Haida Gwaii / Queen Charlotte Islands

MARINE MATTERS

April 2003

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Down from the Mountains

By Berry Wijdeven

Picture if you will, a young German palaeontologist, roaming the mountain ranges of Europe, examining the fossilized remains of a giant sponge reef deposited some 150 million years ago. Remnants of the reef can be found from Russia all the way to Spain and Portugal. Portions have even been found in Newfoundland. They were part of a giant reef system, 7,000 km long and up to 60 meters thick which was the largest living structure ever created.

While the existence of the reefs had been known for some time, little was known about their ecology, how the sponges lived and interacted with their environment. These were the answers the young palaeontologist was looking for as he examined the exposed remnants of the giant reef, studying the thick layers of fossilized sponge, searching for clues to ecosystems which had become extinct more than 40 million years ago.

Then one day in 1996, the palaeontologist happened upon an article which would change his life and bring him down from the mountains. Published in 1991 by four Canadian scientists from the Pacific Geoscience Centre in Sidney, BC, the article described the discovery of anomalies picked up during sonar scans of the Hecate Strait and Queen Charlotte Sound. According to the scientists, the anomalies were sponge reefs.

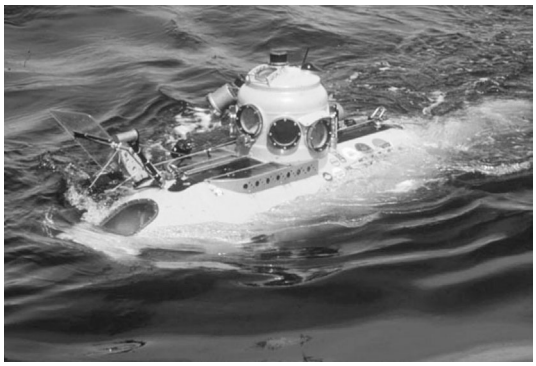
The German palaeontologist, Dr. Manfred Krautter, still sounds slightly overwhelmed as he describes his first reaction to the article.

“At first I couldn’t believe it.” he says. “I was electrified. We palaeontologists had thought they had died out. It’s like…like a dinosaur would pass you.”

Dr. Krautter contacted the scientists at the Geoscience Centre and suggested a joint venture to study the reefs. He received an enthusiastic response and by 1999 the team was ready to start their study.

Dr. Manfred Krautter: “ These are absolutely the only siliceous sponge reef systems in the world,” he says. “We have an exceptional opportunity and maybe a last chance to learn more about these “living fossil reefs” and their environment.” • *photo from Manfred Krautter*

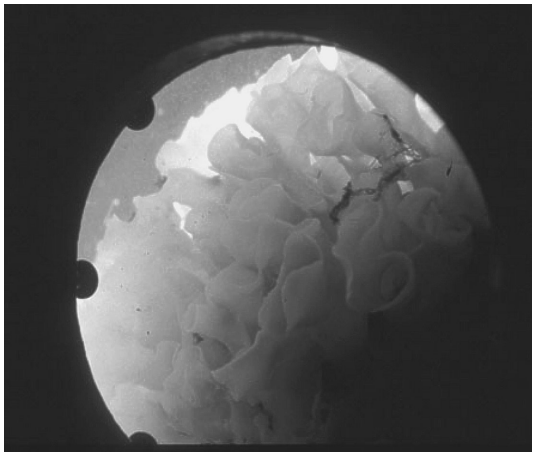
Just getting a glimpse of the sponges wasn't easy. Located at depths of 150 to 250 meters, the reefs can't be reached with scuba gear. So the team secured the services of the research vessel *CCGC John P. Tully* and the two-person submersible *Delta*. The sub was cramped and cold, with water temperatures hovering around four degrees Celsius at those depths, but the scientists were rewarded with the opportunity to finally sneak a peak.



The submersible Delta preparing to dive • *photo Natural Resources Canada*

In July 1999, the sub, with Dr. Krautter on board, made the first of 18 dives. For the first time ever, anywhere in the world, living, thriving sponge reefs were being studied by direct observation.

"It was like a time machine," says Dr. Krautter. " Like a dive back millions of years. You get in the sub, in the present time, dive down and arrive 140 million years ago."



Farrea occa sponge seen through the Delta submersible porthole • *photo Natural Resources Canada*

The journey didn't disappoint.

"I was absolutely, absolutely impressed. I was not prepared to see that many sponges."

Videos of the dives provide a glimpse of this hitherto unknown world. As the sub descends it passes endless numbers of jellyfish. Then it gets dark. Near the sea bottom at a depth of some 198 meters, the sub's lights are turned on. At first, the camera focuses on a section of muddy sea floor, but as the sub begins to move, the sponge reef comes into view. Masses of white, ghostlike shapes emerge. There are sponges everywhere. Some look like giant wine goblets. Others have multiple finger-like protrusions or bouquets of slender tubes. It looks eerie, alien, and stunningly beautiful.

