiords by the freshwater runoff and smother the slow-growing, immobile marine organisms attached to the rock walls. If the dark-stained low-salinity layer with its important light-absorbing properties is interfered with, then light may reach the marine communities encouraging seaweed growth, eventually displacing the deep-water animals.

The fiords may seem isolated and under little threat but recently there have been proposals to export freshwater, using super-tankers which possibly could mix the low and high salinity layers, and there have been requests to harvest black coral colonies. Even too many deer in the surrounding mountains could increase erosion and have some effect. Fortuitously, the establishment and management of the Fiordland National Park above water has probably also been beneficial to the survival of the marine communities by ensuring that modifications to the vegetation are minimal.

Fiord inclusion essential

In a recent issue of *Forest and Bird* (Vol. 16, No. 4, Nov. 1985) an excellent article on the case for south-west New Zealand to be included as a World Heritage area mentions many of the geological and biological wonders of the area, but nothing is said about the fiords themselves and their unique attributes. It is essential that the fiords are included in any submission, but we must also have due regard for the rock lobster fishermen who rely on the area for their living without significantly modifying its existing natural beauty.

As the marine wonders of the southern fiords become better known, more people will join in the quest to protect the huge 300-year-old black coral colonies, the tube-anemones, sea pens, brachiopods and unusual fishes. Should it proceed, a recent proposal to build an underwater viewing platform in Milford Sound will enable non-divers to gain an impression of the underwater world of the fiords. The marine communities with their living fossils and deep-water representatives are just as unique in the world as the land communities of Fiordland which harbour species such as the takahe and kakapo. Surely the marine environment is worthy of the same status and protection.

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