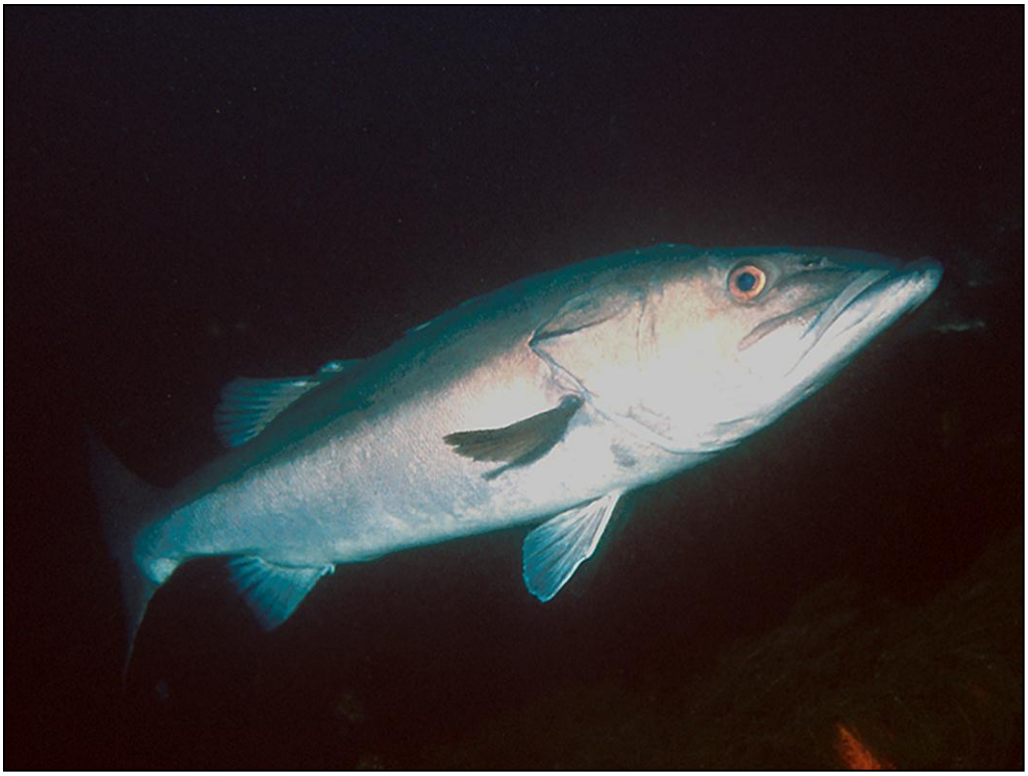
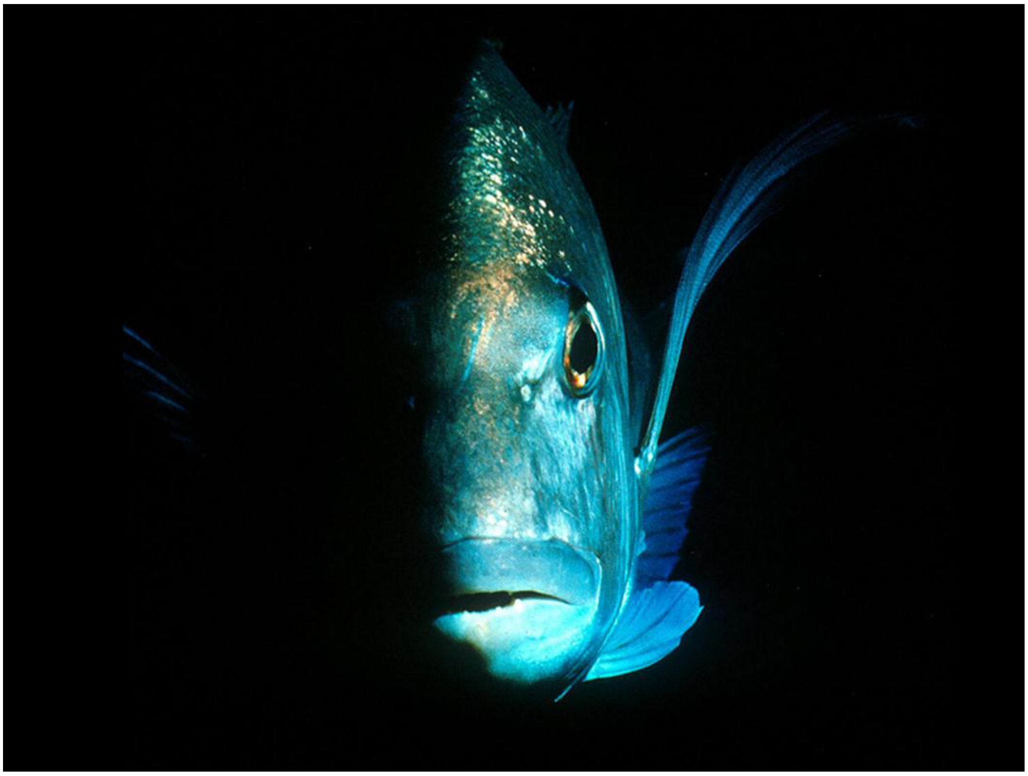
In New Zealand, when we talk of no-take zones in the sea we really mean marine reserves, set up under the Marine Reserves Act 1971. Although there are a few other ways of achieving full protection, the Marine Reserves Act is the specific piece of legislation designed for this purpose. It does have some short-comings, however, and to correct some of these a new Marine Reserves Bill has been prepared, but has been languishing in the storage cupboards of Parliament with no action for more than ten years.

New Zealand has about 30% of its land area protected for its natural values, mainly in National Parks and Regional Parks. In the sea we have only about 9% of our territorial seas protected in a similar way, for the purposes of biodiversity protection and scientific study. We need a network of marine reserves for the same reasons we have National Parks and other land reserves. Although there was a national goal of 10% of our territorial seas in protection adequate for biodiversity by 2010, (Biodiversity Strategy 2000), the timeframe was missed and the distribution of the existing protected areas is far from representative of all habitats. Most of the area is around remote offshore islands, with only about 1% on accessible mainland coasts.

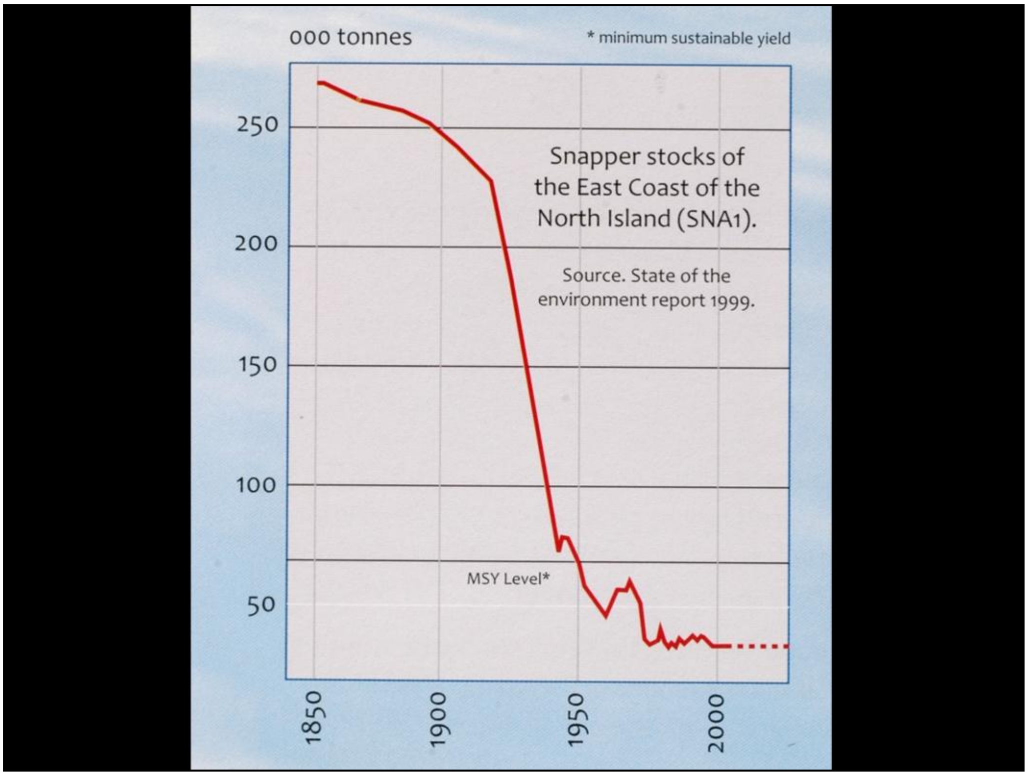
Lets look at some of the pressing reasons why we should have a good network of marine reserves, and why we should get on with this before too much more damage is done to our seas. One of the first things people do in new areas is go fishing. Inevitably the largest, most aggressive predatory fish are the first to be caught, like these kingfish. Large predatory fish at the top of the food chain have a major influence on the rest of the ecology, and their removal in quantity starts to upset the balance of our inshore areas. Our shallow reefs and other inshore areas have been seriously altered by removal of too many of their top predators.



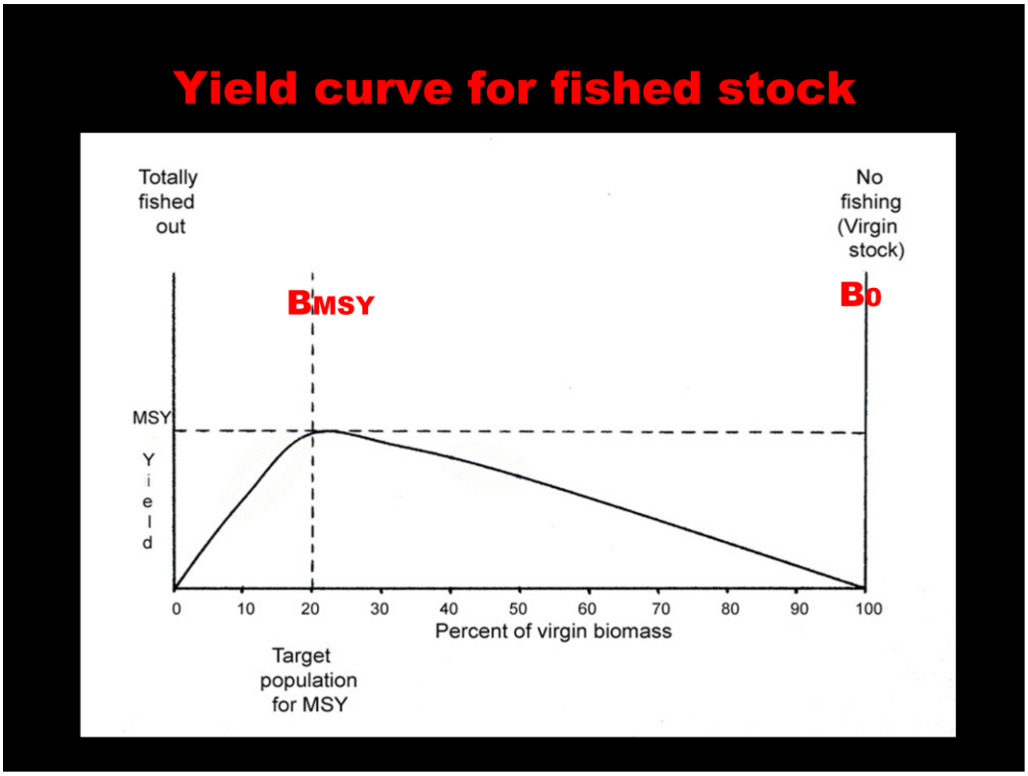
Hapuku is a classic example of overfishing. Few people realize that in the early half of last century hapuku were a common reef fish on our shallow coastal reefs. Now they are considered a deep water fish as they are extinct in diving depths, particularly in northern New Zealand. This photo I took at the Three Kings Islands in 1983, when I was witnessing some of the last hapuku to be seen by divers. We may never know what their ecological role was on shallow reefs. I believe their biomass is probably less than 5% of its pre-fished state, and their TAC (Total Allowable Catch) should be reduced to zero.



Let’s look at snapper, our most important northern fish from a recreational and commercial fishing point of view, as well as for the ecology of our coastal reef systems. We know more about the fisheries biology of snapper than any other fish so we should be able to get its management right.

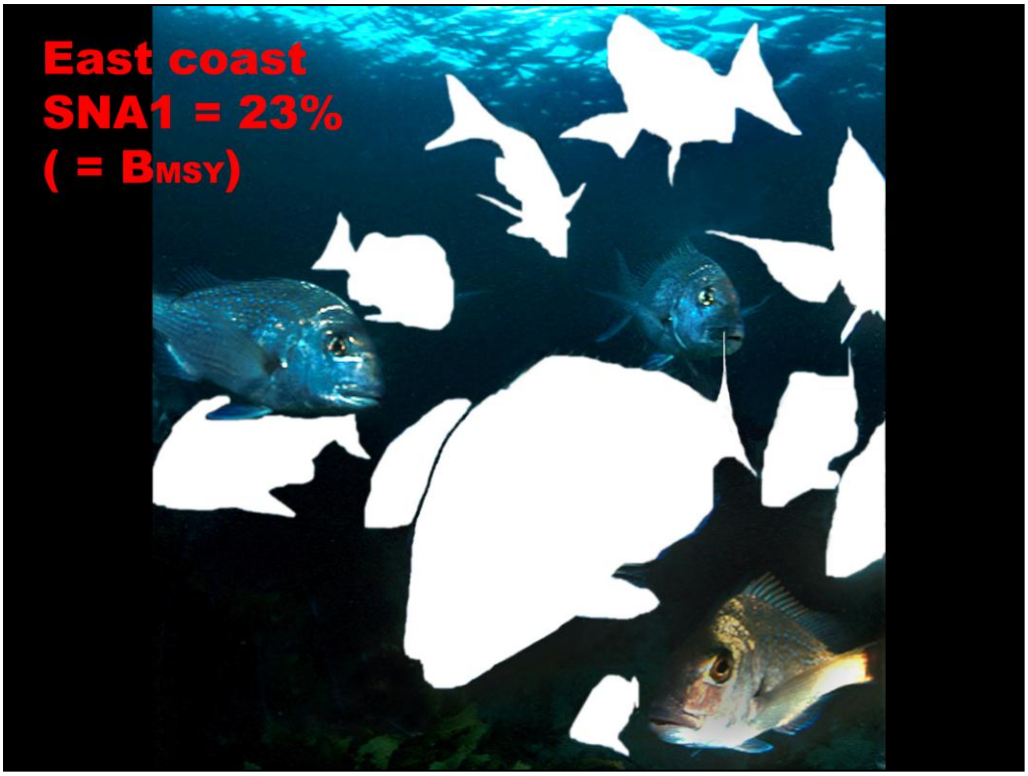


Historically, fisheries scientists tell us there were about 270,000 tonnes of snapper in northeastern NZ (SNA1) in 1850, before any large scale fishing commenced. In the early half of the 1900’s, snapper biomass declined rapidly when industrial-scale commercial fishing got started, using trawlers, pair trawls, long lines and Danish seine techniques. The Government was concerned at the rapid decline of our most important fish, and in 1986 brought in the Quota Management System to manage our fisheries. This is still regarded as one of the best fisheries management systems in the world, and its application arrested the drastic decline of snapper.

