In the middle of the night I surfaced from a filming session beneath El Torito at the Poor Knights, and stepped into a hot shower. The dream of a diving lifetime - living in comfort so close to my favourite underwater world. Above us the sky was solid rock. The huge vaulting roof of Rikoriko Cave dwarfed our 100-ton ship moored in one corner of its vastness.
During the four months Walt spent in New Zealand filming 'The Islands of Friendly Fishes', Rikoriko Cave was to be our refuge from rain and wind, our safest anchorage. The cavern was the scene of the "Cave Jams", rock music sessions with our Maori friends from over on the coast, who provided on the spot soundtrack music for the film. During our first filming session out there I had the chance to show Walt all my favourite diving sites and introduce him to the group of fishes which have become so tame since I began photographing there five years earlier for my books *Beneath New Zealand Seas* and *Fishes of the New Zealand Region*. Once so hard to get near, they now let my wife Jan pick them up and stroke them for Walt's movie lens.

In the Northern Archway Walt was amazed to see and film a squadron of ten large stingrays flying up and down the walls of this 120-feet deep undersea keyhole like giant butterflies. His mind quickly jumped to an exciting thought: like the dense schools of pink and blue maomao there, these rays are probably feeding on the plankton which sluices through the archway. Such behaviour would be most unusual for stingrays which normally feed over mud and sand bottoms, crushing shellfish in their grinding jaws. For them to spend hours swooping around cliff faces, soaring and banking like delta wing bombers, is very strange; plankton feeding is the likeliest explanation.

Walt returned to the arch with a powerful movie flood. Blue maomao (kyphosids) fluttered around the light, their dorsal spines standing out like needles in silhouette, the edges of their bodies burnished copper. Walt filmed incredibly dense masses of fishes seething around us against a vivid backdrop of orange, sulphur yellow and scarlet sponges encrusting the rocks. As we left they streamed out of the archway in a blue river, pouring past Walt's lens for five minutes - a rope of fishes.

Next I took Walt around to Airbubble Cave on the weather side of the Knights. There was still quite a surge running but we managed to enter. From recent heavy weather the first airbubble was brimful, a vast silver plate or a pool of mercury in the cave roof. I prefer the second dome, further in and about a foot above the level of the outer one. In that airbubble we can stand clear of the water, with five feet of air around our heads, just our knees in the sea.
"Look at your depth gauge, Walt."

"Well I'll be damned - twenty-five feet down. It's extraordinary - a natural underwater house."

At our feet a strange turquoise radiance glows through the surface. From the great low portal arch light bounces across the floor of the cavern, glancing off bright coloured fishes like jewels and shining up into the airbubble. A shadow flits across the light - a torch beam gets brighter and brighter and Janice Carson surfaces alongside me with the powerful movie light. The air dome is illuminated, its walls intricately plastered with a delicate filigree of calcareous encrustations. As the beam shines on the edge where water meets rock it burns with a weird green fire - a special trick of the light hitting the meniscus. Clouds of vapour come and go, pulsing with the rhythm of the surge outside: increases of pressure are causing a cloud chamber effect - we can watch meteorological phenomena beneath the sea.
Later we returned to Airbubble Cave to film a synch-sound sequence. We anchored my aluminium boat near the cave. Walt stayed topside, fully suited up, wearing headphones, sunglasses and scuba gear - a freaky sight as Janice and I slipped over the side. I took the hydrophone down on a cable and showed Janice the way to the airbubble. When we got inside we were to do a recording level test. Then Walt would leave the Nagra tape recorder going and join us with the movie camera and floodlight.

Down in the airbubble it was magically peaceful after the turmoil topside: white water, schools of trevally and maomao, foam and the roar of the sea. Cut to a tranquil, luminous underground lake,

muted colours, fish silhouettes and sculptured sponges. As we surfaced in the airbubble I said to Janice: "I've always wanted to get you alone in a cave from Walt. Now I'm going to rape you." My voice boomed in Walt's earphones as he sat up there in the pitching boat and we stood there in the dark dome our ears clicking with the pressure changes and vapour clouds swirling around our heads. Janice screamed and said: "If that was rape, do it again."
Walt got the message, set the sound level and joined us. He filmed us discussing the depth of the cave, the vapour clouds and their cause and the origin of the airbubble. I believe that the air gets into the cave during heavy weather when the exposed side of the Knights gets a thrashing. The sea in the cave is charged with tiny bubbles, which percolate upwards and displace the water in the dome. After long periods of calm I have found the bubble much diminished: gas under pressure dissolves into the water.

To introduce to the area a marine scientist of Walt's experience was the realisation of a longterm ambition for me, after years of observing and wondering at the strange things out there. Each dive I showed him an aspect which had mystified me for so long and he would come up with a solution.