Aphrocallistes, one of the main sponge reef building species • *photo Natural Resources Canada*

Over the next three years, using the sub, a remote controlled vehicle and side-scan sonar data, the team discovered four reef structures covering about 700 km2 of seafloor in Queen Charlotte Sound and Hecate Strait. The mounds are up to 21 metres high and many kilometres wide. Radiocarbon dating has determined the reefs to be 9,000 year old.

Sponges are among the oldest life forms on earth. They have been found fossilized in rock layers 600 millions years old. Sponges still flourish today with more than 7,000 known species in both fresh and marine waters all over the world.

Unlike the soft sponges we sometimes find washed up on the beach or those in our bathtubs, the sponges that make up the reefs are siliceous or glass sponges that have a rigid structure created by using silica dissolved in the water. The waters off the BC coast have some of the highest silica content in the world. This silica originates in feldspar deposits in the BC interior and is brought to the coast as sediment in rivers and streams.

Each siliceous sponge can grow up to 1.5 meters tall, yet it is a one cell organism. The sponge walls are thin and brittle, two to three millimetres in thickness, making them extremely fragile. Touch them and they break apart. When a sponge dies, its skeleton becomes part of the structure of the reef. Because the sponges are so delicate, the structure of the reef is dependent on the sponge's ability to trap sediment for strength and support.

Dr. Krautter emphasises how dependent the reefs are on just the right amount of input.

"If you have too high a sediment input, the sponges won't like it, they will die. And if it would be too low, the structure will collapse. It's a very balanced system. And that's just dealing with the sediment. It's also very balanced speaking about nutrients. There are many, many factors playing together in forming this little niche. That's why it's so unique."

Though the reefs have survived for 90 centuries, they have not escaped recent damage. The culprit? Bottom trawling.

"There's a LOT of damage," says Dr. Krautter. "Before we did the cruise in '99, we studied all these side-scan sonograms and based on this data we choose certain areas to go with the submersible. When we came here and went down with the sub we couldn't find any sponge anymore. It had been erased, like a desert."

The sponge reefs are large enough to withstand some damage – the most northerly reef for instance is more than 30 kilometres long and 12 kilometres wide – but nobody knows how much critical mass is needed to maintain the reefs. According to Dr. Krautter much of the most southerly reef has already been lost.

”And we know it is bottom trawling, because we could see the trawl marks. We could see the trawl marks on the side-scan and we saw it on the screen of the digital camera.”

Damage to the reefs is impossible to restore. Once a reef area is gone, it is gone forever. The reason for this is that the sponges need firm ground to settle on. The scouring action of the glaciers provided this solid base when the reefs were established following the last age of glaciation. Since then, however, much of the ocean floor has gradually been covered with a thick layer of sediment, making it impossible for the sponges to anchor themselves.

For Dr. Krautter the saddest part is that bottom trawlers shouldn’t even be on the reefs.

“Trawling makes no sense in these areas because we saw a lot of fish in the reefs, but only juvenile fish. Juvenile rock fish. It’s a nursery, a kind of kindergarten. They use the niches, the caves, the areas between the sponges to hide from predators. And after getting a certain size, they get out. If you erase the reefs, you will absolutely erase the fish stock.”

In July 2002, the sponge reefs got a reprieve of sorts. Robert Thibault, the Minister of Fisheries and Oceans, declared the sponge reefs closed to bottom trawlers. These fishery closures are a good start, but they lack permanence. Long-term protection is still needed for the reefs. Dr. Krautter would like to see the sponge reefs declared a Marine Protected Area and perhaps even a UNESCO World Heritage Site.

For a German scientist, Dr Krautter displays a lot of passion when it comes to the sponge reefs. He is clearly anxious not to lose this opportunity, an opportunity he never dreamed possible.

“These are absolutely the only siliceous sponge reef systems in the world,” he says. “We have an exceptional opportunity and maybe a last chance to learn more about these "living fossil reefs" and their environment and therefore we should use it!”

Years ago, a young German palaeontologist started looking for answers in the mountains of Europe. Now, the depths of Hecate Strait may finally provide him with those answers.

