IN THE ENVIRONMENT COURT OF NEW ZEALAND
AUCKLAND REGISTRY

I TE KŌTI TAIAO O AOTEAROA
TĀMAKI MAKAURAU ROHE

IN THE MATTER	of the Resource Management Act 1991
AND	of an appeal under clause 14 of Schedule 1 of the Act
BETWEEN	**ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND** **BAY OF ISLANDS MARITIME PARK INCORPORATED** **Appellants**
	NORTHLAND REGIONAL COUNCIL **Respondent**

PHILIP MAXWELL ROSS EVIDENCE IN CHIEF
ECOLOGY
TOPIC 14: MARINE PROTECTED AREAS
16 APRIL 2021 (updated 22 June 2021)

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Introduction, qualifications and experience

1. My name is Philip Maxwell Ross.

2. I hold a BSc in Biological Sciences and MSc in Marine Sciences from the University of Auckland, and a PhD in Biological Sciences from the University of Waikato. I am a Senior Research Fellow in the Environmental Research Institute at the University of Waikato where I have been employed since 2012. I have over 20 years' experience undertaking research across a variety of marine and coastal ecosystems.

3. My research has focused on past and present human impacts on the environment and the notion that knowledge of human-environment interactions will guide the sustainable use of natural resources. My recent research has had two key strands:

   a. the impacts and management of shipwrecks and oil spills (New Zealand & Solomon Islands), and

   b. the history, ecology and management of toheroa, a threatened surf clam of significance to both Māori and Pakeha. This research combines mātauranga Māori (Māori knowledge) with ecology, archaeology, history, anthropology and genetics.

4. My position at the University of Waikato involves undergraduate teaching, supervision and mentoring of graduate students, training of staff, outreach activities with school, community and Māori groups, and the development and maintenance of relationships with regional stakeholders. Working with iwi and hapu has become a major component of my position, and has involved providing scientific advice, co-developing environmental monitoring programmes, and collaborating on research projects. I have also held positions on a number of advisory boards and working groups focused on aquaculture and environmental management.

5. While studying for an MSc at the University of Auckland's Leigh Marine Laboratory (2001-2003) my thesis examined associations of juvenile fish with seafloor habitats and the impact of scallop dredging on biodiversity in Kawau Bay. I also assisted with underwater surveys of fish, crayfish and benthic habitats at the Poor Knights Islands, Mokohinau Islands and

Mimiwhangata. I have spent very little time underwater in East Northland in the last 10 years.

Code of conduct

6. I have read the Code of Conduct for Expert Witnesses in Part 7 of the Environment Court's Practice Note 2014. I agree to comply with the Code of Conduct. In particular, except where I state that I am relying upon the evidence of another person as the basis for any opinion I have formed, the evidence in this statement is my expert opinion within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

Scope of evidence

7. Northland Regional Council have asked me to provide my expert opinion on:

   a. the ways in which fishing can impact indigenous marine biodiversity;

   b. how the current management of the Coastal Marine Area (CMA) gives effect to New Zealand Coastal Policy Statement (NZCPS);

   c. how the draft fishing control provisions would protect marine biodiversity and give effect to the NZCPS; and

   d. the boundaries of the proposed fishing control areas;

8. I have also been asked to review and comment on the evidence of Dr Nick Shears, Dr Mark Morrison, Mr Vince Kerr and Dr Rebecca Stirnemann.

9. In preparing this evidence, I have considered the scientific reports and literature provided in **Appendix 1** of this document.

Executive summary

10. Recreational, commercial and customary fishing can negatively affect indigenous marine biodiversity in a number of different ways through both direct (removal of organisms, modification of seafloor, alteration of population size structure) and indirect (loss of prey items, phenotypic evolution, altered species interactions) mechanisms. The magnitude and types of impact depend on the types of fishing gear used, the scale of the

fishery and ecological interactions of target or bycatch species with other components of the ecosystem.

