# The Cliff Dwellers- Poor Knights Inverts

**Phylum by phylum Wade Doak describes the main groups of invertebrate inhabitants of the Poor Knights Islands, a picture which is a blue print for understanding marine life on undersea cliffs anywhere in the world. An Australian college lecturer once said of this text: "It could be called "Beneath South Australian Seas."**

## THE CLIFF DWELLERS

# Poor Knights Marine Invertebrates

WADE DOAK

**By the same author:**

The **Elingamite** and its Treasure

Diving for Treasure

Beneath New Zealand Seas

The Cliff Dwellers - an Undersea Community

Fishes of the New Zealand Region

Sharks and Other Ancestors

Islands of Survival

Dolphin Dolphin

The Burning of the **Boyd**

Encounters with Whales & Dolphins

Ocean Planet

Wade Doak's World of New Zealand Fishes

The New Zealand Diver's Guide

Swimming With Dolphins in New Zealand

Friends in the Sea - Solo Dolphins in New Zealand & Australia

Deep Blue - A South Pacific Odyssey

I Am A Fish

**AUTHOR'S NOTE**

Since 1972 I have written four books about Poor Knights fishes and marine invertebrates. As my titles went out of print [one was reprinted seven times] copyright has reverted to me.
Now with this C.D.ROM I am trying to overcome my long frustration and taking a gamble on a hunch: I believe there are many people who would appreciate this material: an accumulation of diver observation over four decades. Such books , held in a digital database, need never go out of print and are readily updated. Illustrations for these books are extended by wall charts, some A3 size [18 x26 cm] that can be printed out . I can also offer a larger range of illustrations .

*The Cliff Dwellers: Poor Knights Inverts.*

**WALL CHARTS FOR MARINE INVERTEBRATE BOOK**:
Extending the text are the following wall charts:
**A: Invertebrates of the Poor Knights Islands:** 82 species colour I.D. chart.
**B: Castle in the Sea:** P.K . sea caves explained and listed as leading dive sites.
**C: Poor Knights Islands Ocean Gateway**: P.K. map and cliff profile diagram.

**WADE DOAK , BOX 20 WHANGAREI , NEW ZEALAND.**

## CONTENTS



## 1 **"WALL OF MOUTHS**

"I DRIFT SUSPENDED, weightless and silent in liquid space. Behind me a blue void - the open ocean. In front, the earth stands on edge, inhabited by strange creatures from the turquoise horizon above to the blue-black abyss below. This reef wall has been eroded and cut by the lower sea levels of the Ice Ages. It is literally blanketed with living creatures. Hundreds of miles of ocean drift, pushing plankton along the cliff face. Not the least sedimentation to clog the myriad hungry mouths." So wrote undersea explorer Dr Walter Starck of a coral reef wall in mid Pacific. Wherever land and ocean meet suddenly, the wall of mouths is found - an assemblage of life forms comprising the most diverse and stable community on this globe.

Our nearest star broadcasts energy into space in constant streams of photons. Most of these that reach its third neighbour fall upon the ocean. Over its vast surface tiny plants capture the daily energy input and store it in chemical form. All the dwellers on the undersea cliff share the same energy source. While plants on land spread wide their leaves to receive the solar input, the sessile cliff dwellers ensnare organic packages from the passing current.

The ocean's true pastures consist of tiny single-celled plants, invisible to the eye, called *phytoplankton*. These float freely in its sunlit layers where the quantity of light is sufficient for them to photosynthesise nutrient mineral salts into plant tissue.

Such microscopic plants have an advantage over larger plants in this free-floating life, otherwise larger seaweeds would also drift around the ocean in this manner supported by gas-filled floats. The single-cell plant has a maximum of surface area available to absorb sunlight and nutrients and this also provides a greater frictional resistance, in relation to its mass, to resist sinking beyond the sun's rays.

In ideal conditions the amount of such plant life produced in an area of sea may exceed that produced for the same area of tropical forest. This explains why these microscopic plants can support dense populations of planktonic animals, huge schools of fish, and the masses of filter-feeding invertebrate life encrusting rock faces and populating the sea bed. Phytoplankton of ancient seas, is thought to have given rise to all the oil and gas which has fuelled this civilisation. Diatoms are one of the most common forms of phytoplankton. They resemble delicate crystal caskets, each formed of a siliceous case housing the single plant cell. The dinoflagellates drive themselves along with two whip-like flagella. Some species of these, such as Noctiluca, can produce a brilliant phosphorescence when agitated at night by a ship's wake or the dipping of an oar.

These tiny plants are the origin of the most important food chain of the seas. On them feed a huge variety of different forms of tiny marine animals called zooplankton. And so this food chain grows with animals of increasing scale consuming or being consumed, right up to the larger, visible forms of zooplankton: shrimps, jellyfishes, comb jellies, and salps.