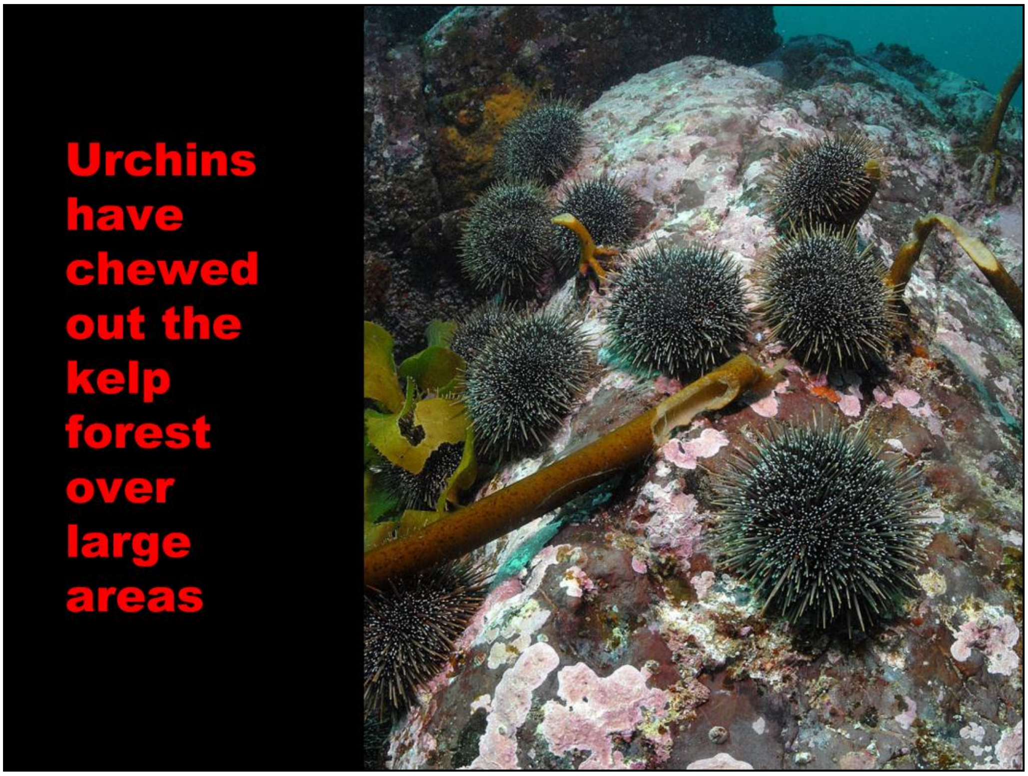


This graph is a yield curve, which is a somewhat simplistic view of how most of our fin-fish fisheries are managed. It can help us to understand how our snapper fishery has been managed up to recently. The vertical axis is the yield, which is how much biomass can be taken from the fishery annually on a sustainable basis. The horizontal axis shows the proportion of the pre-fished biomass remaining. At the right hand side the biomass is 100%, and yield is zero, representing the situation before any fishing started. At the left hand side the biomass is zero, and the yield is also zero, representing the hypothetical situation if all the fish had been taken and there were absolutely none left! If we apply this to snapper, fisheries science tells us that to be able to maximize the yield from the snapper fishery, we should reduce its biomass to about 20% of its pre-fished state. Actually the target has been 23% for some years. This is technically Bmsy – the biomass at which the maximum sustainable yield can be taken from the fishery. In other words we should remove nearly 80% of the snapper and try to keep the population at only 23% of what it naturally was, if we want to maximize the annual harvest, and hence commercial gain, from the fishery. Unfortunately removal of nearly 80% of snapper, a top predator on the reef, has serious ecological consequences which have not been adequately recognized by fishery managers and policy makers.

We can use this photo of a school of snapper to represent the pre-fished state of the snapper population. There are lots of snapper, including some larger ones.



In this photo I have removed most of the snapper including the larger ones, leaving just a few which represent 23% of the pre-fished state. This is how our snapper fishery has been managed up till recently. Most of the fish have gone, and their ecological role on our shallow reefs has been severely compromised. Unfortunately fisheries managers apply this management to the whole snapper population. They do not leave any areas unfished as a “control” for the big “experiment” which is fishing. Only in marine reserves are the fish protected from fishing.



One of the favourite foods of snapper is the kina or sea urchin. There have been so many snapper removed that kina have multiplied dramatically on our shallow rocky reefs. A favourite food of kina is the kelp Ecklonia, and kina have eaten most of the kelp on many of our reefs.

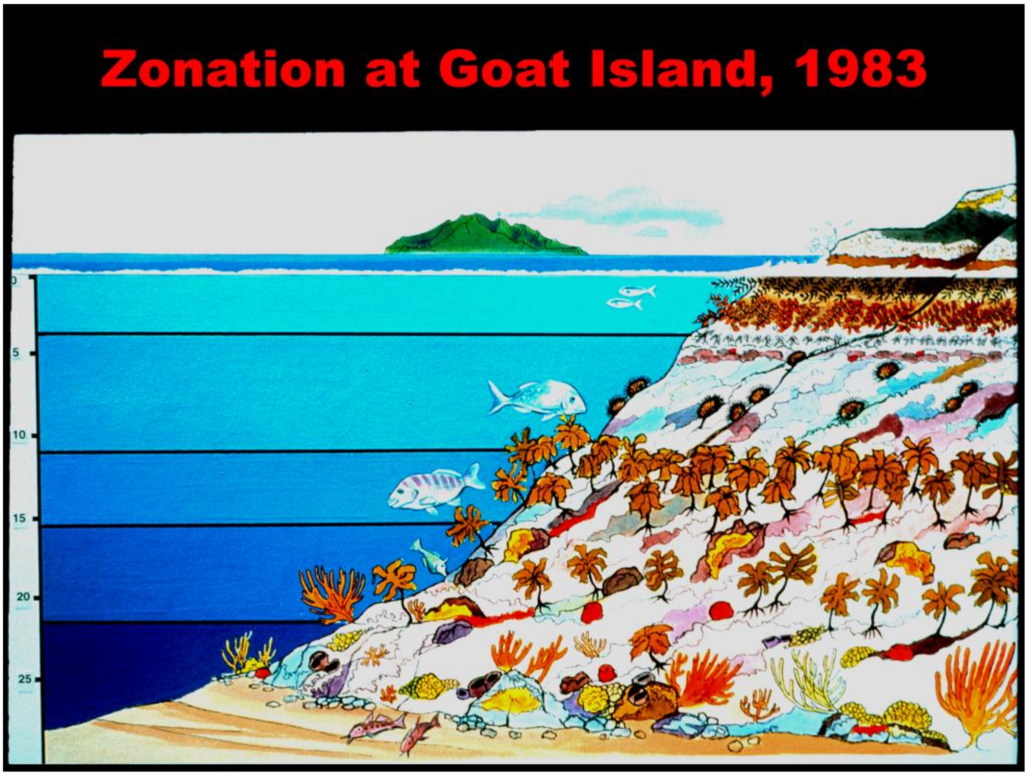
We are left with large areas of essentially bare rock covered in urchins. These areas we call kina barrens or urchin barrens, and now most of our shallow reefs from North Cape to East Cape are like this. The loss of kelp and its associated life is a serious degradation of our shallow reefs and a significant loss of biodiversity, brought about by not leaving enough snapper to carry out their ecological services. The urchins keep the rock bare by grazing at the surface.

I like to compare kina barrens with a paddock full of sheep. The sheep keep grazing the grass stopping it from growing tall.

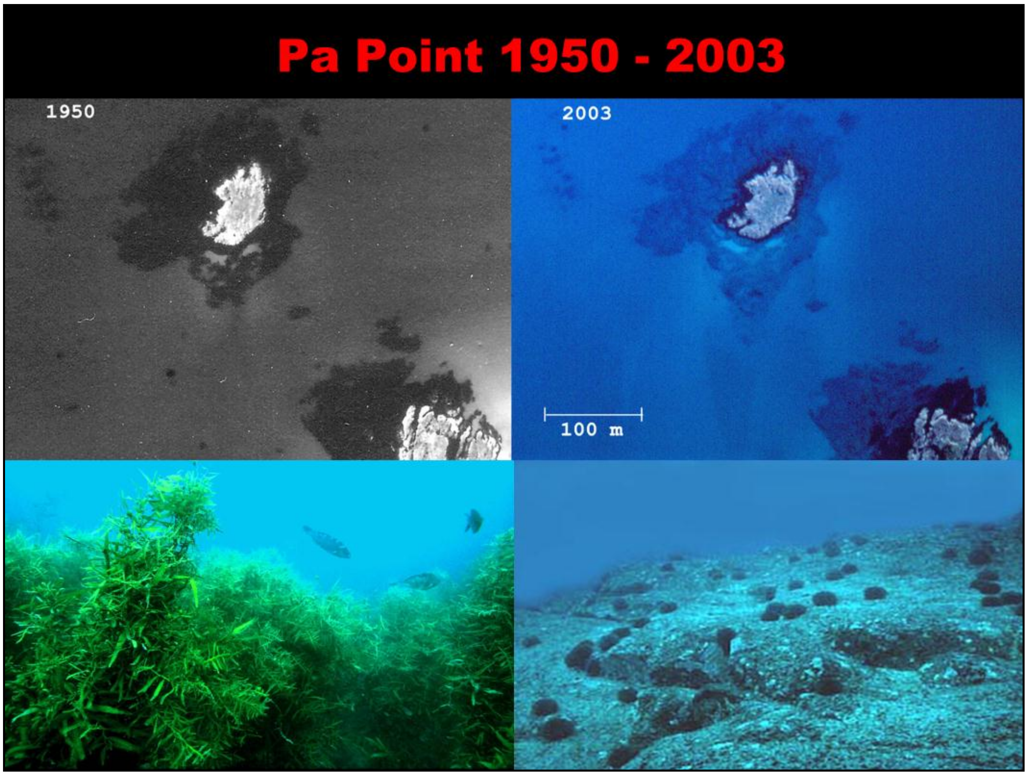
You would not expect a forest to grow in the presence of many sheep. The sheep keep grazing off any seedlings that may try to grow.

Similarly you would not expect sponges and seaweeds to grow in the presence of large numbers of kina. All this life is lost in kina barrens.

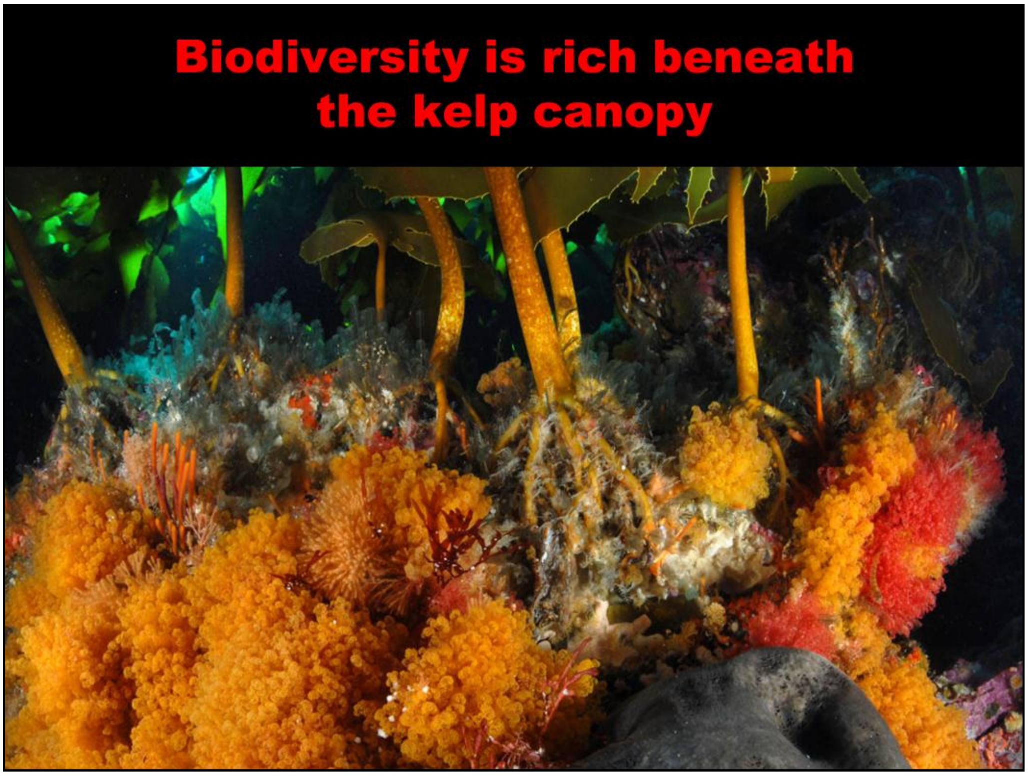
This is the Goat Island Marine Reserve, the first in NZ established in 1975. In the centre is Goat Island itself, with the Auckland University's marine laboratory on the shore behind the island. Research only possible in a protected marine reserve has revealed a huge amount of knowledge about our inshore seas and important commercial fisheries. Tawharanui Marine Reserve is on the peninsula at upper left.