11. Fishing efforts tend to initially target long-lived, high trophic level, piscivorous bottom fish and, over time, shift toward short-lived, lower trophic level species. Archaeological evidence alongside oral histories and historical texts reveal how the ecology of East Northland has changed over time as a result of fishing. Contemporary fish diversity is lower now than it was historically, key species have been reduced to a fraction of their unfished biomass, and fishing has altered the size and age structure of fish and invertebrate populations.

12. Fishing methods that involve dragging gear across the seafloor (trawling and dredging) will modify the structure of the seafloor and can alter the biodiversity that occurs there. In the Bay of Islands, Cape Brett and Mimiwhangata areas, ecologically important habitats and rare and threatened species that are presently unprotected from these fishing methods include seagrass meadows, shellfish beds and deep reefs communities consisting of fragile, long-lived and slow growing invertebrate species (including protected corals).

13. It is my opinion that the proposed fishing control provisions will significantly improve the protection of indigenous marine biodiversity in the region and that significant ecological benefits will result from the implementation of these marine protected areas.

14. Furthermore, the proposed fishing controls are consistent with the principles of marine protected area design, with government policy around marine protected areas, with the approach currently taken by the Ministry for Primary Industries to managing fishing impacts, and with their commitment to managing the effects of bottom trawling in coastal waters.

Impacts of fishing on marine biodiversity

15. Recreational, commercial and customary fishing can negatively affect indigenous marine biodiversity in a number of different ways through both direct and indirect mechanisms.

16. Direct impacts of fishing on marine biodiversity include:

    a. The removal of both target and non-target (bycatch) organisms;

b. The removal, modification or destruction of seafloor biodiversity or habitats through contact with fishing gear (trawls and dredges);

c. Alteration in the size and/or population structure of target or bycatch species (e.g. by preferentially removing larger fish).

17. Indirect effects are those that are not caused directly by fishing activities. These include where fishing:

    a. Removes prey or food items for target or non-target species;

    b. Results in genetic changes in a population (e.g. selection for slow-growing and early maturing individuals);

    c. Alters the interactions that occur between species. This can result in the proliferation or decline in species not directly impacted by fishing (e.g. trophic cascades).

18. The magnitude and types of impact caused by commercial vs. recreational vs. customary fishing depends on the types of fishing gear used, the scale of the fishery and ecological interactions of target or bycatch species with other components of the ecosystem. For example:

    a. Large trawls and dredges which directly impact seafloor biodiversity (discussed below) are only used by commercial fishers;

    b. Smaller dredges which have similar types of impacts, but at a reduced scale, are used by recreational fishers;

    c. All types of fishing remove biodiversity with the impacts on indigenous biodiversity dependent on the number of fish removed and ecological interactions. For example:

        i. Recreational fishing has a comparatively large impact in the Hauraki Gulf where it removes twice as much snapper as commercial fishing.

        ii. Pre-European exploitation of fur seals resulted in their disappearance from northern New Zealand (Smith 2002)

Direct impacts of fishing on biodiversity

Target fish species

19. **The removal of target species** is the most well documented direct impacts of fishing on biodiversity. It is an impact of both recreational, customary and commercial fishing. Fishing efforts tend to initially target long-lived, high trophic level, piscivorous bottom fish and, over time, shift toward short-lived, lower trophic level invertebrates and planktivorous pelagic fish (Pauly et al. 1998). This can imply major changes in the structure of marine food webs.

20. It is likely that fish diversity in East Northland is lower now than it was prior to the commencement of industrial scale fishing. Paulin (2007) has written a perspective on Māori fishing history and techniques in which he presents evidence of what fish biodiversity may have once looked like in East Northland. For example, a night shark fishing expedition at Rangaunu Harbour (Northland) in 1855 that involved 50 canoes resulting in a catch of more than 7000 sharks (Matthews 1911).