Most of these animals live permanently in the plankton. Then there are the larval stages of a major proportion of bottom-living invertebrate animals of every major phylum. The young of anemones, gorgonians, polyzoans, marine worms, molluscs, sea urchins, starfishes, crabs, shrimps, crayfish and many fishes all spend a portion of their living drifting in the plankton, feeding on the phytoplankton or on each other, being distributed to new areas by the currents, until they eventually metamorphose or grow into adult forms and settle to the bottom or carry on life as fishes or other marine animals.

Zooplankton is also the food of the many filter-feeding animals which compete for standing room on every submerged surface.

With their stinging tentacles the polyps on black coral trees, hydroid bushes and gorgonian fans seize the tiny animals and thrust them into their central mouths, as do anemones, zoanthids and cup corals. Sponges draw them into their filtration systems; polyzoans, barnacles and tube worms catch them with their bristles and tentacles; bivalve molluscs and sea squirts or ascidians draw them into their siphons and filter them; feather stars entrap them in their plumes. Almost every animal which lives fixed to the rock face or protrudes from sand or mud, filters and digests the plankton that passes by on the currents.

Why is there such a diversity of life forms on the undersea cliff? Why hasn't a single life form become more successful than all the others over the past sixty million years? If we look at a patch of cliff through time, the answer becomes clear.

In a rainforest when a tree falls, it creates an opportunity for which ever plant happens to have its seed time at that moment.The rain forest plants have staggered their seed times throughout the year.

So under the sea, the cliff dwellers have spaced their larval production: different colonisers are at hand every month, opportunists ready for any standing room that becomes available. New spaces are created by a variety of agencies, both biological and physical: grazing animals, violent storms and disease.

The resultant diversity of organisms explains the longevity of such an ecosystem. It is like a net: many agents can create holes in it but man alone is capable of destroying it. No one function is performed by a single entity which, if removed, causes the whole system to collapse. With such a mosaic of overlapping habitats a soon as one species is affected several others are already taking it place.

Species diversify and stabilise through time: the undersea cliff is a flexible ecosystem on which human culture would be wise to model if it is to survive. For the organism that destroys its environment, most surely destroys itself.

When environmentalists urge the protection of threatened species in a world wherein more and more people face starvation it is not that they prefer plants, whales and birds to man, but because the story of ecosystems shows clearly that we cannot survive by ourselves. And yet: on land, more than half the animal extinctions of the past 2000 years have occurred since 1900. In the sea, mechanised over-exploitation of wild stocks has us heading on the same unhappy course.

## 2. THE CLIFF DWELLERS

THE NEW ZEALAND continental shelf ranges in depth to 600 feet before the bottom begins to slope steeply some two miles into the abyssal depths of the Pacific ocean floor.
The life-crammed margin was created by millennia of erosion and surf. Rivers carried down sand, gravel, and silt. Glaciers gouged away the land and deposited it in the sea. The ice-ages froze so much of the world's water that the sea level changed, frequently dropping some 150 feet. A million years ago on beaches now far below the surface, the Pleistocene surf pounded on the rocks, creating sea-caves, fissures and underhangs, smoothing the surface of the broadening shelf.
Along the east coast of the North Island, very near the edge of the shelf, a series of volcanoes periodically erupted before all but one died. Today the remnants are a string of offshore islands; the last in the chain, White Island, an active volcano still.
Standing clear of the coasts, in deep waters, these offshore islands, principally the Poor Knights, Mayor Island and White Island, have been the natural choice for the first intensive exploration and photographing of our continental shelf by divers.

### The Poor Knights Islands

Scuba divers find the Poor Knights, a total no- take marine reserve, ideal. The steep cliff faces plunge not quite vertically to one hundred or more feet, broken by ledges, caves, fissures and underhangs. At 150 feet there is often a sandy plain shelving away gently for some fifty feet before a second slope carries on down to greater depths beyond scuba diving range. This submarine topography means that the diver has a wide range of depths within a short horizontal distance. Elsewhere on the continental shelf he might have to travel many miles between depths of 40 feet, 120 feet and 200 feet. Around the offshore islands he can glide gently down a giant staircase from sea level to an ice-age beach fifteen storeys below. Sea life is at its most prolific on rock faces, and before his mask the changing life patterns at varying depths may unfold in the course of a single descent. This giant staircase then is the best starting point for a study of our continental shelf. Because a small area encompasses the conditions of large expanses of sea bottom, complex relationships can be studied easily, giving rise to questions and producing theories that pave the way for the future exploration and conservation of our submarine frontier lands.

As the diving group prepares to descend, the rock face at water level is seen to be fringed with sea weeds: the large brown *Carpophyllum* and the small reds, their tresses alternatively hanging from their hold-fasts dripping and shiny, or floating out in the incoming surge.
Directly beneath them the *Ecklonia* forest begins. Sparse at first because of heavy wave action, it burgeons into a dense canopy of between 30 and 60 feet, and suddenly thins to scattered clumps and dwarfed individuals as the staircase steps down past the 75-foot level through the sombre blue depths.