This shows the underwater zonation pattern on the northeast corner of Goat Island, just a few years after the marine reserve was established. It is typical of the zonation of life on shallow reefs throughout Northland and the Bay of Plenty. Underwater zonation is influenced mainly by light and water movement. Just below low tide mark the shallow mixed algal zone is dominated by brown and red seaweeds, below which is the kina barrens. Below that is a dense band of the kelp Ecklonia, which thins out in deeper water as light levels reduce. On the deeper reefs large algae are absent and life is dominated by sessile colourful invertebrates such as sponges, bryozoans, ascidians and hydroids. In 1983 when I drew this diagram we thought the kina barrens zone was just a natural part of the zonation sequence. We now know that whole zone is an artifact of fishing. We know this because we now have enough marine reserves which have been in place for long enough for that zone to completely disappear. After protection snapper and crayfish numbers and sizes slowly built up to a point where they were able to eat the kina which allowed the kelp forest to return. This process takes about 12 to 15 years from protection.

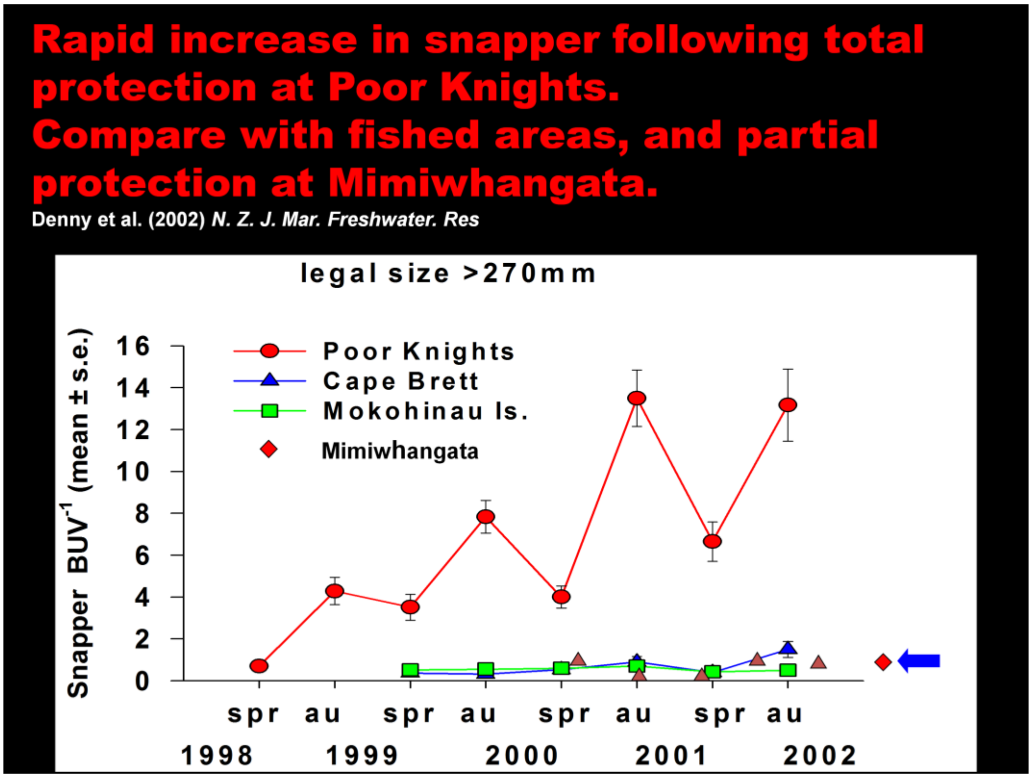


We can get an idea when the kina barrens appeared and how extensive they are by looking at aerial photographs. This shows a small area at Mimiwhangata in Northland, with a rocky headland and small offshore reef, photographed in 1950 and again in 2003. The pale background is sand and the dark area in the 1950 photo is rocky reef. It is dark because it is covered in tangle kelp as in the bottom picture. On the right the 2003 photo shows the rocky reef as pale, with just a dark fringe around low tide mark. The reef is pale because it lacks kelp and is a kina barren. In this area the change from kelp-covered reef to kina barrens happened about 1983 over a couple of years.



Kelp forest is very important to the ecology of the reef, by providing shelter for a vast variety of life which lives under the kelp canopy. Over 350 species have been found living amongst the holdfasts of the kelp. Remove the kelp cover and we lose all this biodiversity and the reef becomes an “ecological desert” with drastically reduced ecological value in the kina barren.

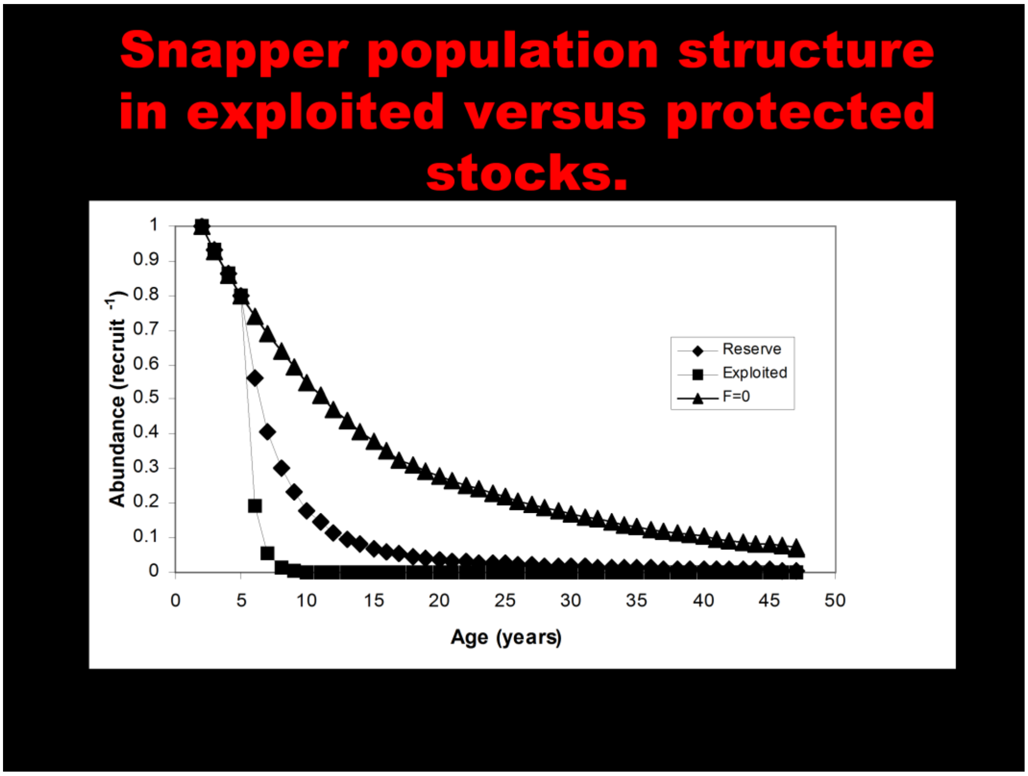
The Poor Knights Islands became a marine reserve in 1981, but initially it was only partly protected. No commercial fishing was allowed, but recreational fishing continued in most of the reserve. Scientists were concerned that marine life did not appear to be recovering as well as expected and in 1998 all fishing was stopped. Within two years snapper numbers increased 16 times and scenes like this were common. These snapper are too large to have settled there as larvae and grown to this size in two years. They must have moved in to the area, and decided to stay because there was now no fishing.



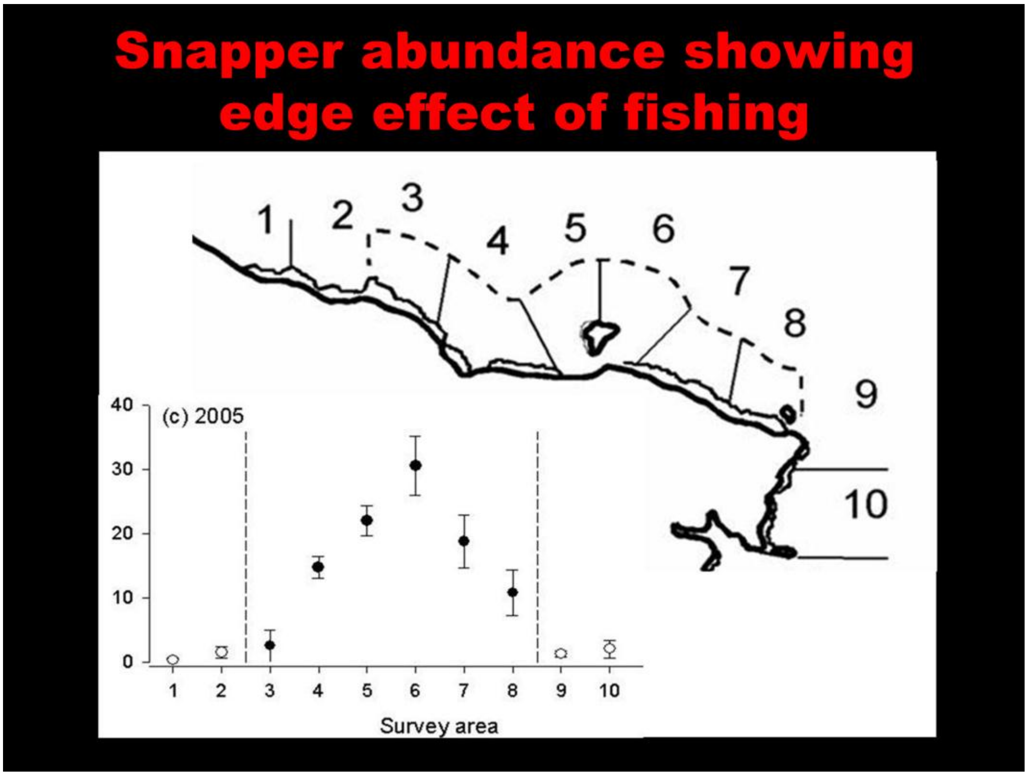
Monitoring at the Poor Knights following full protection showed a rapid increase in snapper numbers, with a clear seasonal change as some of the fish moved inshore and offshore seasonally, but the trend is clearly upward. At the same time monitoring at geographically similar fished sites at Cape Brett and the Mokohinau Islands showed consistently very low numbers of snapper.

After ten years of full protection there were many large snapper at the Poor Knights, having had a chance to grow older and larger because there was no fishing. The Poor Knights situation shows how the snapper population was suppressed by recreational fishing, despite commercial fishing being banned since 1981. Partial protection did not work.

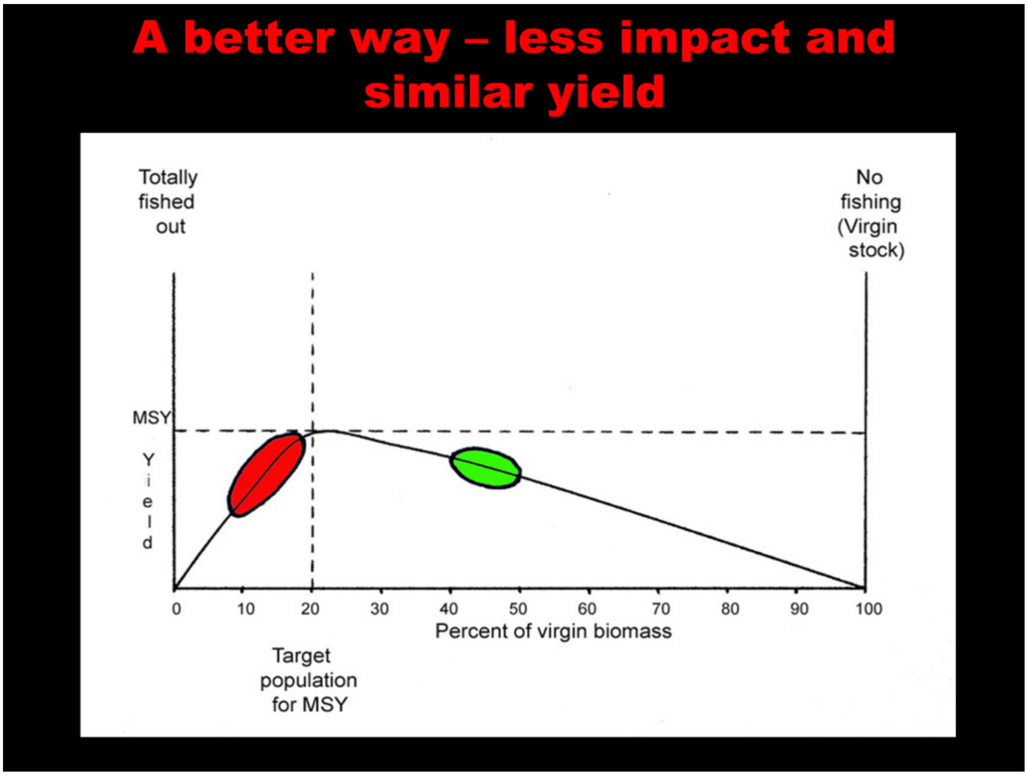
We know from many studies that large fish are the best breeders. Not only does a large fish produce disproportionally more eggs than smaller fish, but a large fish will spawn several times in a season whereas a first-time breeder may spawn only once. The eggs from a large fish are also larger and of better quality, giving the resulting larval fish a better start in life. There are also genetic and social benefits from having many large fish in the population, which now only happens in no-take marine reserves.



The population structure of snapper is influenced markedly by fishing, with larger fish being preferentially removed by fishing. This graph shows the difference in the population structure in the unexploited stock (top), the Goat Island marine reserve (middle), and the fished SNA1 stock of northeastern New Zealand. In the unexploited stock there are many 20, 30, and 40 year old fish. Snapper will live to around 60 years given a chance. In the SNA1 stock nearly all the fish disappear as soon as they reach a legally takeable size at around six or seven years of age. There are very few older fish in the exploited stock. At Goat Island marine reserve there are many more older fish than in the exploited stock, with 15 and 20 year old fish present, but the population structure is nowhere near that of the unexploited stock and will never reach that state because the reserve is too small for that to happen.