21. Paulin also quotes Colenso (1869) who wrote:

> *They [Māori] were not (as many have rashly supposed) deficient in food…They were very great consumers of fish; those on the coast being true Ichthyophagi. The seas around their coasts swarmed with excellent fish and crayfish; the rocky and sandy shores abounded with good shellfish;… all choice eating. Sometimes they would go in large canoes to the deep sea-fishing, to some well known rock or shoal, 5 to 10 miles from the shore, and return with a quantity of large cod, snapper, and other prime fish; sometimes they would use very large drag nets, and enclose great numbers of grey mullet, dog-fish, mackerel [sic], and other fish which swim in shoals; of which (especially of dog-fish and of mackarel [sic]), they dried immense quantities for winter use. They would also fish from rocks with hook and line, and scoop-nets; or, singly, in the summer, in small canoes manned by one man and kept constantly paddling, with a hook baited with mother-of-pearl shell, take plenty of kahawai; or with a chip of tawhai wood attached to a hook, as a bait, they took the barracouta in large quantities. Very fine crayfish were taken in great numbers by diving, and sometimes by sinking baited wicker traps. Heaps of this fish, with mussels, cockles, and other bivalves, were collected in the summer, and prepared and dried; and of eels also, and of several*

> *delicate fresh water fishes, large quantities were taken in the summer, and dried for future use.*

22. The evidence of Ngati Kuta and Te Uri o Hikihiki provides numerous other accounts of past fish abundance and diversity. For example:

> *"The number of fish that you could see was incredible. There were kahawai chasing the takeke (piper), warehunga (kingfish) chasing the kahawai; you could watch them all around Ipipiri."*[1]
>
> *"Around the inside of the islands of Ipipiri we would snorkel for tipa (scallops). They were commonly found on quite shallow sand banks and it was easy to collect them in only eight feet of water."*[2]
>
> *"…there were huge migrations of ana (herrings) in the Inner Bay of Islands. The fish were following the plankton which made the water brown. Many kahawai, kuparu (john dory) and warehunga (kingfish) were caught around the schools of ana (herrings)."*[3]
>
> (Ngati Kuta)
>
> *"the sea around Mimiwhangata peninsula once had an abundance of marine resources including tuatua, kina, scallops, crayfish, mussels, oi and fish. Our kaumatua Puke Haika told me that in the 1950s you would always come across schools of large snapper and lobster. This abundance had turned to scarcity by the mid-1970s."*[4]
>
> (Carmen Hetaraka, Te Uri o Hikihiki)

23. Contemporary fish diversity by comparison appears to be far lower with **Snapper (*Pagrus auratus*)** now by far the most abundant demersal generalist predator in nearshore habitats in northern New Zealand (Morrison et al. 2002; Morrison & Stevenson 2001, Kendrick & Francis 2002). Sharks were more abundant in the past in coastal waters (Paulin 2007) as were hapuku, which are now considered a deep-water fish (but were formerly caught in depths of less than 15 m). The removal of these

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[1] Evidence in chief of Matutaera Te Nana Clendon, Robert Sydney Willoughby and George Frederick Riley, at paragraph 74.

[2] Evidence in chief of Matutaera Te Nana Clendon, Robert Sydney Willoughby and George Frederick Riley, at paragraph 76

[3] Evidence in chief of Matutaera Te Nana Clendon, Robert Sydney Willoughby and George Frederick Riley, at paragraph 77.

[4] Evidence in chief of Carmen Hetaraka, at paragraph 82.

top predators is likely to have had ecosystem-wide ecological consequences many of which are not currently understood.

24. The North East region is a significant fishing ground for a number of commercial species. These include snapper, John dory, terakihi, gurnard and trevally. Snapper makes up the majority of both commercial and recreational inshore catch. Other species caught by commercial fishers include leather jackets, kahawai, golden snapper, jack maceral and kahawai. In deeper water hapuka and bluenose are also targeted[5].

25. Because of their abundance and life history, snapper are an important part of the coastal marine ecosystem (Salomon et al 2008). They are a keystone species (an organism that helps define an entire ecosystem). Localised depletion of snapper probably occurs within the key parts of the fishery (Parsons et al. 2009), and this has some known and some unknown consequences for ecosystem functioning in those areas.

26. Snapper were an obvious fishing target for early-Māori and European fishers in New Zealand (Parsons et al. 2009) and continue to be one of the most targeted inshore fish species today.