In the initial 30 feet, between the stalks of kelp, and especially within the many curving chambers or recesses in the rock, a multi-coloured sea anemone, *Corynactis haddoni* is often the dominant encrusting form. If the diver peers into these small, wave-sculptured grottoes, he will see a kaleidoscope of colour. Little seaweed can grow in these dark spaces but the surge sweeping the fronds allows a brief glimpse of the vivid carpet of anemones, a random splatter of red *Lithothamnion* "paint", orange *Tedania* sponge encrustation and delicate bryozoan bushes: a bright green floss, branching orange floss and orange-brown floss. Beneath the *Ecklonia* such bryozoans form a very dense zone down to 50 feet, interspersed with thecate hydroids like

fragile trees or ferns: *Symplectoscyphus subarticulatis, Lytocarpia* and *Aglaophenia*. Red algae wave in the gentle rocking of the sea-swells, and from every crevice and hollow weed-dwelling fish - butterfish, kelp fish, and black angels dart or mould themselves into the walls.
The upper 75 feet is a zone of dizzying profusion. Beneath the, life forms encrust each other and use every inch of space threefold to secure a position on the staircase. This intense competition for space has resulted in an astonishing variety of fauna: these organisms can only live where other life forms permit.

Close to the diver's mask a fantasy of tiny marine organisms, several inches thick, smothers the rock walls. The sessile, filter feeders are among the first animals in the food chain. On them the mobile feeders, such as crabs, starfish and whelks, rely for food and shelter. Many filter feeders strain microscopic plant life, *phytoplankton,* from the upper regions. Others are carnivores on a small scale, catching tiny animal plankton. Where light intensity is low carnivorous animals such as the anemones cannot colonise unless an ample food supply is created by vigorous water movement. Hence the enigma of their presence in dark recesses in shallow water, but their absence beyond 25 feet.Water movement rather than light intensity appears to be the limiting factor in their case.

It is the interplaying factors of water movement and light intensity, brought about by increasing depth, and variations in the rock slope, that produce micro-environmental changes. These in turn create favourable opportunities or limits for the inhabitants of this vertical garden and together with biological disturbances, account for the crazy-quilt patchiness of each form.

However, as the divers glide beyond the 75-foot level a marked change is apparent. Wave action no longer has any real part in the distribution of species. From now on it is all a matter of light intensity, as determined by the degree of slope or the increasing depth, for the sea is a great light filter.

This lower region is the supreme realm of the sponges. Most seem to prefer a light intensity below I per cent of normal sun-light, and in the shallow regions they must seek dark underhangs or fissures in the underworld of the *Ecklonia* forest. At the upper levels heavy wave action often inhibits development, but in the quiet, dim depths, as competing life forms diminish, sponges gradually dominate the rock slope with encrusting varieties -
lemon-yellow, violet, or bright orange-red. Farther along the wall at 180 feet stand graceful erect sponges like candelabra, salmon-pink funnel shapes, organ pipes, yellow golf balls, and where scorpionfish lie camouflaged, massive dark-blue crenelated cups like eroded battlements. At these depths the hydroids too have developed from the stunted one-inch growth at 20 feet to dainty filament plumularians up to 4 inches long. They festoon the slope, along with the fragile lolly-pink reteporan bryozoan known as "lace coral" and the pink, delicately beaded gorgonian fans of the Primnoides family; the gilled cup corals and fleshy, pliant alcyonacean corals in pastel hues. The divers, falling gently down through skeins of friendly demoiselles, land on a shining white beach. From the cliff foot they gaze up the fantasy staircase, its multitudinous life forms in silver-rimmed silhouette, to where the *Ecklonia* forest looms in dark knots, merging in the haze of distance just beneath the living quicksilver of the surface. A poetry of drowned colours, frozen sound and sublime weightlessness invades the mind at these depths. The divers are endangered by the hazards of nitrogen narcosis and the bends, and must ascend the staircase to the sun.
No single descent could possibly take in the seething life of these sea cliffs any more than one could become acquainted with all the inhabitants of a skyscraper in a single elevator ride.

Our description has concentrated on the sedentary cliff dwellers, as these show the least variations from area to area.An average section of sea cliff may not have the huge variety of fishlife which can be found around the spectacular archway at the northern end of the Poor Knights. It may lack the astounding sponge growths found in the depths off Hope Point on the eastern side, and the vertical meadows of feather stars at Crinoid Cliff in South Harbour.

What we have in this book is an assembly of material from scores of sea cliffs, each of which compresses the general picture of this life-crammed upper part of New Zealand's continental shelf.

We have chosen to arrange the sea life in order of its evolutionary groups or phyla from simplest to the most complex. Of the twenty-two major phyla of animal life on earth, every one of them occurs in the sea and had its origin there.