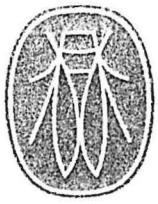

CICADA

GIANTS OF NINGALOO REEF

A film about the whale sharks, manta rays, dugong and humpback whales at the wonderful unexplored Ningaloo Reef of Western Australia.

A proposal from
Tony Bomford and
Cicada productions.

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THE GIANTS OF NINGALOO

Outline of visuals	Outline of commentary
Introduction	
Whale sharks cruising up and down off **Ningaloo Reef.** Shots from surface and underwater.	**Whale sharks are the largest fish in the world.** Big ones may reach 40ft or more.
	For a few weeks of the year there may be as many as 30 whale sharks here at Ningaloo Reef in north-west Western Australia. We don't don't know where they have come from or where they are going. Until now we know almost nothing about them.
	They are rare, but we don't know how rare. They are giants and giants have a habit of becoming extinct. Is the whale shark heading in that direction.
Under water shots of Dr **Geoff Taylor dwarfed by whale shark.**	**Dr Geoff Taylor is an amateur naturalist who has made whale sharks his passion.**

We have a chance to follow his attempt to unravel some of the mysteries of these magnificent fish.

Manta rays swimming just below the surface scooping in plankton. **Dugong** with calf swimming by. **Humped-back whales** spouting and breaching.

Whale sharks are not the only giants to visit these rich waters. Manta rays, dugongs and the mighty humped-back whale all cruise along the Ningaloo reef.

TITLES "THE GIANTS OF NINGALOO

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Sequence 2

Dr Geoff Taylor finishes filming whale shark under water, surfaces, and climbs aboard his trimaran, where he joins the crew and cameraman, Tony Bomford.

Dr Geoff Taylor is the, medical doctor at Exmouth, basically a U.S base town.
When his medical duties permit, Geoff devotes his time to studying and photographing whale sharks. Briefly Geoff relates how he became involved with whale sharks. For the last six years Geoff has spent much of his spare time looking for whale sharks. A consistent pattern of sightings emerged, with the first whale sharks, being seen in March, staying around in April and gradually disappearing in May, with just a few odd sightings later on in the year.

So what is the great attraction of Ningaloo?

In 1985, scientists discovered the amazing phenomenon of **coral spawning** which occurs here at that time of year.

Geoff is sure that the whale sharks follow the coral spawning, and this year he will be able to look at it more closely.

Geoff swaps his cine camera for his stills camera and reenters the water.

What do we already know about whale sharks? That they are fish, breathing through gills, and although they are sharks, they eat small fish and plankton, and in this respect they are like the hump backed whales.

Geoff photographing whale sharks under water.

The number of baby whale sharks found is still in single figures, and they are probably born live, like most of the larger sharks. What the babies feed on is anyone's guess! We don't know how fast they grow, or how long they live. The largest one is said to have been 18 meters long and weigh a staggering 40 tons. **They are called whale sharks because of their great size.**

Whale sharks under water.

Sequence 3.

Aerial view of the trimaran sailing along outside the reef. Huge ocean swells. Breakers crashing on the reef.

Ningaloo Reef is one of the hot spots of our blue planet.

Views showing its relationship with the N.W. cape.

The continental shelf is only a few miles off shore, closer than anywhere else in Australia.

The deep ocean and dry land almost touch each other. Conditions are perfect for coral formation, hence the Ningaloo reef, which runs 160 miles southwards from the N.W Cape.

The ocean outside the reef. Underwater shots of sunlight filtering through the surface.

The deep ocean water is almost lifeless, but as it mixes with water from the shallows and from the lagoons, nutrients allow the phytoplankton to grow. This in turn nourishes millions of animals of amazing diversity.

Manta rays cruising along edge of the reef

Marvellously adapted to the feeding on plankton, the manta ray sieves gallons of water through its gaping mouth, trapping planktonic organisms on its highly modified gills.

These rays can reach 6 meters from wing tip to wing tip and weigh up to two tons. They are probably feeding on smaller creatures than the whale sharks feed on.