27. Anecdotal accounts of their early abundance are provided by Parsons et al. (2009) as follows:

    a. The earliest observation obtained was from Captain James Cook aboard the Endeavour in 1769. Upon anchoring in present day Bream Bay, his crew caught so many snapper (referred to by Cook's crew as "bream") he deemed them worthy of a place name.

    b. Most of the 19th century descriptions emphasise the widespread distribution, great abundance and large size of snapper. For example, in 1886, Captain Gilbert Mair observed the Maori of Maketu, in the Bay of Plenty, as they used a giant seine net to capture *c*. 37 000 fish in one haul; 20 tons of which was reportedly snapper.

    c. James Hector, government scientist in 1872 commenting on snapper:

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[5] Fisheries New Zealand – Fisheries infosite: North East Coast North Island/North East Finfish.

"*In clear shallow bays troops of this fish may be observed rooting up shell-fish that are buried in the sandy bottom, and crushing them with their powerfully armed jaws*."

d. Wiremu Parone can remember in Parengarenga Harbour "*snapper being herded up the Waihuahua Channel, to be blocked off at the top, and enough taken to meet the needs of those present.*" – date unknown.

e. In Doubtless Bay, Northland, a 1907 fishing trip was described in which there "*were seven schnapper lines on board, and we seemed to have stopped in the midst of a big shoal of schnapper and yellow-tail, with a few gurnet as policeman to keep the rest in order. The first catch was a four-pounder [1.8 kg] schnapper—and after that there was no cessation. More often than not two fish came up on the one line, and schnapper after schnapper flew into the big box we had. The coach driver was perched up on the deckhouse, and he rained down schnapper and yellow-tail on to the heads of those below, and on every side the fish came in, till the owner of the launch got tired of putting them in the box. In less than two hours over 2 cwt [100 kg] of fish had been caught*".

28. Due to increasing fishing pressure, the spawning stock biomass (**SSB**) of snapper in the SNA 1 area (north-eastern New Zealand) declined steadily from the early 1900s until the 1980s when it sat at between 10 and 20% of the species initial biomass (**B_0;** Figure 1).

29. Historically, East Northland snapper were not fished down to as low a biomass as the other SNA 1 stocks (Hauraki Gulf and Bay of Plenty) as the northern coast has a lot of foul ground (rocky reefs) that cannot be trawled[6]. Consequently, East Northland always retained more snapper and larger snapper than the rest of SNA 1.

30. Due to changes in the management of the snapper fishery, SSB has increased over the last three decades and the most recent stock assessment for East Northland (2012) estimates a biomass close to 24% of B_0 (Figures 1 and 2). The management target for snapper in the SNA 1 fisheries area is 40% of B_0.

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[6] Northland Regional Council, Significant Ecological Marine Area Assessment Sheet, Eastern Bay of Islands and Cape Brett Coast.