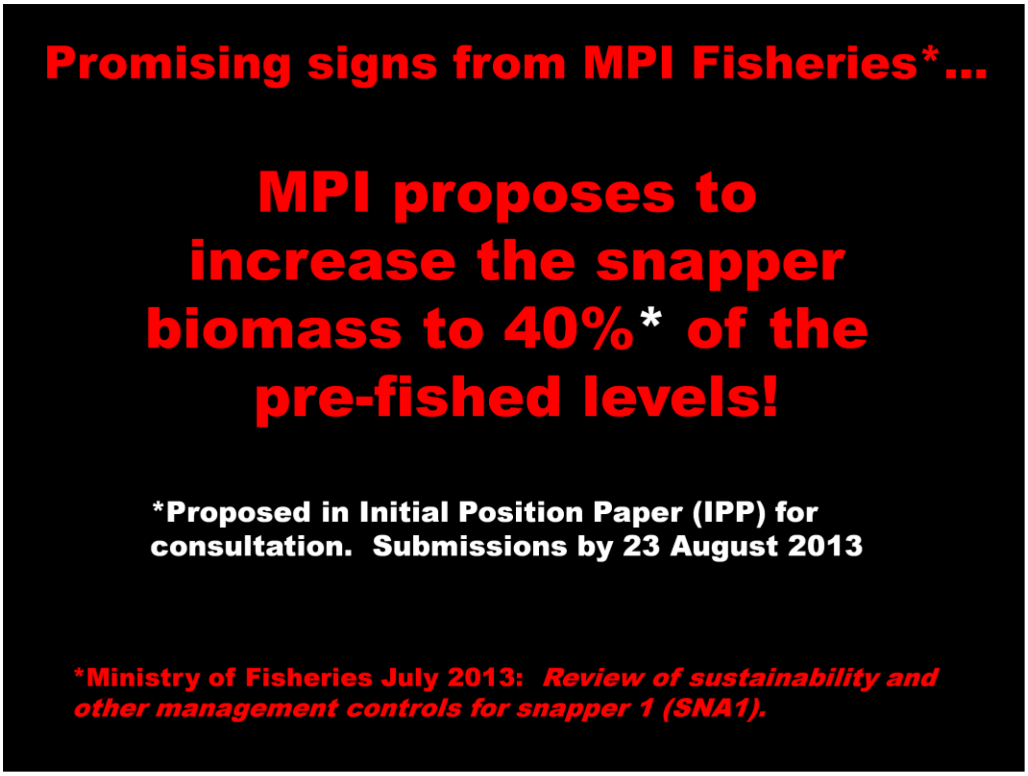
Fishing around the edges of a marine reserve influences the fish population inside the reserve by a phenomenon known as the edge effect. At Goat Island marine reserve scientists divided the reserve and adjacent coast into 10 zones, and measured the numbers of snapper in each zone. They found very low numbers in the fished areas off each end of the reserve, and numbers increasing to a peak in the middle of the reserve. They could tell that fishing just outside the reserve affects numbers of snapper inside the reserve for a distance of about two kilometres. Fishing outside the reserve stops the snapper population building up inside the reserve to its pre-fished population structure. Scientists could tell that if you wanted to restore the snapper population to its pre-fished structure you would need a marine reserve at least 40 square kilometres in area. The Goat Island marine reserve is only 518 hectares or a little over 5 square kilometres.



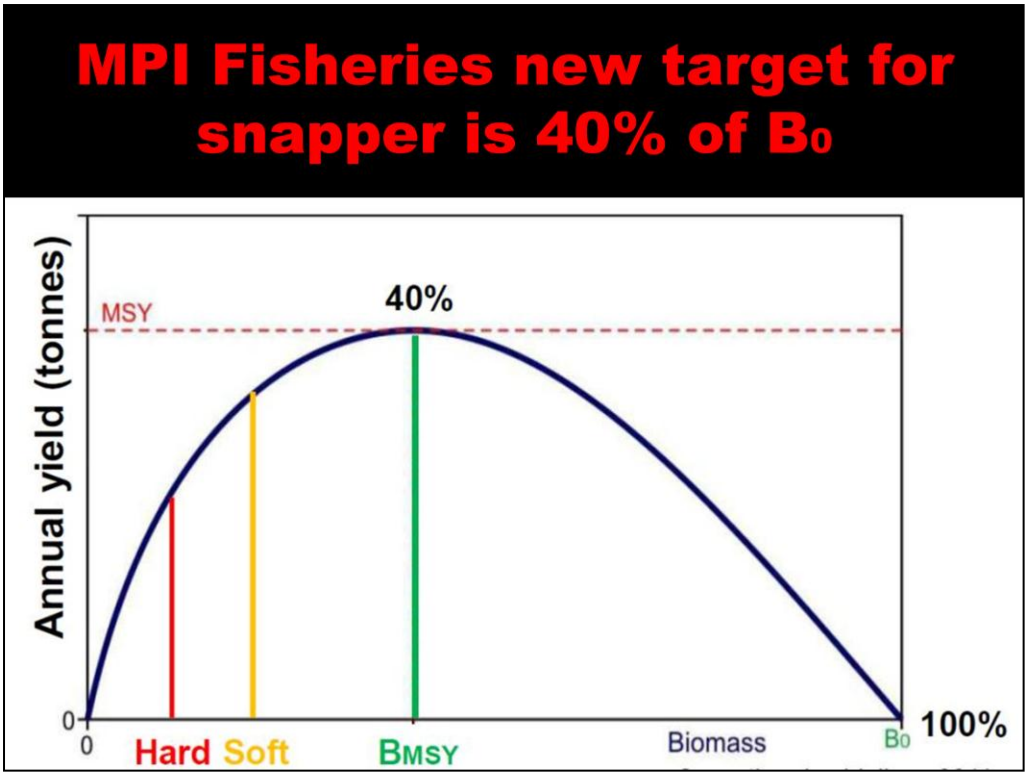
Getting back to the yield curve, it is not surprising that the impacts of fishing on the ecology of our seas are enormous, particularly in inshore areas, when we consider that it is Government fisheries policy to exterminate approximately 80% of the commercial fish stocks of most species (which are in general high-end predators within the ecosystem) and attempt to maintain them at only about 20%. This is in order to achieve the Maximum Sustainable Yield from the fishery, or the most weight, and hence monetary value, that can be taken from the system on a sustainable basis. And they apply this policy EVERYWHERE there is not a marine reserve or some sort of fisheries closure. Trying to keep the stock at about 20% is “knife edge” management. A lot of expensive research is required, and feedback into quota levels and management, in order to ensure that the stock remains on target. Usually there is not enough information on which to base critical decisions. The shape of the curve changes rapidly around the 20% level, and a small mistake in allowable catch can push the population over the edge on to a very steep part of the curve, leading rapidly to a population crash. On the west coast and in the Bay of Plenty the snapper stocks are below 10% and there is a good case to close the snapper fishery in those areas. In the Hauraki Gulf snapper stocks are hovering around the 20% level. Even if they get it right and can maintain the stock at 20 or 23%, this takes no account of the effect on other parts of the ecosystem. Even a schoolkid can understand that if you take out 80% of the population of a top predator from ANY ecosystem, this will have severe repercussions through the rest of the ecology. This effect is called a “trophic cascade”. With over 80% of the snapper (and crayfish) gone from the east coast, we can see some of the more obvious trophic cascade effects. The extent of kina barrens, for example, is a result of not leaving enough snapper and crayfish in the system, and the kina have multiplied and eaten large areas of kelp, with severe impacts on biodiversity of shallow rocky reefs. The graph can give us an indication of how fishing could be better managed. A target of 20% for Bmsy is difficult to maintain and several fisheries are running at under 20%, so they are not achieving MSY and are putting at risk the very population they are fishing as well as causing severe impacts on the rest of the ecology. The red bubble on the left shows the area in which several fisheries are operating, including snapper on the west coast and in the Bay of Plenty. If fisheries managers tried to maintain the biomass at around 45% instead of only 20% there would be many advantages. The actual yield achieved at 45% biomass is about the same as what is achieved in the overfished state in the upper part of the red bubble, or about what the SNA1 stock is producing at present. But at 45% there are many advantages: (a) that part of the curve is fairly flat so an error in estimates makes relatively little difference to the yield, (b) it provides a huge safety buffer, guarding against sudden crashes in the population, (c) the trophic cascade impacts on the rest of the ecology is minimal, (d) the population will contain many large individuals (virtually absent below 20% stock level) which are the best breeders, (d) these large fish maintain the rest of the ecology in a healthier state and can remove kina and thus help restore healthy kelp forests, (e) they help maintain genetic diversity in the population, (f) they provide much better trophy fish for recreational anglers, (g) the higher population makes it quicker and easier and cheaper for commercial fishermen to catch their quota, (h) the larger (older and wiser) fish probably have other important social and breeding functions that we don’t even know about.

The photo shows how a population of 46% of the pre-fished biomass would look. A lot more fish, including more of the larger, older individuals.

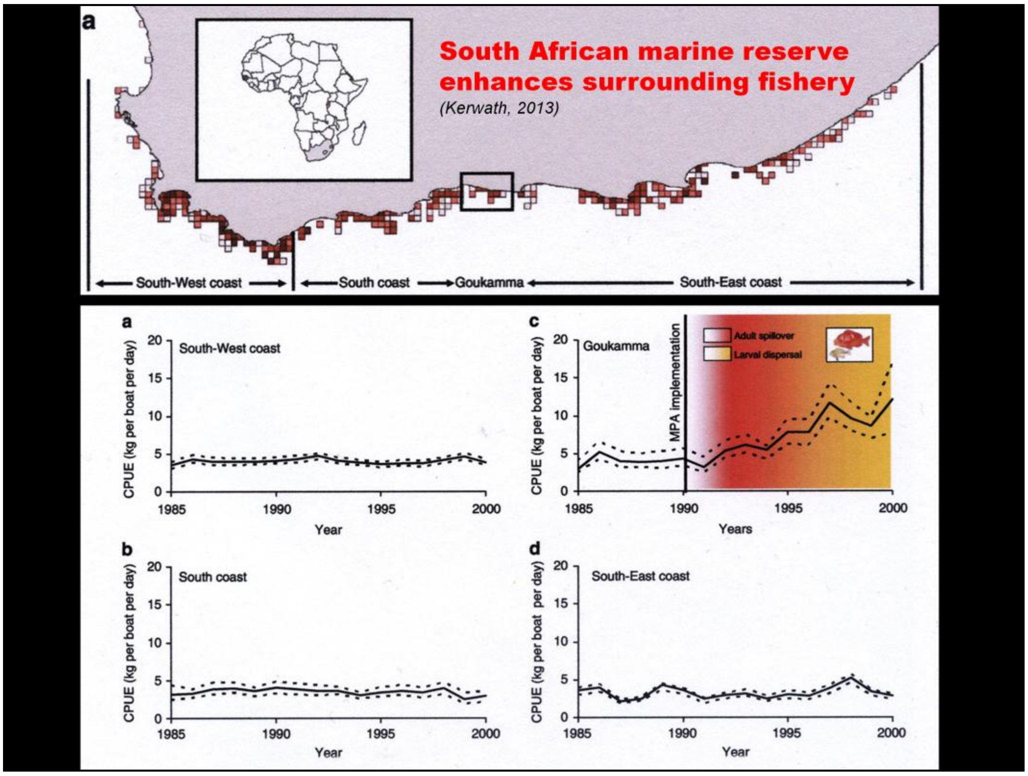
Recently there have been promising signs from MPI Fisheries who seem to be coming to a realization that there are benefits to leaving more fish in the sea. They realize that more fish can be left in the sea with very little sacrifice in terms of yield from the fishery. Leaving more fish in the sea reduces the risk of a population crash, and can actually increase the catch per unit effort and thus reduce the cost of catching fish.



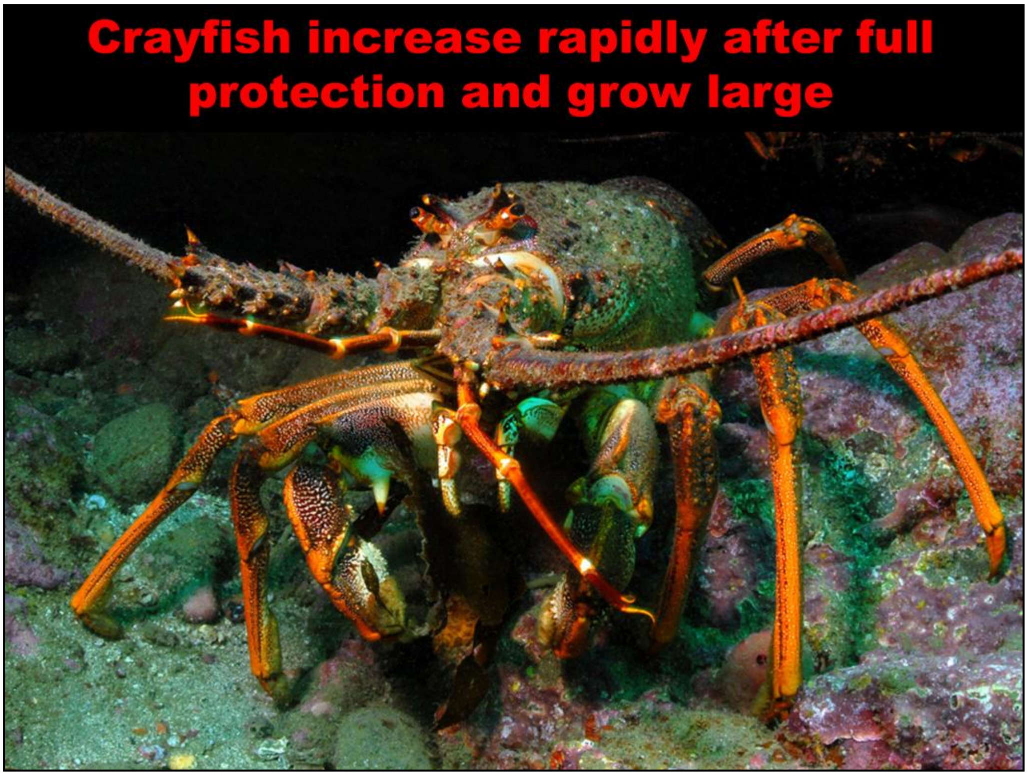
So MPI has launched a process to increase the snapper biomass to 40% of its pre-fished state. This is a very good move and MPI should be congratulated, but unfortunately the appreciation was lost in the political fuss resulting when recreational fishing allowances and fish sizes were reduced in order to start toward the re-build.