At 175 feet in Landing Bay some years earlier we had discovered a colony of garden eels. These animals spend their lives in sand holes, their heads and half their slender length extended up into the water column. Swaying like strange plants in the current, the eels have adapted to feeding on tiny particles of plankton. Garden eels have never been recorded in latitudes such as these and they are very likely a totally new species.
My diving friends and I had several times tried to capture specimens using quinaldine, but always failed. The eels withdrew into their burrows no matter how silently we approached and when the narcotic agent was pumped into the burrow the drugged eel just remained within.
Though Walt is an expert with the tiny, multiprong fish sampling spear a diver at 175 feet is narcoticised too - by the high pressure of nitrogen his scuba delivers to him. Performance of delicate tasks and precise thought is very difficult. When Walt saw the eels he held his breath, silently gliding over the seabed. He fired his spear with smooth precision, so that it hit the sand an inch in front of the eel's body. The first garden eel specimen taken in New Zealand was transfixed through the neck as it withdrew into its hole. Walt told me topside that he had nitrogen tremors. It was a matter of getting into "synch" with them and firing while on target.

Planning the Film

Once he had gained an overall impression of the area, Walt sat down in the cabin and planned the film. Along with us were two close friends of mine, New Zealand marine biologists Dr Howard Choat and Tony Ayling, both experts in fish behaviour who joined El Torito to conduct experimental work with labrid fishes there. Howard was also doing a study of the relationship between *Ecklonia* kelp and sea urchins. Tony was continuing his two-year-old programme studying the behaviour of one small cleaner-wrasse community of the genus *Pseudolabrus.*

Walt felt the film theme was developing spontaneously: a comparison between the Poor Knights situation and the tropics. Here in place of corals were lush kelp beds and other marine plants. The abundance of life was surprising; probably it equalled the best tropical situation but the diversity of life forms was much reduced. Countering the lessened variety of fish species was the enormous abundance of individuals of each species: the huge schools of maomao, trevally and demoiselles; even pufferfishes, triggerfishes and blennies swam in schools and there were dense populations of scorpionfishes, morays, goatfishes and serranids. This, Walt felt, was the unique aspect of the Poor Knights islands. On a coral reef it is harder to concentrate on a particular species for an in-depth behavioural film study over an extended period.
Another factor facilitating such a treatment was the surprising absence of many big predators. While there was some predation by kingfishes and sharks this was nothing like the scale on which predation occurs on a coral reef. For this reason the Poor Knights fishes were much tamer and

more approachable than in the tropics. They do not flee from the diver, accustomed to seeking refuge in the reef at every large shadow, and their behaviour can be observed much more easily.
The film would bring out these aspects, starting with the intensity of planktonic life and portraying the complex food chain linked with it: the encrusting invertebrates on the cliff faces, the fishes, and the seabirds that nest on every inch of the islands, sharing their burrows with the prehistoric tuatara lizard.
Even the island's forest canopy owes its luxuriance to the plankton, from which it gains nutrients through seabird droppings: an ecosystem that is energised by the oceanic plankton, just as earth life receives energy from photons radiating through space.
The film would show Howard and Tony as scientists working in the field of wrasse or labrid biology. It would depict my wife Jan and me as laymen seriously involved with the marine life and its recreational aspect: the fun of watching and recording fish behaviour; whose enthusiasm had attracted El Torito to these islands of friendly fishes.

Cross section: Right now Howard is beneath the ship measuring kelp plants along a transect line and counting sea urchins. Tony is sitting motionless in his study area, mapping on a plastic slate every movement that his cleanerfishes make, every interaction and response. Ian is grooving after three years' absence from the Knights. Walt and Janice have the projector rigged up to see rushes of the Laulasi film; I'm pen pushing.

On the way out today Walt was reading Steinbeck's ‘Log of the Sea of Cortez’ and passed it to me suggesting I read a passage discussing creativity and anarchy. It applied very well to El Torito:
"We thought that perhaps our species thrives best and most creatively in a state of semi-anarchy, governed by loose rules and half-practised mores ... There is no creative unit in the human save the individual working alone ... In pure creativeness, in art, in music, in mathematics there are no true collaborators. The creative principle is a lonely and individual matter."