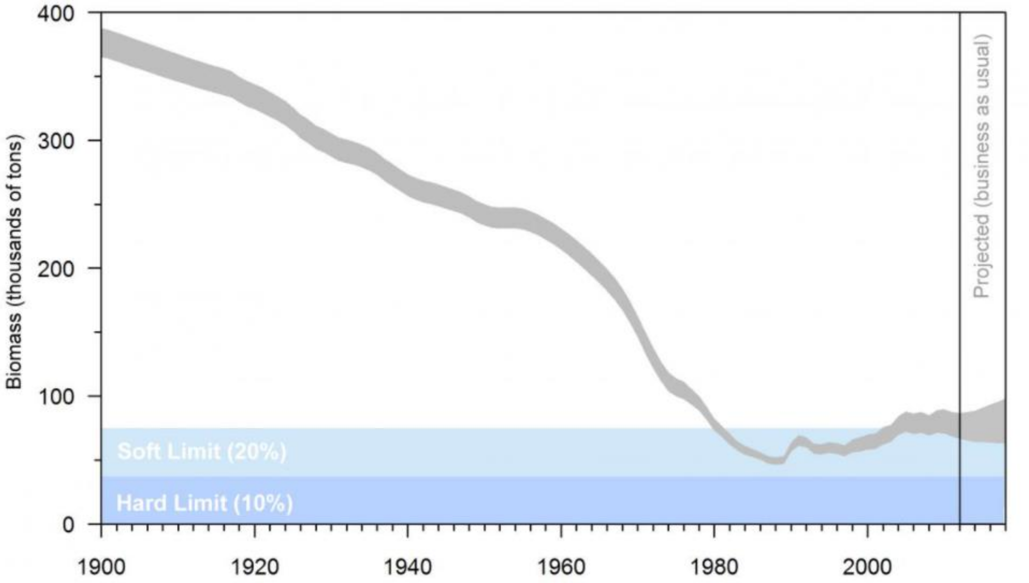

Figure 1. Historic snapper biomass and business as usual prediction. The width of the grey line shows the uncertainty in the spawning stock biomass.[7]

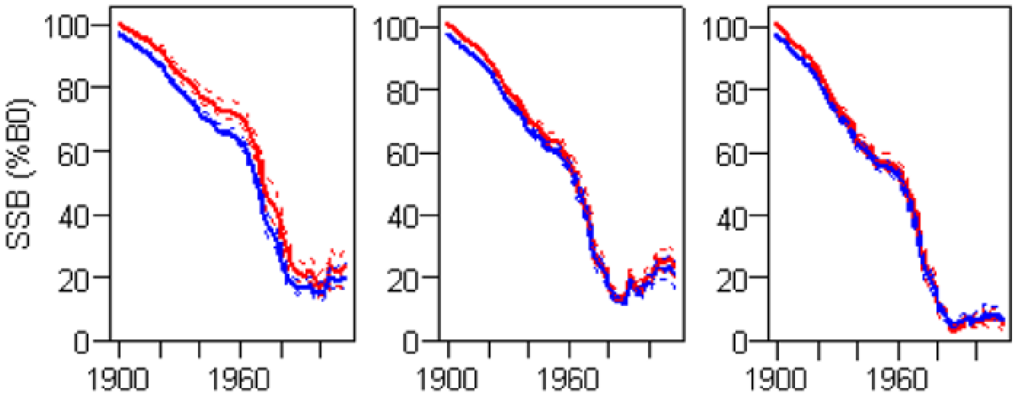

Figure 2. Spawning stock Biomass trajectories by stock (red lines) and area (blue lines) for East Northland (left), Hauraki Gulf (centre) and the Bay of Plenty (right). Broken lines are 95% confidence intervals.[8] *(Fisheries New Zealand 2020)*

31. A stock assessment is currently being undertaken for SNA 1 and it appears likely that the abundance of snapper in East Northland has increased since the 2012 assessment (pers. comm. Darren Parsons, NIWA).

32. The spiny rock lobster or **crayfish (*Jasus edwardsii*)** is also a keystone species that was formerly more abundant in north-eastern New Zealand.

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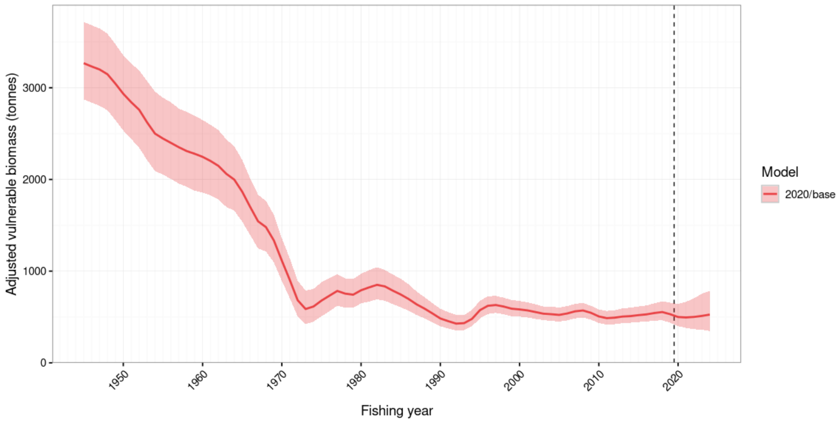
[7] NIWA, https://niwa.co.nz/fisheries/snapper-stock-status

[8] https://www.mpi.govt.nz/dmsdocument/40787-Fisheries-Assessment-Plenary-May-2020-Stock-Assessments-and-Stock-Status-Volume-3-Red-Cod-to-Yellow-Eyed-Mullet