The yield curve for snapper has now been re-written by MPI, and they now believe Bmsy should be set at 40% of the pre-fished biomass, with “soft” and “hard” targets at 20% and 10% respectively. The hard target should be the point at which the fishery is closed.

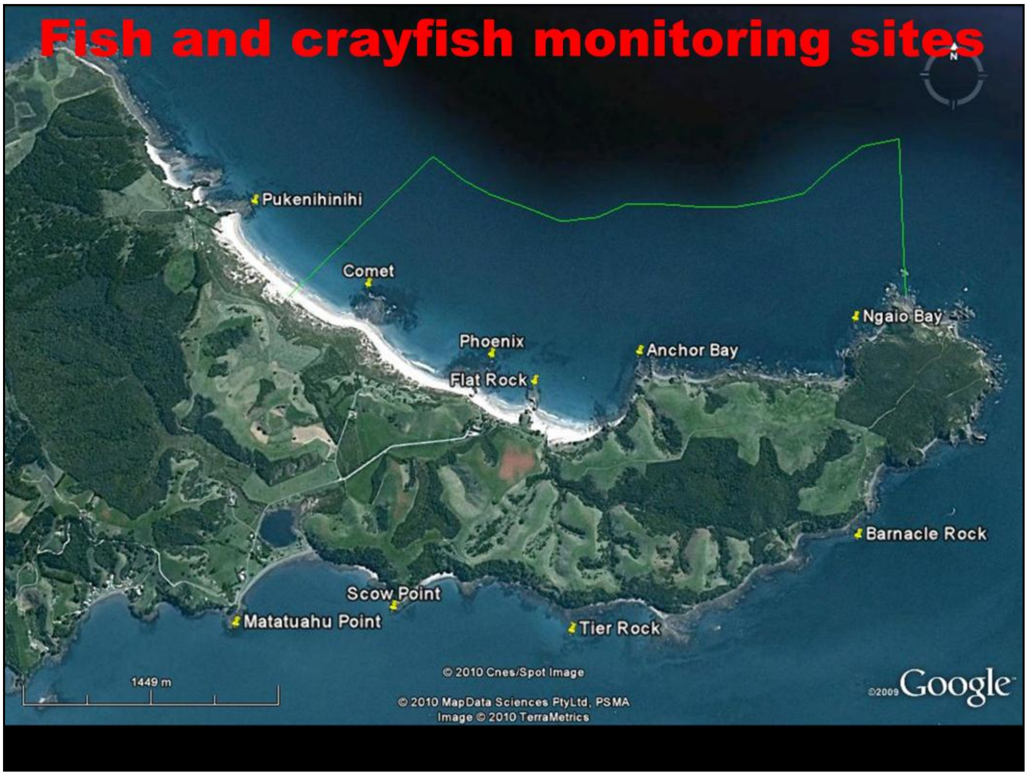


Sometimes fishermen want assurances that marine reserves will improve fishing elsewhere. In New Zealand hard data on this is difficult to produce, but a recent study from South Africa gives us a good example. A small boat commercial fishery for a fish very similar to our snapper has shown that, within 30 kilometres of a fairly large marine reserve catch per unit effort doubled in the ten years following protection, whereas in fishing areas remote from the marine reserve catch per unit effort remained constant.

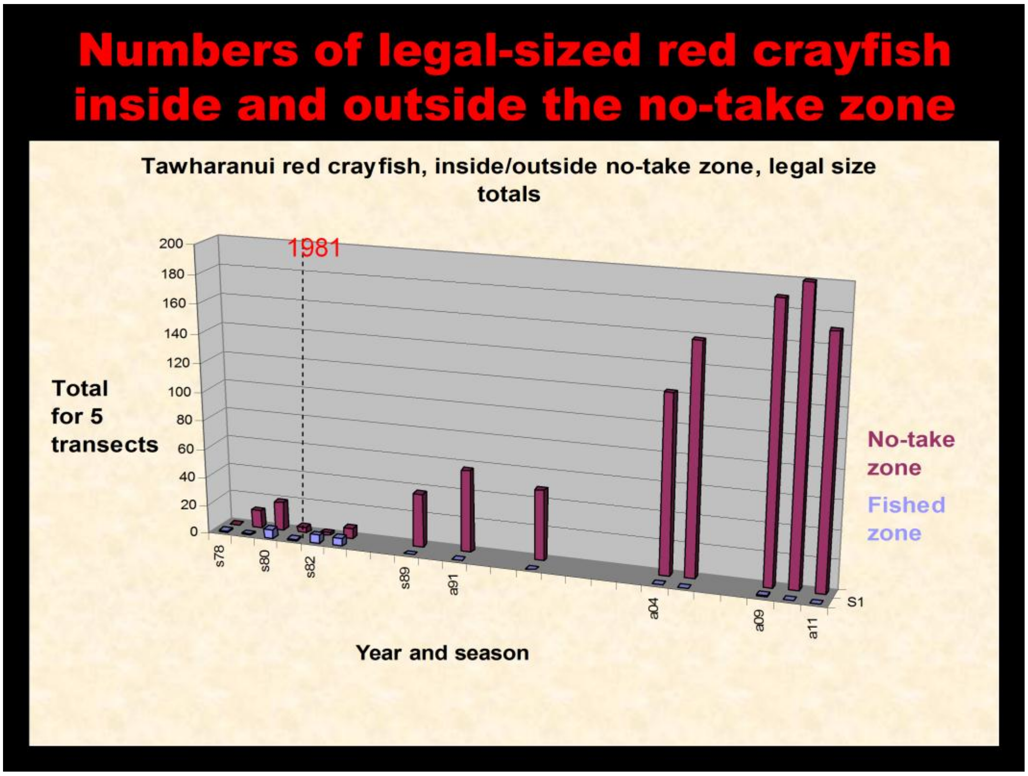


Lets look at crayfish in relation to protected areas. We now have several examples that show that after full protection crayfish can increase in numbers and grow old and large.

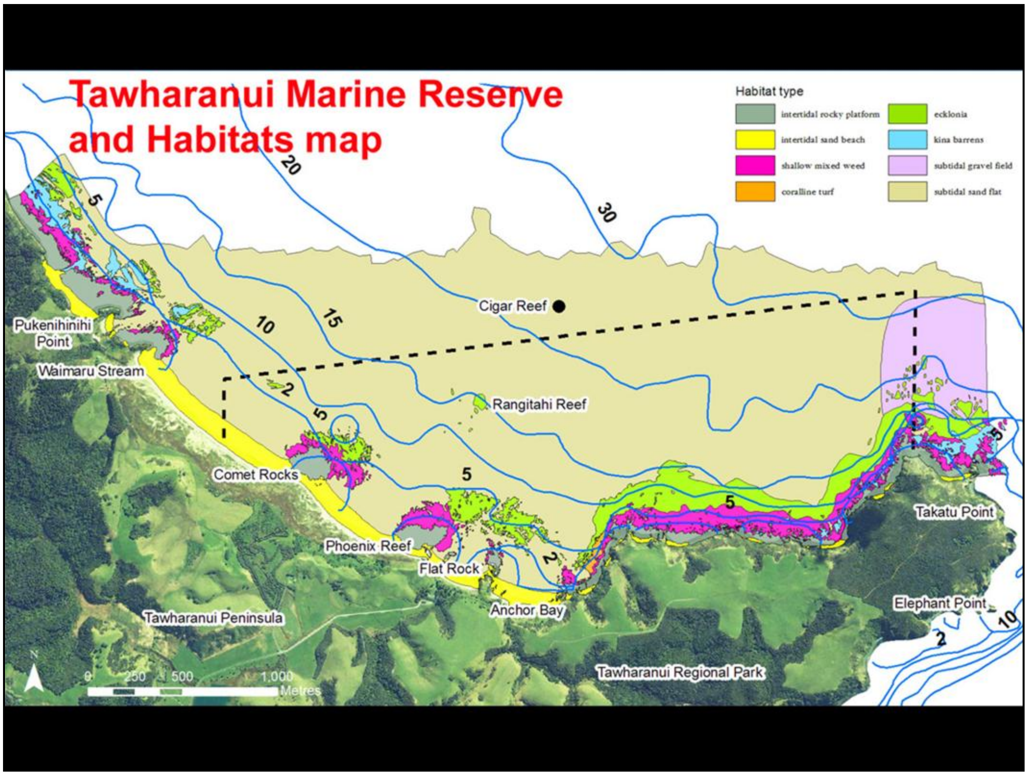
At Tawharanui Marine Reserve I have been monitoring fish and crayfish since 1977, a few years before any protected status was introduced.



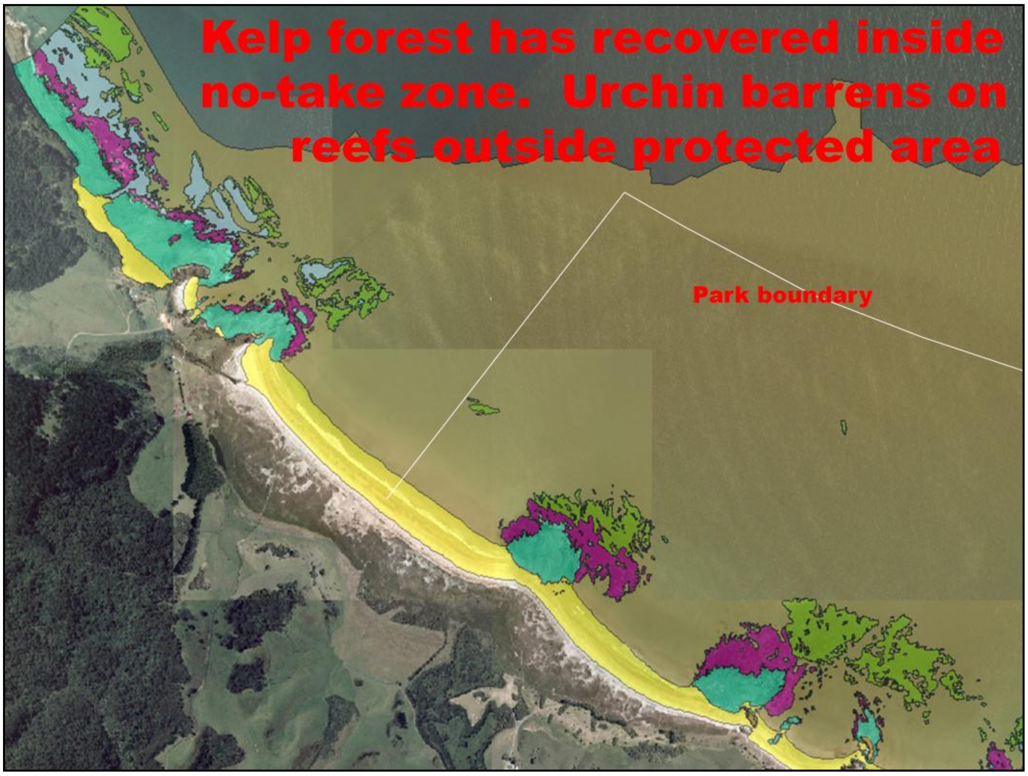
The green line indicates where no-take status was given to marine life in 1981 in what was then a Marine Park under the Fisheries Act. The yellow markers indicate my sampling stations, five of which are inside the protected area and five are in the fished areas outside the Park.



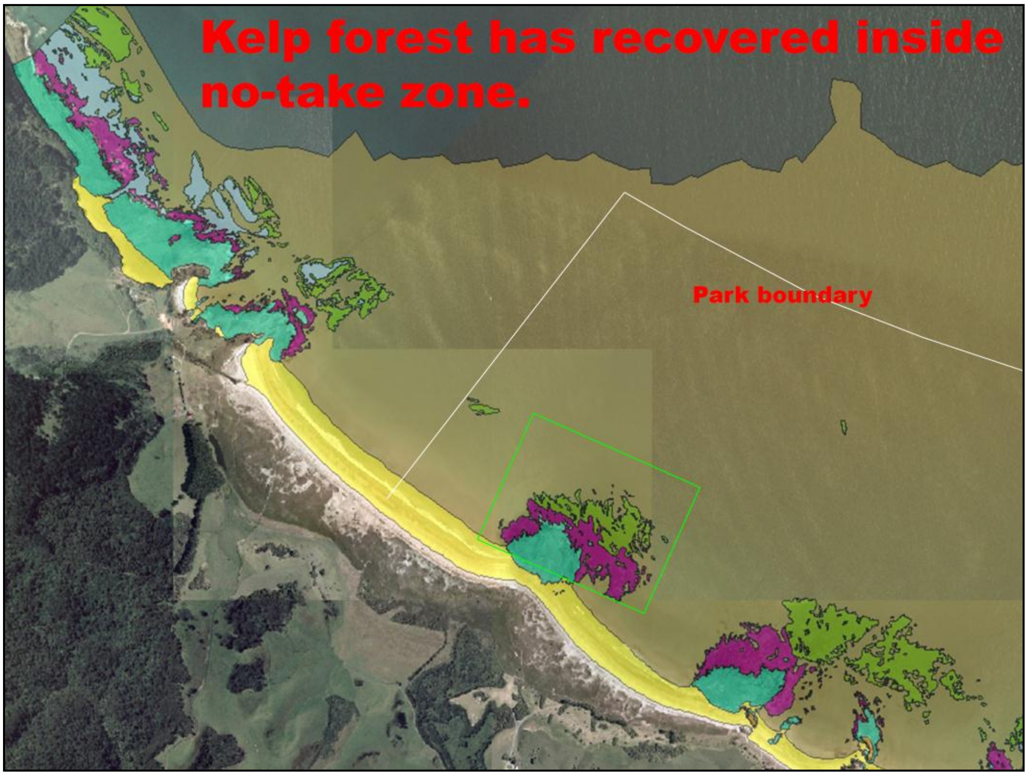
The graph shows changes in numbers of legal-sized red crayfish since 1978. Numbers were very low at the start of the monitoring programme, following severe fishing-down of crayfish generally in the 1960's and 1970's. The blue graph shows that, following protection inside the Park in 1981, crayfish continued to decline to virtually zero outside the Park and stayed that way to 2011. Meanwhile inside the protected area crayfish numbers increased, slowly at first, but then more rapidly to a peak of 1000 legal-sized crayfish per hectare in 2010. A slight drop since then, and to 2013 (data not yet entered), probably indicates a migration or "spill-over" of legal-sized crayfish into fished areas outside the Park. In the early days of protection when the habitat was still degraded kina barrens, the accumulation rate of legal-sized crayfish (productivity?) inside the park was 22 kilogrammes per hectare per year (1982 to 1991). In the later part of the study period when the habitat had recovered to healthy kelp forest, the accumulation rate of legal-sized crayfish was 70 kilogrammes per hectare per year (about 2000 to 2010). This suggests that the healthy reef ecosystem is over 3-times more productive in terms of crayfish numbers than the degraded kina barrens during the early days of protection. Does this suggest that, if our shallow reefs were allowed to recover to a healthy kelp-dominated state, the sustainable take of crayfish could be 3 times more than the current harvest?



