



Tube anemone (*Certianthus* sp). Very common throughout the fiords in sandy pockets below 6 m, but very rare elsewhere in New Zealand.



A 1 metre tall black coral colony supporting several perching snake stars. The largest population of the protected black coral in the world occurs in shallow water in the fiords. When living, black coral appears white as the small white polyps obscure the dense black skeleton beneath. Depth 15 m.

The spiral feeding organ (lophophore) of the brachiopod after the top shell has been removed. Commonly known as lamp shells, these living fossils used to be the world's dominant marine animal and have been in existence for at least 600 million years.

are often thought of merely as the long ribbons of water which separate the more familiar mountains. Many visitors to the area return with memories of constant heavy rain, waterfalls, swarms of sandflies and dense forest from the snowline to the water's edge. A few may wonder at the incredible forces generated by the glaciers as they cut through the mountains on their way to the sea; but until recently very few thought about the marine life in the fiords themselves, apart from when they may have been seals, dolphins and penguins during a launch trip.

The land and climate are important in understanding the marine life beneath the dark waters of the fiords; in few other places do these mesh together so intricately to produce such unique environmental conditions that here support one of the richest and most unusual marine ecosystems in the world.

### Towering mountains

The New Zealand fiords are the drowned

lower reaches of valleys which were last occupied by glaciers approximately 20,000 years ago. Between the sheer sides of towering mountains rising to heights of 2,000 metres or more, the sea now penetrates on average 16 km inland. Beneath the water these steep mountains continue down as rock walls until they reach the mud-covered flat floors of the fiords. The water depths range from around 100 m to more than 450 m in the deeper basins. A shallow ridge near the fiord entrance marks the seaward extend of the former glacier; this is called a sill, and it partially cuts off the water in the fiord from the sea.

Freshwater flows into the fiords continuously in prodigious amounts as a result of rainfall (almost 7,000 mm a year) and the spring-summer melt, but as it rushes down through the surrounding dense bush it rarely washes away the soil since the bush has a thick carpet of mosses and ferns. With little erosion, sediment is not carried into the fiords to smother the plants and animals there. Rather, the

freshwater picks up large quantities of leaves and other plant detritus as well as dissolved organic material from the undergrowth, carrying this down into the fiords to provide nutrients to plants and animals.

The dissolved organic material stains the freshwater and by the time it enters the fiord, it is the colour of weak tea, or pale ale, coloured but not cloudy. Because this freshwater is less dense than the seawater in the fiords, it sits as a less salty surface layer which is normally around 3 m thick. Even during periods of strong winds this layer does not fully mix with the higher-salinity seawater below since large waves or swells cannot form in the enclosed fiords. The low salinity layer continually flows seaward over the top of the seawater, but as it moves it entraps and carries some higher salinity water from below, developing a two-layered circulation with high-salinity seawater flowing into the fiord below an outflowing low-salinity layer. This circulation is, however, confined to the upper 20-40 m.