Howard surfaces, showers and joins us. On the Australian Great Barrier Reef Howard had done extensive research on tropical parrotfishes, or scarids, on which he is regarded as a world authority. These fishes are extremely abundant on coral reefs, although algal growth there is nothing like the luxuriant growths of sea plants found in temperate regions.
I raised a problem that had been bugging me for some time. In the past year El Torito had gone north from Lord Howe on an island-hopping run through the tropics to the Solomons and now back to my home range, the Knights.
"How is it that with all the big kelp forests down here we've only got four species of herbivorous fish, when on a coral reef, where it's all grazed down to a thin algal film, herbivores are among the most abundant species?"
Howard:"Yeah, why can't one scarid make it here when we've got all these tropical labrids and serranids?"
Walt: "You know what it might be? It may be physiological. For a herbivore to digest plant material it's a pretty complicated process and takes a very long gut. It's a slow process compared with digesting protein. Carnivores have very short guts, the shortest of all being the vampire bat which has a little straight tube because blood is so readily assimilable."
Howard: "The other major difference is the size of the algae. On the coral reef the average stalk size is about two inches. Here it's several feet."
Walt: "Interestingly, at Lord Howe you had not many herbivores and there you’ve got a lot of tropical algae, growths several feet high - acres of the stuff. It's really striking to see tropical algae like that."
Howard: "Yes, in temperate areas like New Zealand, much of the herbivore biomass goes into echinoids (sea urchins) and invertebrates."
Walt: "It's going into animals that have a lot lower metabolic requirement - they just sit there. Even if it takes them three days to digest algae it doesn't make any difference because of their low energy needs. But a fish has got to move around a lot. To keep that higher metabolic rate fuelled he must be able to get enough nutrition out of his diet. Apparently enough energy can't

readily be obtained from algae at lower temperatures."

Howard: "Evolutionarily it seems you were better off being an omnivore. As a herbivore it's difficult metabolically. The animal must make sacrifices in a lot of directions. What the *Ecklonia* is doing evolutionarily is interesting. The kelp is an opportunist: it finds a suitable area and covers it, growing rapidly to maturity and reproduction before being cleaned off. If it is not chewed off it can probably live a long time as my tagging experiments in deep water here indicate."

Walt:"In the tropics you could never get an alga that had to grow that high before it reproduced - it would be eaten beforehand."

Howard:"On the reef there are many little filamentous red, green and brown algae and they produce spores when they're only a few centimetres high."

Walt:"The mouth of the parrotfish seems best suited to getting a the stubble left by the other fishes."

Howard:"I think that production-wise the amount of algal material grown on a coral reef is probably about as much as it is here. It must be plentiful here to support all those herbivorous fishes. In the tropics the situation is quite different: since an alga is eaten quickly it reproduces as rapidly as possible otherwise selection would weed out the ones that had to grow higher before reproducing."

Me: "Maybe the weed-eating niche isn't being thoroughly exploited here because the area is relatively young from an evolutionary point of view. Has there been time for many species to adapt to the problems of being a coldwater herbivore?"

Walt: "The coral reef is such a stable and ancient system. The Poor Knights, like all temperate rocky reefs, are very transient structures geologically. These islands are going to wear down and erode away in a few million years whereas a reef keeps replenishing itself and persists as a reef for a great time. We know the age of some modern coral reefs: they are Eocene structures; there are no other habitats that stable. The coral reef is the most stable environment on earth."

Howard:"Yes, the Eocene fish are very like our present-day fauna. Most of the Eocene mammal families are extinct, whereas most of the Eocene fish genera are still going: scarids, serranids, siganids. Reef fishes have developed to a maximum degree of flexibility. They aren't highly specialised like freshwater fishes which reach maximum performance in a narrow area, say, one particular river tributary of the Amazon."

Walt: "This is also a factor that has made coral reef communities so stable over long periods of time. No one function is performed by a single entity which, if removed, makes the whole system collapse. You have overlapping habitats, so if one species gets knocked out for any reason, half a dozen are already taking its place. What he was feeding on is fed on by others and those feeding on him have other things to eat and that takes up all the slack. On the reef you don't have these chain relationships taught so often to students. Most of the basic concepts in ecology come from intertidal and terrestrial communities of temperate regions.

"As soon as people start trying to apply that type of thinking to the reef community they come up with absurd ideas such as with the crown of thorns / tritonshell relationship: the shell is removed and the starfish devour the reefs and the east coast of Australia is washed away! Jack Randall and I were studying the *Diadema* urchin in the Caribbean. We found that twenty different fishes are predators on that urchin and gobble it up, spines and all. I'm sure that a number of things can eat the crown of thorns. Triggerfish, puffers and the big Maori wrasse do. When small many could be devoured. On the reef there is no tight 1:1 relationship. Nothing feeds exclusively on it, such as is suggested by some of the ridiculous control proposals for the crown of thorns problem: releasing millions of painted shrimps."

The crown of thorns problem was a perfect example of science being caught with its pants down. Knowledge acquired from pure research does not have much immediate monetary value and gets very little financial support until something goes wrong. Then we find we are casting around blindly in all directions for a solution to something which, viewed on a long-term basis, may not really be a problem at all. The coral reef system is not likely to be destroyed permanently by a starfish plague even though, from an economic viewpoint, the loss to the tourist industry from a temporary devastation may be of enough social consequence to warrant attention.

EXTRACT ENDS