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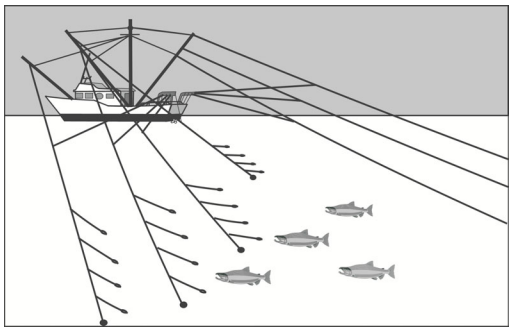
The Trouble with Trolling

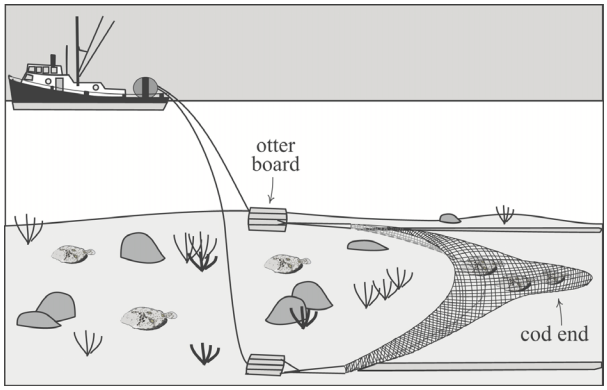
By Lynn lee and Berry Wijdeven

Trolling. It’s considered by many to be one of the least invasive methods of commercial fishing along the BC coast. There are no nets involved, by-catch isn’t much of a problem and there’s little impact on fish habitat. Fishers are dependent on fish striking the lures, providing at least a semblance of fairness.



Trolling • *illustration by Berry Wijdeven*

So what then is the trouble with trolling? Well, it turns out people sometimes confuse trolling with trawling. And trawling, now there's a whole different kettle of fish. Trawling's got "issues". Bottom trawling, commonly known as dragging, has come under attack for its impact on fish habitat as the heavy weights and big nets crush and flatten the sea bottom, damaging and destroying fish habitat and delicate ocean life. Equally troublesome is the catch of a substantial volume of undersized or unwanted fish, the so-called by-catch, while in pursuit of the legal-sized targeted fish species. There are also mid-water trawlers who don't damage fish habitat but can still produce substantial by-catch.



Bottom trawling or Dragging • *illustration by Berry Wijdeven*

By now you probably get an idea why trollers don't want to be confused with trawlers. To further clear the muddy waters, here is a brief description of these two commercial fishing practises in BC. Stay tuned for upcoming issues to learn about other coastal fisheries.

Trolling

First Nations people were the first on the coast to troll for fish. Using dugout canoes, they would hold the fishing line in their hand or wrapped around their paddle as they moved through the water. Nowadays, commercial fishing boats with poles and multiple fishing lines have replaced this traditional hand-lining technique. Some boats deliver fresh salmon to the packing plants, packing ice to chill fish caught over a maximum 10-day trip. Other, generally larger trollers, have flash freezers on-board, allowing them to freeze their freshly caught salmon and stay out on the water for several weeks.

On the BC coast, commercial trolling for salmon involves dragging up to six 300 metre long weighted stainless steel fishing lines with multiple hooks behind a moving vessel. The wily fishermen can be very selective and use knowledge about the behaviour of each salmon species to adjust lures, fishing depth, fishing location, fishing speed and other intuitive factors to catch the salmon of choice.

North Coast commercial salmon trollers target all five species of Pacific salmon: chinook, sockeye, coho, chum and pink, depending on the numbers of each species expected to return to major spawning streams. Of the different commercial methods of catching salmon (gillnet, seine and troll), trolling provide arguably the highest quality salmon to markets.

Although the majority of the BC troll fleet targets salmon, trolling is also used to catch albacore tuna further offshore and sometimes to catch lingcod and halibut. The BC recreational fishery also uses trolling to catch salmon and halibut, though recreational boats are usually smaller than commercial boats, ranging from small open skiffs to mid-sized motor cruisers. Recreational fishers can only use one single hooked line per fisher.

Trawling/Dragging

Trawlers are industrial fishing vessels designed to catch a lot of fish in one fell swoop. The boats drag a long wedge-shaped net that narrows into a funnel shaped bag called the “cod end”. On an otter trawl, the mouth of the net is kept open by water pressure on two “otter doors” situated on either side of the net. As the net is dragged along, fish in front of the net are forced into the cod end. Different sized nets are used depending on the fish species targeted in order to allow undersized fish to escape. Trawl tows can last for up to 3 hours, determined by fishing conditions and fish abundance.

Trawlers can drag a net in mid-water (pelagic trawling) and/or along the seafloor (bottom trawling). Mid-water trawling is used to catch fish like hake that school in large groups within the water column. Bottom trawlers target bottom-dwelling fish like cod, sole and flounder. In BC, trawl nets are often fitted with heavy pieces of rubber tire that roll the net along rough, rocky seafloor. There are also smaller otter and beam trawls used to catch shrimp. As their name suggests, beam trawlers use a metal beam instead of otter doors to keep the mouth of the net open. They also have a “tickler chain” in front of the net to cause shrimp to jump up out of the soft bottom. In “dredging”, a related form of fishing, nets with chain-mesh bottoms are dragged through soft bottom to catch scallops (common on Canada’s East Coast).