Sea birds resting on on Frazer Island.

Noddies and fairy terns seem to relish the sand beneath their feet after months out at sea.

Waves crashing against the face of the reef. A quick look at **the diversity of corals**, related to their position on the reef..
CUs of active coral polyps.

This watery soup of plankton is washed against the wall of mouths that make up Ningaloo reef.
220 species of coral, formed from an intricate partnership between animal and singled-celled algae. Their limey skeletons form the backbone of the reef.

A wide range of beautiful, delicate filter feeders:
Anemones, feather stars, fan worms, etc.

And a host of other animals live on the reef ensnaring the minute animals of the plankton.

Sequence 4.

High angle view of the **Ningaloo reef system** from the Cape Range.

The Ningaloo reef differs from the Great Barrier Reef of the east coast, because it is so close inshore. In places the reef is only a few yards from the beach. The rainfall is so low that virtually no sediment is washed into the sea. This allows coral growth close in shore. Kangaroos now hop over fossil reefs, a legacy from past Ice Ages.

A few shots of **kangaroos** and the odd **emu** for authentic Aussie flavour.

Of course the coral will change as the sea level changes because of the'greenhouse' effect. In fifty years sea levels may have risen by a meter. This will effect how the coral will grow.

Fossil corals

Fossil sharks tooth.

Geoff's daughter found a fossilised sharks tooth. It is is about twice as big as the tooth of a modern great white - a big great white is about 20 feet long. **Imagine an active predator the size of a whale shark!**

Geoff and friends set up camp in the Cape Range National Park. The trimaran anchored just offshore.

Luckily, whale sharks are extremely docile animals and this makes Geoff's research possible

Sequence 5.

Sunset over the reef.
Loading equipment onto the boat.

For 364 nights of the year the coral reef is quietly ensnaring plankton and building up reserves for reproduction. All this pent up energy is released in one great orgasm involving the whole reef. 7-9 days after the full moon, an hour and a half after sunset, on a falling tide, **the reef erupts.** This simultaneous spawning is one of the most remarkable events in nature, and tonight will be night.

Divers entering the water at dusk.
The coral before spawning starts.
The first bundles of eggs and sperm being released, then more and more.
Spawn drifting up to the surface.

Staghorn, table and brain coral are hermaphrodite, but most of the others are either male or female. In any event the eggs from one colony are fertilised by the sperm from another of the same species.

Hundreds of polychaete worms wriggling through the water.

Polychaete worms spawn at the same time as the coral. The tail end of the worm carrying the eggs or sperm breaks free from the front end of the worm, and wriggles to the surface where eggs and sperms are released.

(check this) The predators simply cannot cope with this super abundance of food.

Any fish feeding on the spawn at night.
Coral spawn on the surface.

Although millions of eggs are eaten, millions more drift out to sea. By morning there are thick pink slicks of spawn drifting away from the reef.

Light aircraft flying over the reef.
Geoff inside the plane.

Two weeks later.

"This year I have been given a grant by the Dept. of National Parks and Wildlife to count whale sharks from the air. In a couple of hours I can survey the whole 160 miles of the reef.

Aerials of the coral spawn.

The coral spawn should show up clearly. If it is drifting southwards, we will know that the Leeuwin current has started to flow, bringing warm water from the north. Maybe it will bring the whale sharks. Most of the whale sharks seem to arrive

Aerials of whale sharks
Geoff counting whale sharks.

a week or two after spawning. ..... it would be nice to take a closer look at some of those."

Sequence 6.