Protected areas are not just about helping crayfish and snapper numbers recover. More importantly they are about biodiversity recovery and protection. This is a marine habitats map of Tawharanui Marine Reserve, showing the new boundary of the marine reserve created in 2011. The shallow reefs are coloured purple and green, representing two types of kelp forest. Outside the marine reserve to the east and west a pale blue zone is sandwiched between the purple and the green. This is the kina barrens zone, and represents seriously degraded reefs which continue to North Cape and East Cape wherever there is NOT a marine reserve, or a few other situations where kina barrens do not occur.



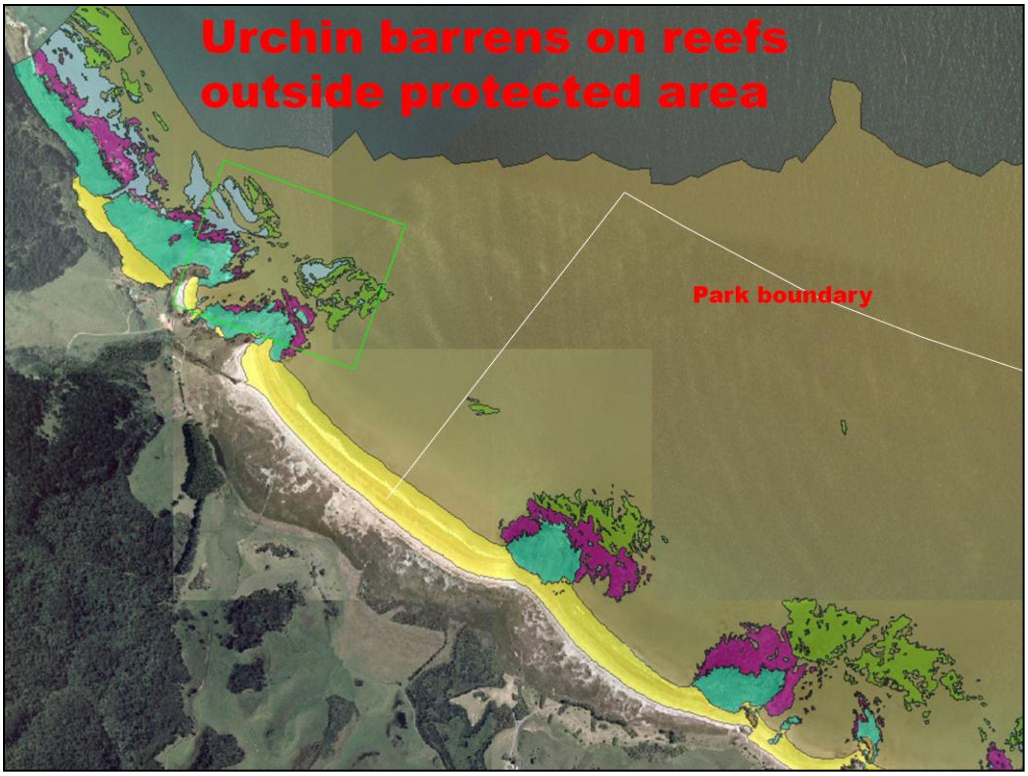
A closer look at the western end of Tawharanui Marine Reserve shows more detail. The reefs to the east and west of the protected area boundary are each about 500 metres from the boundary.



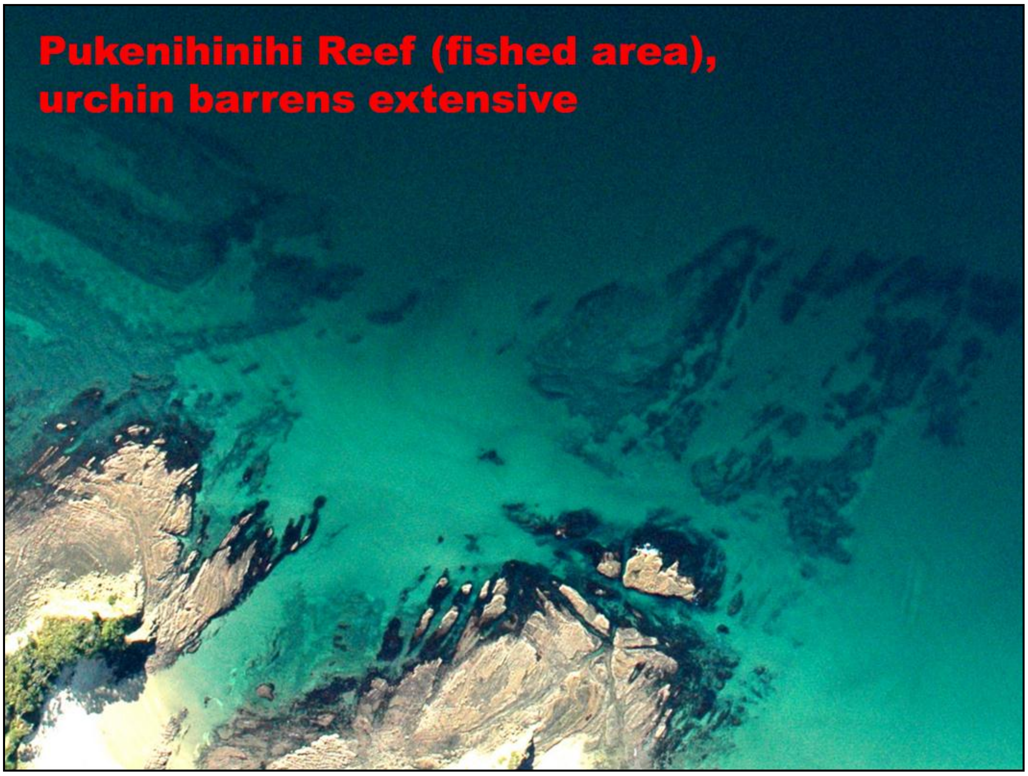
At Comet Rocks inside the reserve, the kelp cover is continuous from the intertidal rocks down to the sand.

This shows in the aerial photograph as a continuous dark colour on the submerged reef.

It is dark because it is covered in kelp, with all its rich biodiversity protected beneath.



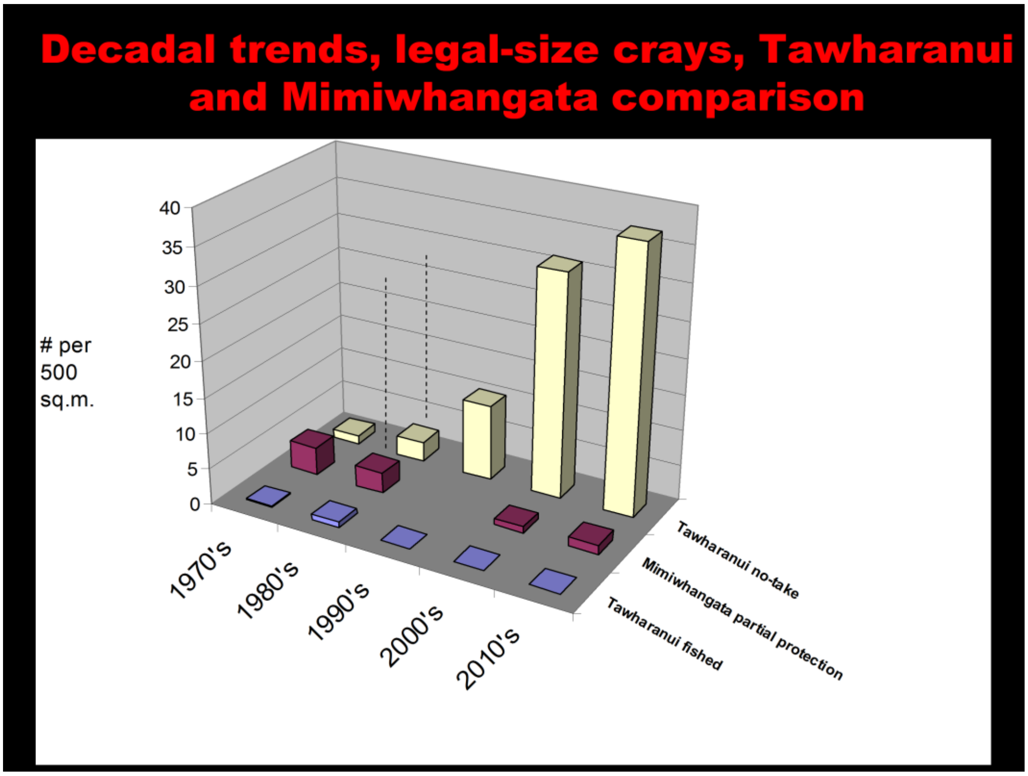
At Pukenihinihi Point outside the reserve, the pale blue indicates kina barrens between the purple and green kelp forest zones.



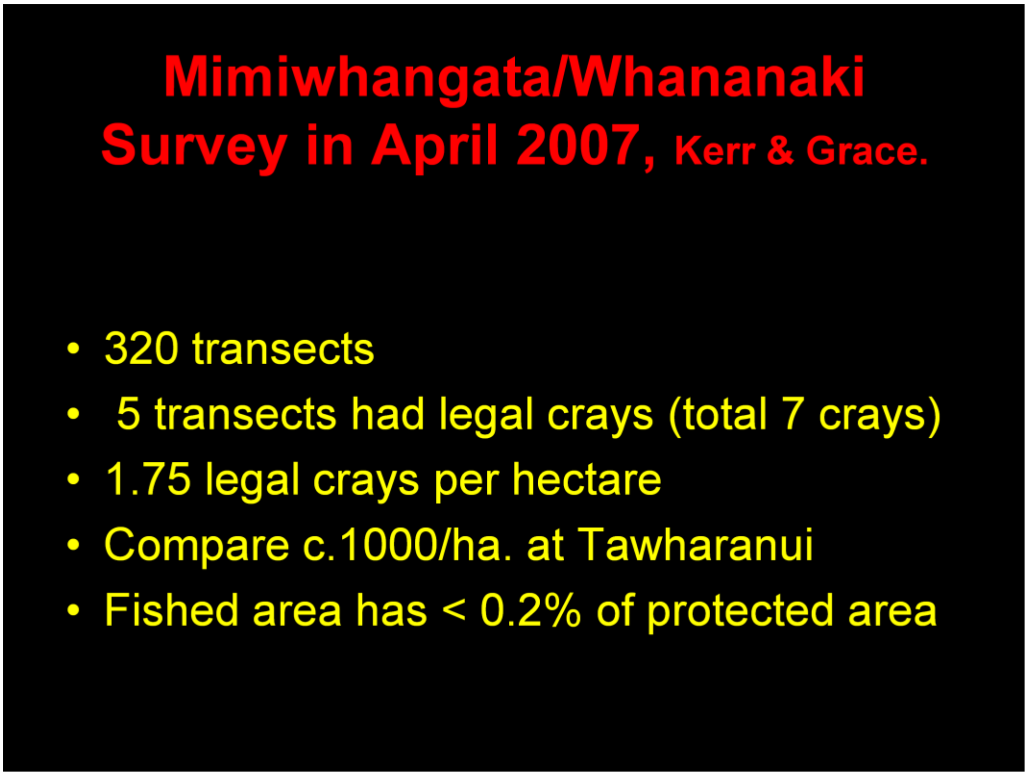
The aerial photo shows extensive pale areas on the shallow reefs, with just a fringe of dark algae around the low tidal rocks and close to the sand.

The pale areas are kina barrens – heavily degraded reef areas because there are not enough snapper and crayfish to keep the kina numbers down to a level where the kelp forest can survive. The kina have eaten all the kelp and maintain the rock surface relatively bare by their continual grazing activities. This is a serious loss of biodiversity on our shallow reefs brought about by too much fishing.

At Mimiwhangata Marine Park on the Northland east coast there has been no commercial fishing since 1994 and some restrictions on recreational fishing since 1984. I have been monitoring marine life since 1976 in a parallel programme to that running at Tawharanui. We have a unique situation where we can compare a partly protected park (Mimiwhangata – no commercial fishing) with a fully protected area (Tawharanui), by the same methods and over a similar long time frame.



In this graph I compare crayfish results in three scenarios – Tawharanui fished in blue in the foreground, Mimiwhangata partly protected in red in the middle, and Tawharanui totally protected in yellow in the background. These are legal-sized red crayfish, and I have grouped the data into five decades, from the 1970's to the 2010's. The vertical dotted lines indicate the period in which the protection regime started. In the fished area at Tawharanui crayfish dropped away to virtually nothing and have stayed that way. At Mimiwhangata crayfish started at a higher level probably because it is remote from population centres and there were still some residual crayfish remaining in the 1970's, but the following trend was downwards despite no commercial fishing. At Tawharanui in the area protected since 1981 crayfish increased dramatically. This clearly shows that removing commercial fishing for crayfish and allowing recreational take has no long-term beneficial effect. Partial protection, by banning commercial fishing, is ineffective at restoring crayfish.