Trawling is not a particularly selective fishing method, providing high volume, lower quality fish to markets. An otter trawl can bring in 60 tonnes (12,000 lbs) of fish or more in one haul of the net. Good skippers can generally target and capture the fish species they are after, but it is impossible to avoid at least some bycatch. At times, trawlers can be responsible for a lot of bycatch, including fish and shellfish that have no commercial value, undersized commercial fish and commercial fish that they cannot retain either because they are not allowed to keep them or because they are over allotted quotas.

Then there is the habitat issue. Trawlers have a big impact on the sea bottom where fishing occurs. Everything in the path of the trawl net is disturbed and all animals at or near the bottom are removed or destroyed. Although some of these animals are quick to re-colonize a trawl area, many are slow to return and, if an area is constantly disturbed, some may never return.
As you can see, there’s a sea of difference between trolling and trawling. They just sound the same. And for trollers, that’s a bit of a drag.

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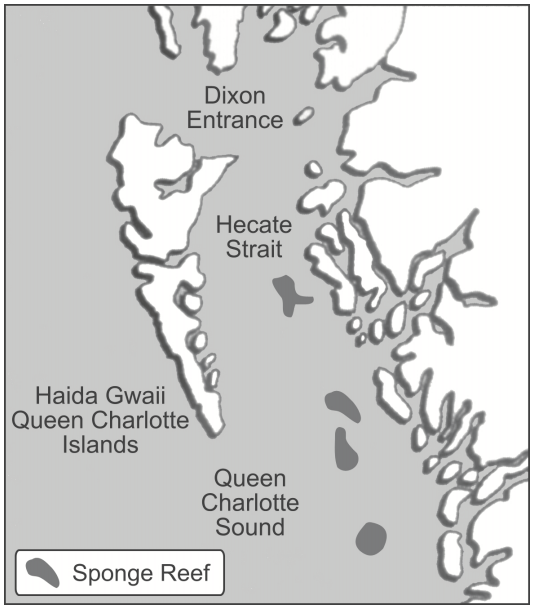
Save the Sponge

By Lynn Lee and Berry Wijdeven

On July 19th, 2002, the Minister of Fisheries and Oceans, Robert Thibault, announced that the four sponge reef areas in Hecate Strait and Queen Charlotte Sound would be closed to groundfish trawl fishing. Fishing industry groups, including the Canadian Groundfish Research & Conservation Society and the Groundfish Trawl Advisory Committee, proclaimed their support for this action and vowed not to fish the reefs again. Case closed, sponge reefs saved, right?

Well, maybe. Fisheries closures are temporary, defined in management plans that must be renewed on a yearly basis. If sponge reefs are to receive meaningful long-term protection, they would need Marine Protected Area (MPA) status with fishing activity restrictions under Canada’s Oceans Act.



Rough locations of sponge reefs • *illustration Berry Wijdeven*

The difference? Marine Protected Areas are proactive and planned with long-term objectives, while fisheries closures are generally reactionary and short-term. MPAs are created with active participation from interested and affected parties including fishers and local communities, whereas fisheries closures are implemented and maintained by government, with little or no community involvement. And while fisheries closures tend to be isolated and focussed on single or a few commercially important species, MPAs have a broader focus that can deal with many species, habitats and ecosystems. In short, MPAs can provide more secure, long-term protection.

While at the national level MPAs do not specifically exclude any human activities in the Pacific Region agencies have agreed that all MPAs should share minimum protection standards prohibiting ocean dumping, dredging, and the exploration for or development of non-renewable resources. There must also be a specific prescription in each MPA to limit other human activities. In the case of the sponge reefs, an effective MPA designation must additionally prohibit harmful fishing activities such as trawling and longlining.

A quick review of the Oceans Acts suggests that the sponge reefs are ideal candidates for MPA status, meeting all MPA objectives. Section 35 (1) of the Act states:

> *A marine protected area is an area of sea the forms part of the internal waters of Canada, the territorial sea of Canada or the exclusive economic zone of Canada and has been designated under this section for special protection for one or more of the following reasons:*
>
> (a) *the conservation and protection of commercial and non-commercial fishery resources, including marine mammals and their habitats;*
>
> *(b) the conservation and protection of endangered or threatened marine species, and their habitats;*
>
> (c) *the conservation and protection of unique habitats*;
>
> *(d) the conservation and protection of marine areas of high biodiversity or biological productivity;*
>
> *(e) the conservation and protection of any other marine resource or habitat as is necessary to fulfill the mandate of the Minister (of Fisheries and Oceans Canada).*

The sponge reefs are unique and should be protected. If you are concerned about their continued well-being and support their designation as MPAs with fishing restrictions, please send your valuable opinions to:

The Honourable Minister of Fisheries
House of Commons
Wellington Street
Ottawa, ON K1A 0A6

No postage is required.

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