Whale sharks from the trimaran.	"What I really want to find out is whether the whale sharks are actually feeding on the coral spawn, or on the animals that are eating the spawn, like small squid or blue sprats.
Whale sharks underwater.	Most of the time when I have seen whale sharks, they have just been cruising gently up current with their mouths open. Unlike basking sharks, they have tremendous suction, and could pull in a whole shoal of bait fish in one gulp. They have tiny teeth, 1/8 inch long.
CUs of the fish that associate with the whale sharks. Sucker fish or remora.	**There is a whole community of smaller fish that live with the whale sharks.** They all seem to have sucker fish. These have suction pads on their heads, they are not parasitic, but just hitch on for the ride.
Juvenile Golden Trevallies swimming on the pressure wave just in front of the mouth. **Cobia or King Fish** swimming below the whale shark.	The little golden Trevallies seem to live a precarious existence. When they mature they will live in shoals on the reef. Sports fishermen often try to get a lure close to a whale shark to tempt the king fish out. They are prized game fish.

Evening outside the reef.

Whale sharks actively feeding on the surface.

Trawling for zooplankton and examining the catch

Diving by night possibly with shoals of squid. Possibility of whale sharks feeding.

Geoff has had reports from local fishermen of whale sharks thrashing around on the surface at just this time of year. We know that the zooplankton come up to the surface in the evening.

Perhaps if we dragged a plankton net through the water we could find out what was about. If we can find the whale sharks feeding we can jump in the water and have a look.

But all this could be under threat. An army of tiny snails is gnawing away at the reef at this very moment.

The aerial surveys may show that the whale sharks are attracted to areas where the coral spawn is concentrated. **This is a serious problem - Ningaloo Reef is under attack from the Drupella snail.**

Sequence 7 **The Reef under attack**

Under water - **beautiful coral gardens.**
CUs of butterfly fish, angel fish and parrot fish feeding on coral.

Nudibranch sea slugs, star fish, etc feeding on coral.

Drupella cornus snail.
Time lapse shots of a group of **Drupella feeding on a head of coral.**
W/A of dead coral.
Algal growth.

On a coral reef you can find an amazing variety of animals that feed on coral.
Many of the most attractive reef fish actually nipp off bits of live coral.

For most of the time, on most reefs, the system is in balance, but occasionally one organism will proliferate to plague proportions. On the barrier reef it was the Crown of Thorns Starfish. They occur here in small numbers. Here it is this drab little snail.
For some reason they have reached such numbers that **they have destroyed vast areas of the reef.**
Algae grows over the dead coral, and many species of fish have disappeared.
Is this simply part of a natural cycle or has the balance of the reef ecosystem been disturbed?

Above and below water **shots of fishermen taking Snapper.**

Because the reef is so accessible, in some areas there has been very heavy pressure from 'sports' fishermen.

Snapper feeding.

Spear fishermen after bluebone.
Bluebone eating Drupella if possible.

Large numbers of Snapper (Spangled Emperor) are caught bottom fishing, or trapped by the shoal. Spear fishermen take large numbers of Bluebone (Bald chin groper) a large wrasse which almost certainly eats molluscs, and perhaps Drupella. It is quite possible that the removal of these fish and other sedentary predators has affected, directly or indirectly the Drupella situation.

Under water shots of devastated coral.
Coral recovering after attack from Drupella. Regrowth and asexual reproduction.

A scientist has recently been employed to study Drupella on the reef. In some places there area signs of recovery. There is no shortage of infant coral colonies.

Coral planulae drifting around and settling to to form a minute new colony.

Hopefully the faster growing corals will re-establish, and in ten years time spawn again, so that the whale sharks will come again to this part of the reef.

THE GIANTS OF NINGALOO

Part 2

Radio Tagging

Preparations being made to attach a dummy radio transmitter to a whale shark.

This year with the cooperation of Professor Gordon Grigg of Queensland University, Geoff has a unique opportunity to solve more of the mysteries of the whale sharks.

Gordon Grigg is a specialist in satellite-tracking animals. Basically the animal carries a very small but powerful radio transmitter which sends a signal to a passing satellite every time it is overhead. The movements of the animals can be followed as long as the radio keeps working.

Perhaps a sequence in the lab in Brisbane of the transmitter being tested and fitted into its housing.

Of course there are a few extra problems with whale sharks. First of all the radio must be put into a water proof housing which will withstand the immense pressures of the deep ocean. **No one knows how deep whale sharks can go.**

Testing buoyancy

Radio signals will only be picked up when the transmitter is on the surface so it must float.