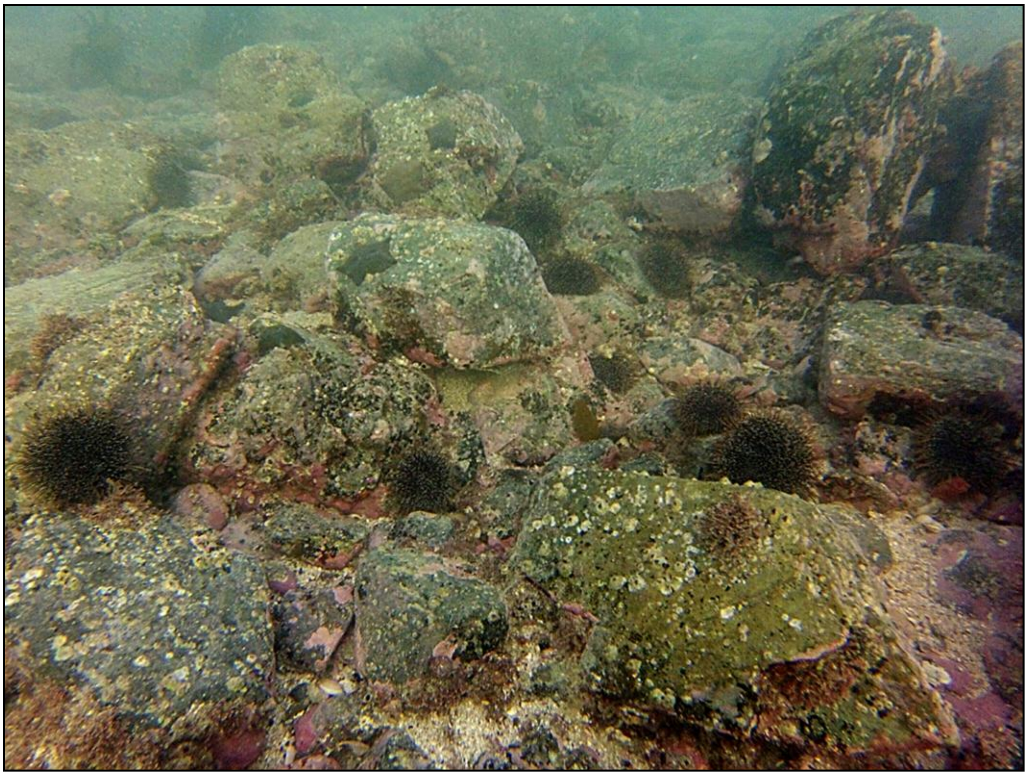


Between Whananaki and Oakura, including Mimiwhangata Marine Park, we did a survey in 2007 of crayfish on shallow rocky reefs. Out of 320 transects only five had any legal-sized crays, totaling only seven individuals. There was no difference inside from outside the Marine Park. This represented 1.75 legal-sized crayfish per hectare on what is typical Northland east coast shallow reefs. Compare this to the 1000 crays per hectare at Tawharanui Marine Reserve and we get an idea of how bad the crayfish situation is in eastern Northland. If we assume the Tawharanui situation represents the natural pre-fished population level on northern shallow rocky reefs, then the Mimiwhangata/Whananaki reefs have less than 0.2% of the pre-fished population.

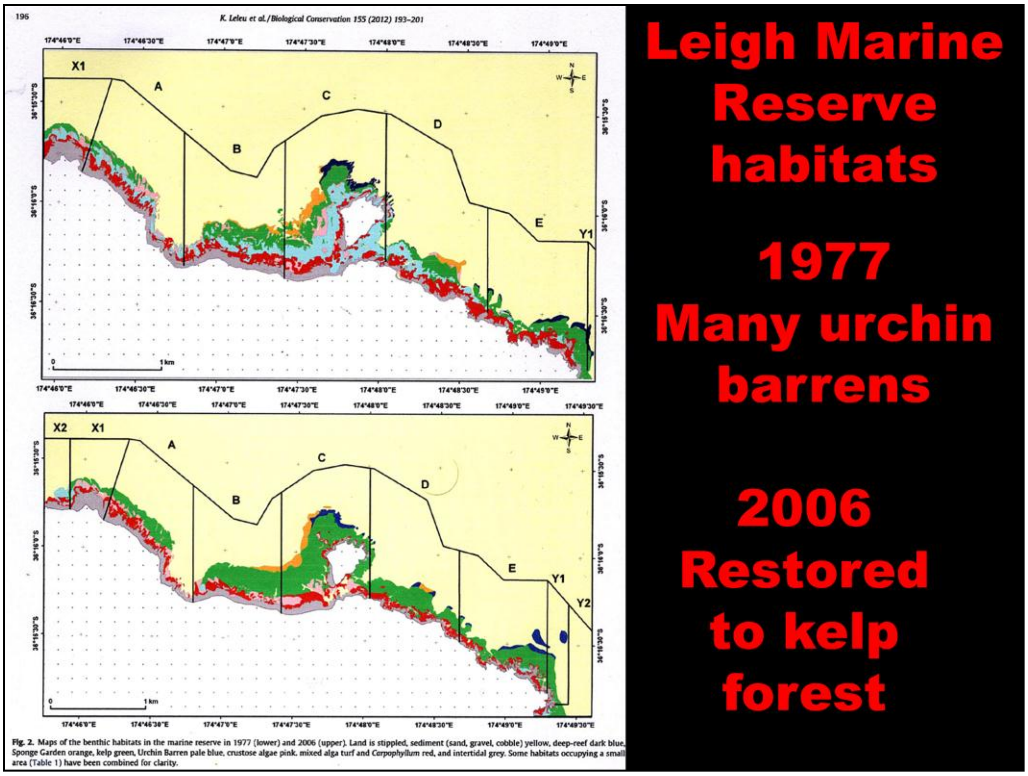
The result is extensive kina barrens on shallow reefs of Mimwhangata and adjacent coasts. This aerial photo at Mimiwhangata shows a narrow fringe of algae around emergent rocks, and a small amount of kelp forest on the edges of some of the deeper reefs, but the rest of the rocky reef is pale-coloured kina barren. And this is in a marine park where you might expect the situation to be better.

Closer to Auckland at Tiritiri Island the situation is similar. The photo shows part of Tiritiri with Little Wooded Island just offshore connected by a shallow reef. Most of the reef is pale-coloured kina barren with a fringe of algae around low tide and the deeper reef edges. This is one of the first places I dived. In 1961 these reefs were covered in lush kelp forest and crayfish feelers bristled out of every crevice! Now it is a barren wasteland and you would be lucky to find even one small crayfish. On Tiritiri Island itself, many thousands of volunteer hours have been spent in the past 30 years restoring the once farmed island to a forested open sanctuary for birds and other wildlife now rare or absent on the mainland. It is now a gem of Auckland's island parks. If you wanted to achieve the same result in the waters around Tiritiri, all you have to do is stop fishing! No planting, no weeding, no pest control – just stop fishing and the shallow reef ecology will recover all by itself.

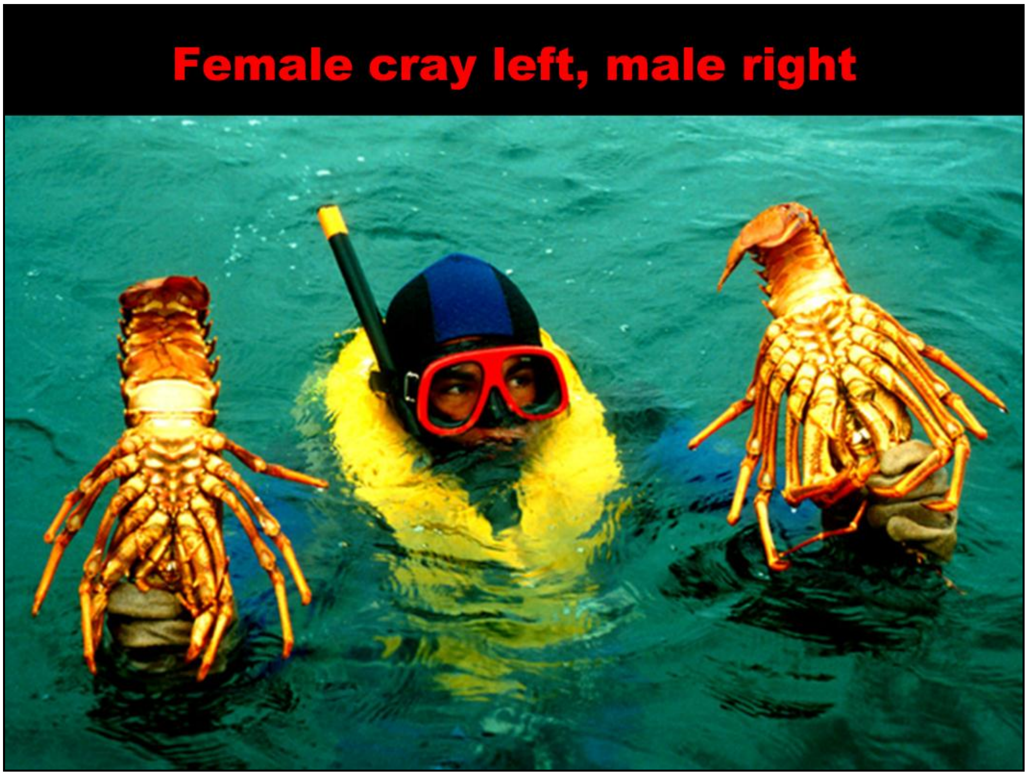
On the northern coast of Waiheke Island I did a survey in 2013 of shallow reefs and found some of the worst kina barrens I have ever seen. The 2008 aerial photo shows an emergent reef off Enclosure Bay with shallow algal beds and pale urchin barrens, with sand to the left. The red dot is the zero point of a transect run down across a boulder field to the sand. The aerial shows algae on the lower part of the boulder reef in 2008, but by 2013 all algae had gone from low tide to the sand. Urchins are actively creating barrens in this area.



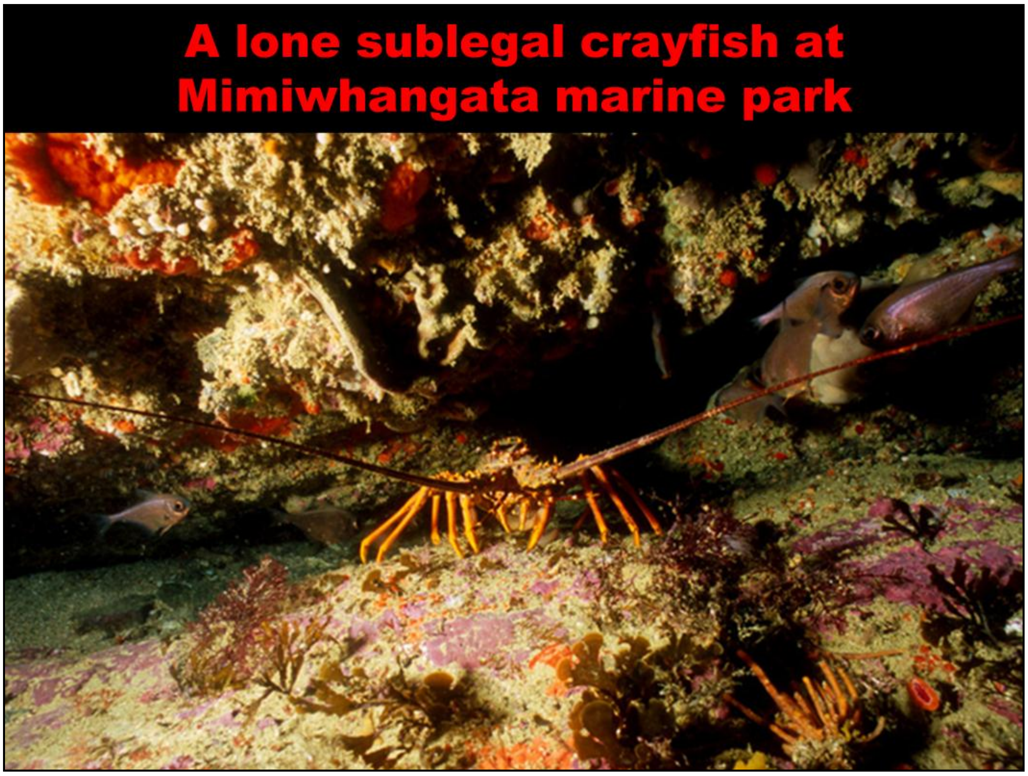
Kina barrens on the boulder reef in 2013, showing complete absence of large algae. There are not enough snapper and crayfish left to keep the kina in check and they have eaten the kelp forest. Some other reefs nearby have good kelp forests, but abundant urchins actively chewing at the kelp bases. Soon those areas too will be kina barrens.



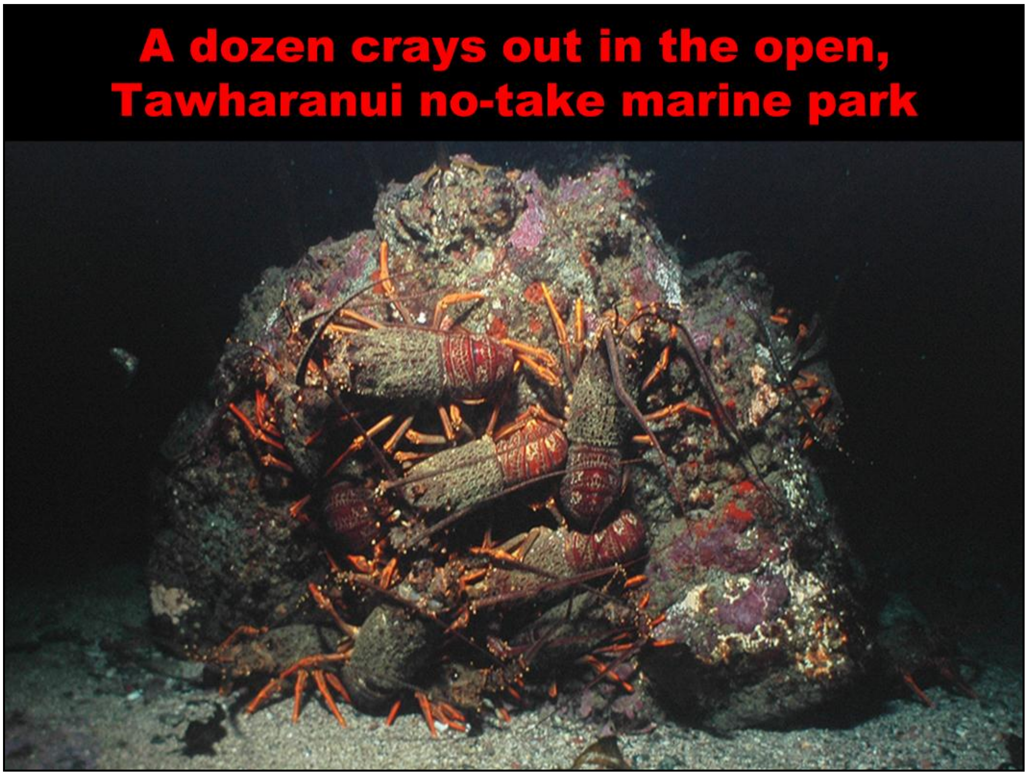
Detailed mapping of the marine reserve at Leigh in 1977 and in 2006 has documented massive changes in the reef habitats. The pale blue areas in 1977 are extensive urchin barrens, which have completely disappeared and recovered to kelp forest in 2006. This came about by snapper and crayfish increasing to natural numbers and sizes following protection, which could then eat the urchins which allowed the kelp forest to recover.



