

drifting sand and constantly struggle against burial and undermining. Plants and animals found here must also tolerate the sand's high temperatures, high reflectivity, low nutrient status and low capacity to hold water. If this is not enough, the plant species nearest the coast are periodically inundated by seawater during spring tides and storm surges.

## Dune zonation

A typical dune system has a landward sequence of zones which runs parallel to the coastline. The strand line just above the high tide mark is the first of these zones. It is characterized by a collection of washed up flotsam including driftwood and seaweed. Directly behind the strand is the foredune zone. Here active dune building is occurring. Behind this is a complex system of reardunes which may exceed 100 metres in height and extend up to 4–5 kilometres inland.

Interspaced throughout the reardune zone are numerous deflation hollows where sand has been removed down to the watertable. Permanent lakelets may occur here.

On the more stable reardunes, vegetation may eventually be succeeded by coastal forest such as the dune podocarp forests of south Westland, the forests at the mouth of the Tahakopa river in the Catlins, and kauri forest on consolidated dunes in Waipoua State Forest.

A variety of habitats with their associated fauna and flora adjoin dune systems. These range from coastal turf meadows, estuaries and lagoons, to

swamps (eg Kaimaumau, Northland), red tussock grassland (eg Mason Bay, Stewart Island) and coastal scrub and forest.

## Native plants of the dunes

The most widespread and successful plants of our natural dunelands are pingao (*Desmoschoenus spiralis*) an endemic sedge and spinifex (*S. hirsutus*) a grass also native to Australia.

Pingao is found from North Cape to Stewart and Chatham Islands. It's tufted shoots of arched orange-green leaves makes it the most colourful plant of the dunes. Often it can be seen growing sinuously down a dune face.

Spinifex occurs throughout the North Island and across the top of the South Island. Its slender network of stems criss-cross the dunes, every so often throwing up a sward of silver-haired leaves. Its flowers develop into starlike clusters of ripe fruit which are often seen dispersing their seeds as they blow along the foreshore.

Both pingao and *Spinifex* are true sand binding and dune building plants. Airborne sand is trapped amongst their spreading shoots. They grow upwards so as not to be buried as sand gradually accumulates around them. By this process a dune eventually builds up.

Sand sedge, *Carex pumila* creates dunes in a similar manner although not nearly as effectively. It spreads an open carpet over the moist sand of the strand zone and deflation hollows.

Sand convolvulus, *Calystegia solanella*, with its glossy heart-shaped leaves, and purple-pink trumpet flowers is found mainly on the foredune.

There are four other special plants of the foredune and strand line which, although widely scattered throughout New Zealand, have become quite rare. These are the shore milkweed, *Euphorbia glauca*, which has blue-green fleshy leaves and clusters of red flowers; *Pimelea arenaria*, the sand daphne; *Poa triodioides*, a sand tussock; and *Theleophyton billardieri*, a small mealy-leaved herb related to fathen.

Two ranunculi also occur on the sandy shore: *R. recens*, a small, hairy-leaved buttercup; and *R. acaulis*, which replants itself by turning the ripe fruit downwards into the sand.

One of the rarest plants in the world, *Gunnera hamiltonii*, of which there is one known wild specimen (a male) spread over



**A marram grass control programme is underway to protect the natural dunes of Fiordland National Park.**

Photo: M. T. Sykes



**Pingao, *Desmoschoenus spiralis* traps drifting sand to form dunes — Manukau Heads, Auckland.**

Photo: G. Loh



**Sand convolvulus *Calystegia solanella* is a common native plant on the foredune — Anapai Beach, Abel Tasman National Park.**

Photo: G. McSweeney

about 30 metres occurs at Mason Bay on Stewart Island at the interface of the reardunes and red tussock grassland and coastal forest.

Sand plants of the more stable rear dunes include the low growing, wiry-stemmed sand coprosma (*Coprosma acerosa*), the densely tangled pohuehue (*Meuhlenbeckia complexa*), and the heady smelling tauhinu (*Cassinia leptophylla*). A curious prostrate broom (*Carmichaelia appressa*) also occurs on semi-stable dunes, and is totally confined to Kaitorete Spit, near Lake Ellesmere, Canterbury.