Geoff and friends experimenting with methods of attachment using dummy transmitter.

Then you come to the problem of attaching anything to the whale shark. The transmitter is far too valuable to risk, so several trial runs will take place to work out the best method of attachment.

After various trials, the real transmitter is attached to a whale shark, causing it the least possible trauma.

We can learn such a lot even with this comparatively simple system. We will know where it is and hopefully where it is going to.

Do we have our own population of these animals, or will he turn up in January off the Seychelles? From that sort of information we can start making a guess at the total world population of these animals.

Shots of the transmitter being towed along the surface then submerging. Various shots of the transmitter out on the open ocean.

From the times of transmission, we can tell if he is on the surface or deep down. We might be able to tell when he is feeding. We can compare his movements to the water temperature, and see how the whale sharks movements relate to the Leeuwin current just off shore here.

Students based on the top of the Cape Range using conventional telemetry, to plot the positions of the whale shark(s)

The signals from the satellite are relayed to Paris, then to Brisbane, and finally to Geoff at Exmouth. **Hourly movements along the reef can be plotted using receivers from the Cape Range.** If things go wrong we might be able to recover the transmitter using this method.

Sequence 9.

If possible we will film sharks attacking 'natural' bait, such as a dead dugong, dolphin or turtle, but this depends on finding a suitable corpse.

To be sure of getting a good sequence we will also film them feeding on 'artificial' bait.

We should be able to film the local population of **Requiem sharks.**
Wobbegong.

Of course, whale sharks are not the only sharks to frequent Ningaloo. With the exception of the basking shark, a plankton feeder from temperate waters, nearly all the others are active predators.

Sharks used to be considered primitive, and their backbone of cartilage, indicates a very ancient pedigree, but they have incredibly sensitive organs of smell or taste.

Some of the sharks have become highly specialised feeders. The wobbegong eats mainly crabs and octopus.

Sequence 10.

Dugong

Dr Geoff Taylor catches up with his patients at the 20 bed hospital in the little town of Exmouth.

By May, the whale sharks are dispersing, hopefully one will be towing a transmitter out into the Indian Ocean. Geoff has to return to his medical duties.

Light aircraft approaching over the sea, and circling low.
Aerial view of the coast.

Once a week he holds a clinic in Onslow, which entails a flight across Exmouth Gulf. As he arrives back at the light aircraft strip near Exmouth, the pilot does a quick circuit over the west coast of the gulf.

Aerial view of small group of dugong.

Exmouth Gulf holds a population of a thousand dugong. These are the only vegetarian marine mammals. Unlike their only surviving relative the manatees, they never move into fresh water. **The northerly tropical coast of Australia is the world stronghold - in most parts of their range they have been hunted to the point of extinction.**

Sequence 11.

Geoff on the trimaran out in the Gulf in pursuit of dugong.

The sheltered waters of Exmouth Gulf are shallow and productive, with beds of algae and seagrass, and supporting an active prawn fishery.

Dugong surfacing to breathe, and then submerging.

From May onwards the dugongs move into the clearer waters of the west coast of the Gulf to calve.

Small groups of dugong swimming under water.

Dugong underwater.

They are vegetarians, feeding on seagrass, which they uproot with their bristly rostral disc, used almost like an elephant's trunk - indeed they are distantly related.

Dugong with calf riding on its mother's back.

Some females don't start to breed until they are fifteen years old, and then they calve every 3-6 years. **With this slow rate of reproduction the population is very vulnerable to over-hunting.** A few are hunted by the aborigines of Onslow, but there is no commercial hunting.
They communicate underwater by a series of chirps.
There does seem to be some sort of movement out of the gulf and round the Cape.

Sequence 12.

Aerials of Exmouth Gulf and the Cape Range.

Although the dugongs may be safe now, they will almost certainly face problems in the years to come. The Cape Range and the Gulf is part of an enormous anticlinal geological structure, and oil and gas reserves have been found, but not yet exploited. Prospecting continues.