Research at the Leigh Marine Laboratory discovered some very important information about crayfish breeding. Females seek large males for mating with because the breeding success is much greater if they mate with a large male. If a ripe female can't find a large male to breed with in a 10-day time window, the eggs degenerate in the ovaries and make the cray partly sterile in future years. There are so few large males out there in the fished population that females must have a real struggle finding a suitable mate. In well-established marine reserves, however, the full size range, including large males, are back to natural abundance, facilitating normal breeding activity. The reserves can act as stud farms, producing large quantities of larvae which are then spread far and wide. This must have implications for the crayfish industry.

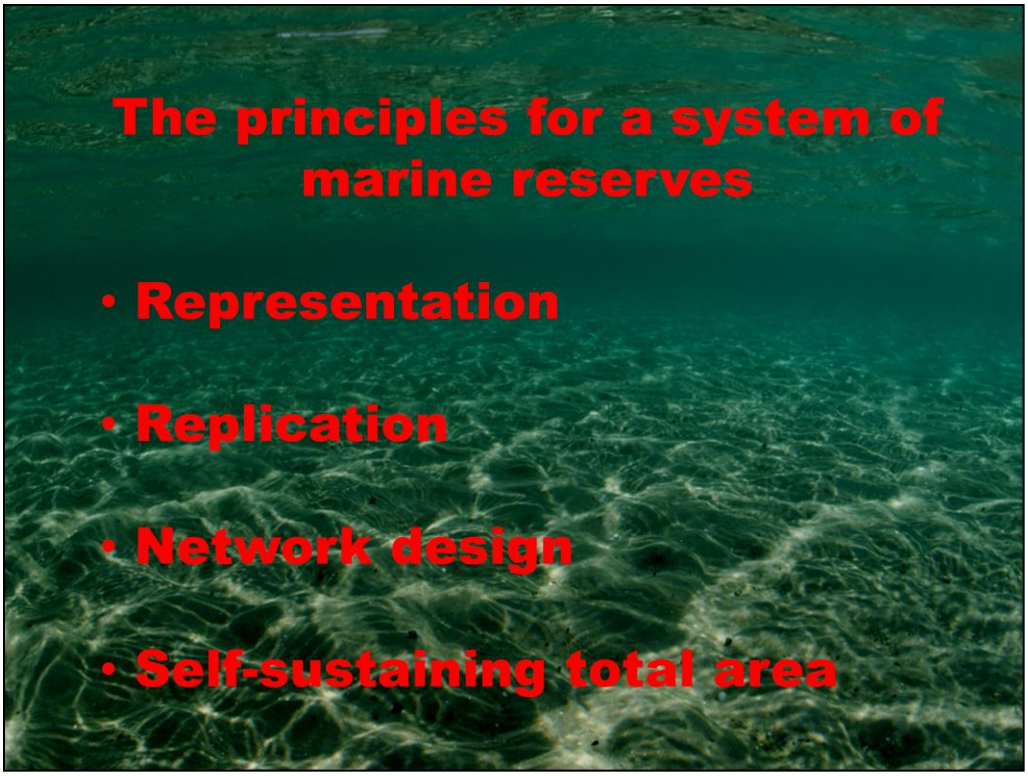


So on the Northland east coast, including Mimiwhangata Marine Park, you are likely to see only small crayfish and very few of them.

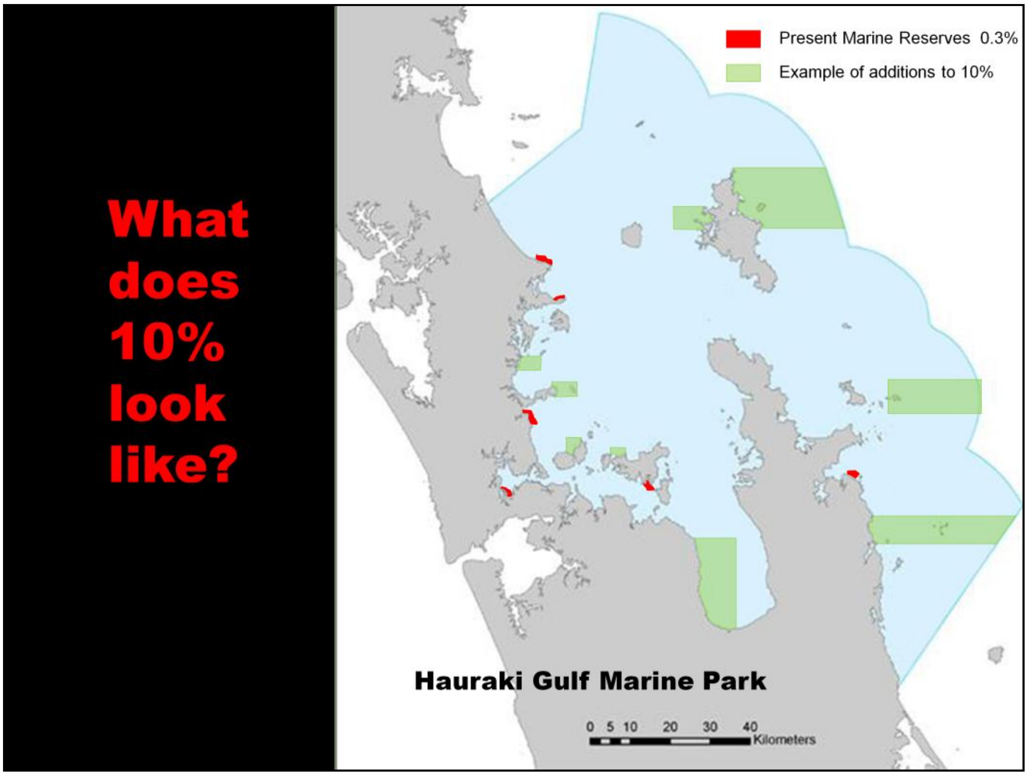


At Tawharanui Marine Reserve, however, crayfish are common, many are large, and not necessarily hiding away in holes.

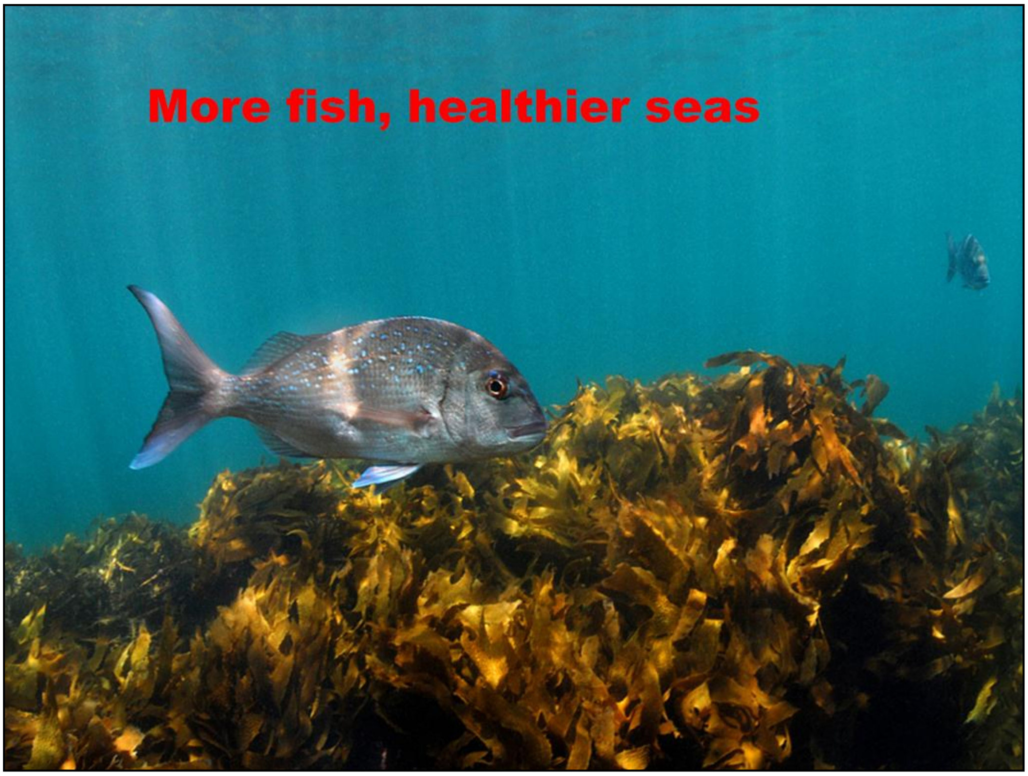
The rules for marine reserves are very simple and apply to everyone. No fishing; no removal of anything; no disturbance. Marine Reserves are permanent, and people are welcome to swim, dive, snorkel, appreciate, study and photograph in them.



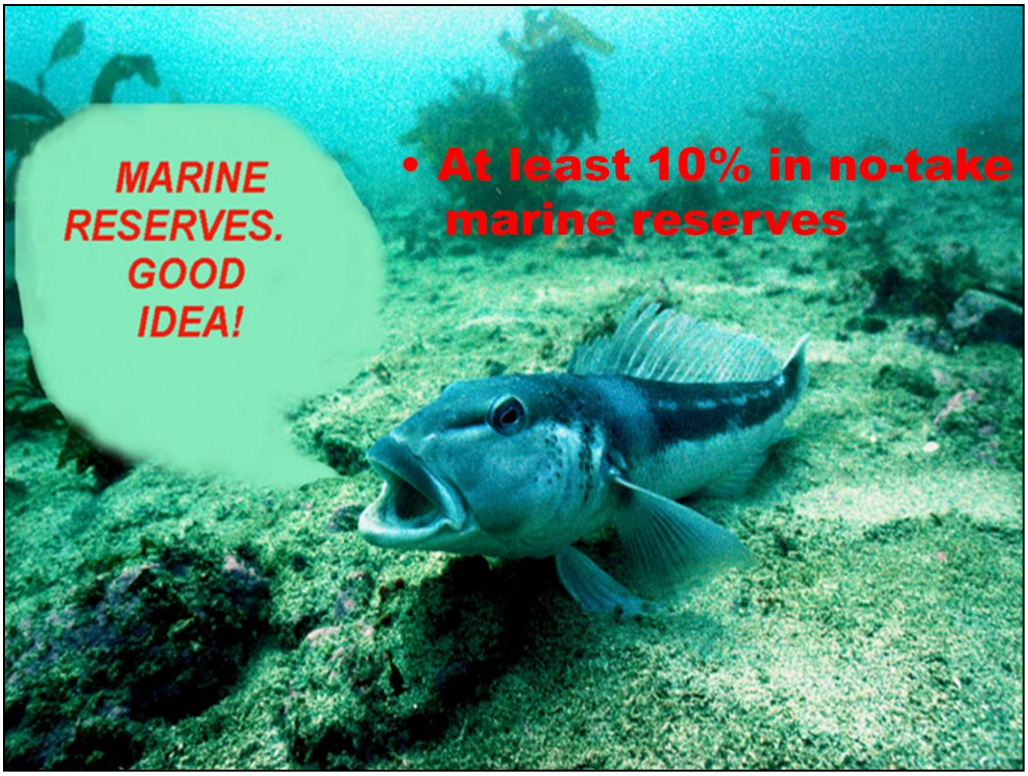
The principles for a system or network of Marine Reserves are: REPRESENTATION; all habitat types need to be represented in the network: REPLICATION; there needs to be more than one example of each habitat type represented in the network – “don’t put all your eggs in one basket”: NETWORK DESIGN; the reserves need to be sensibly spaced to facilitate connectivity between and among them: SELF-SUSTAINING TOTAL AREA; there needs to be sufficient area covered by the network so that a viable “quantity” of reserve area is present. This is often considered to be no less than 10%, as suggested in the Biodiversity Strategy 2000, but some suggest this should be 20%, 30%, or even 40% of the sea area considered.



In the Hauraki Gulf Marine Park we currently have six marine reserves (red patches) covering a total area of only 0.3% of the Marine Park. If we want to push this up to 10%, what does this look like? The green areas are hypothetical examples of possible marine reserves which would bring the total up to 10% of the area of the Marine Park. They are not intended to be suggested areas, but are shown just to get a feel for the amount of area we should be striving for if we want to achieve 10% as a goal. They would need to be arranged in a good network design, and located to represent all habitats found in the Gulf. Some large and some small areas would be desirable.



To achieve a healthier state for the Hauraki Gulf, one of the requirements will be to increase the quantity of fish remaining in the water, and to restore degraded habitats. This can be done by a combination of creating a good network of marine reserves, and reforms to the way our fisheries are managed. Leaving more fish in the sea will help towards improving the Gulf environment.



Marine Reserves provide a much-needed sanctuary for fish and other marine life, which have suffered from too much fishing and other environmental abuses and need a chance to recover. Once matured, Marine Reserves also provide a natural benchmark against which to measure the state of other areas. Accessible Marine Reserves are places where we can see what life on our coastlines was like in the past – a “wet library” where our kids can see and enjoy the natural variety, sizes and abundance of fish, seaweeds and invertebrates in a fully functioning ecosystem.