Drilling rig in the Gulf.

Aerials of the Muiron Islands.

There has been talk of building oil storage tanks on the Muiron Islands, which lie a few miles to the north east of the Cape. The sheltered beaches of these **uninhabited islands are a major breeding ground for green turtles.**

Muiron Islands. Turtle beaches.

Green turtles mating in the shallows.

As with the dugongs, Australia must be one of their major strongholds.

Hatchlings running the the gauntlet of gulls and ghost crabs.

From the time they reach the sea, their life is almost unknown. It seems that they swim far out into the ocean, and drift around in the great circulating currents. **In fifty years time they will return to this beach to breed.** One wonders what they will find then.

The hatchlings paddling out to sea. Above and below water.

Sequence 13

Humpbacked whales off Ningaloo.

Soon after the whale sharks leave, **another giant arrives at Ningaloo.** From July onwards **there will be a steady procession of Humped back whales on their annual migration.**

Like the whale sharks they are plankton feeders, but because they are warm blooded, insulated by a thick layer of blubber, they can penetrate the icy waters of Antarctica, and in a few months eat enough to sustain them for the rest of the year.

Whale sharks, on the other hand, are cold blooded, and so are confined to poorer tropical waters.

Archive film of whaling in Norwegian Bay.

The early settlers were quick to notice whales so close inshore, and in 1913 a whaling station was established in Norwegian Bay. In its checkered history, **during the fifteen years it operated, 11,500 humpbacks were melted down in these rusting boilers.**

Remains of the whaling station. Geoff amongst the rusting boilers.

The Exmouth whale watchers counting whales from the old lighthouse on the Cape.

Humpbacked whales have been protected in Australian waters since 1958. Geoff has started a conservation group in Exmouth, and now the local people count the pods as they move past the Cape, looking for sheltered water in which to calve and mate.

John Bannister, Director of the Museum of Western Australia, following humped back whales photographing tail flukes.

One of the key issues in the international debate on whaling is the size of the remaining populations. It is vital to get as much information as possible.

Every whale carries its personal identification in the pattern of notches and blotches on its tail flukes. John Bannister is compiling an index of photographs.

The most critical issue is just how much the whales of the east coast mix with the whales of the west.

The Pacific Whale Foundation may be taking tissue samples for genetic fingerprinting. This involves physical contact with the whale from an inflatable boat.

The Pacific whale foundation may be taking this work a stage further. Whole family relationships can be worked out by comparing the DNA in various populations of whales.

Hump backed whales with young calf, and attendant whale.

Despite this scientific intrusion into their lives, some of these whales will calf and mate in the sheltered waters of the Muiron Islands and Exmouth Gulf.

Geoff with his family admiring the humped back whales from a boat.

The Range, the Reef, the fishing and the Giants of Ningaloo already attract 10,000 tourist a year to Exmouth. **A major tourist development, complete with marina, is being planned**, which will turn sleepy little Exmouth into an international tourist resort. **Can tourism be developed which is not destructive to this delicately balanced ecosystem? Will people unwittingly destroy what they have come to experience? Will Geoff's children, and their children in turn, marvel at the Giants of Ningaloo?**

Excavations for the marina.

Artist's impression of new hotel complex.

Geoff on top of the hill by the lighthouse overlooking the reef and a great expanse of ocean.

"It's now late July, and I have not seen a whale shark for 5(?) weeks. Until now they have just been lost in the vastness of the Indian Ocean. It's 3000 miles of open water to India that way, and 5000 miles to Africa over there.

Whale shark cruising along towing the radio transmitter.
The transmitter being towed through the water.

This year the situation is different. Thanks to the Argos satellite system, we know where one whale shark is cruising.

"Of course it is a bit risky to draw too many conclusions from the movements of just one whale shark, but it seems as though they do this .....and that means....

END TITLES

If all goes well with the satellite tracking, it might be very effective to give an update at the time of transmission, or to insert a map at the last possible moment giving the latest information.