33. The 2019 stock assessment for CRA 1 (which includes both Bay of Islands, Cape Brett and Mimiwhangata) suggested that vulnerable biomass was at 16% of the B_0 and total biomass at 26%. Spawning biomass in 2019 was 37% of B_0, well above the soft limit of 20% where it is Fisheries New Zealand policy to implement a formal, time-constrained rebuilding plan. The projections to 2023, with 2019 catch levels and recent recruitment, suggested that vulnerable and total biomass would both decline, while spawning biomass was projected to remain constant. Because of the 2019 assessment results, the total allowable catch (**TAC**) of rock lobster in the CRA 1 area was reduced from 1 April 2020. The TAC was reduced from 273 tonnes to 203 tonnes, the recreational allowance was reduced from 50 tonnes to 32 tonnes, the allowance for other sources of fishing-related mortality was reduced from 72 tonnes to 41 tonnes, and the Total Allowable Commercial Catch (**TACC**) was reduced from 130 tonnes to 110 tonnes. (Fisheries New Zealand 2020)



Long-term trend in vulnerable biomass of the Northland (CRA 1) crayfish fishery[9]

34. The reductions in abundance of crayfish as described above are manifested in the experiences of tangata whenua gathering kai:[10]

> *"I was going out on the water with my uncles and kaumatua at seven and eight years old, crayfish were in abundance. At that time, my father and Puke Haika could get enough crayfish to host Manuhiri (visitors) and Hau kainga (locals) for a three day tangi during one dive. The change now is that you can send out a whole team of divers with scuba gear and be*

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[9] https://www.mpi.govt.nz/dmsdocument/43003-Review-of-Rock-Lobster-Sustainability-Measures-for-202122

[10] Evidence in chief of Carmen Hetaraka, at paragraph 54(e).

> *lucky to get enough Koura (crayfish) for the kai hakari (the main meal).”* (Carmen Hetaraka, Te Uri o Hikihiki)

Bycatch

35. The **removal of non-target species** (otherwise known as bycatch) is another relatively well documented direct impact of fishing. Bycatch is the incidental capture of non-target species. This can include non-target fish and invertebrates, as well as birds and marine mammals. Bycatch is an impact primarily associated with commercial fishing, although recreational scallop dredging can have bycatch of benthic invertebrates and algae. Recreational fishers can also catch seabirds. There is no available summary of fish and invertebrate bycatch in snapper target fisheries, with the best available information coming from scientific fishing surveys conducted in areas where target fisheries take place (Fisheries New Zealand 2020). More than 70 species have been captured in research trawl surveys in SNA 1. Kendrick & Francis (2002) noted the following **fish** species in more than 30% of tows by research vessels Ikatere and Kaharoa: jack mackerels (three species), John dory, red gurnard, sand flounder, leatherjacket, rig, eagle ray, lemon sole, and trevally (see also Langley 1995a, Morrison 1997, Morrison & Francis 1997). Smaller numbers of invertebrates are captured including green-lipped mussel, arrow squid, broad squid, octopuses, and scallop (Langley 1995a, Morrison 1997, Morrison & Francis 1997). For SNA 1, information on the bycatch associated with research longlining during tagging surveys is also available, although restricted to the inner and western parts of the Hauraki Gulf. The most common bycatch species in this area included: rig, school shark, hammerhead shark, eagle ray, stingrays, conger eel, trevally, red gurnard, jack mackerels, blue cod, John dory, kingfish, frostfish and barracouta (M. Morrison and D. Parsons unpublished data).

36. There were two observed captures of New Zealand fur seals in trawls targeting snapper between 2002–03 and 2014–15 but low observer coverage of inshore trawlers (average 1.47% in FMAs 1 and 9 over these years, Thompson et al 2016) means that the frequency of interactions is highly uncertain. In these same years, there were no observed marine mammal captures in snapper longline fisheries where coverage has averaged 1.75% of hooks set (Fisheries New Zealand 2020).

37. Seabirds are caught during commercial fishing, most frequently by being hooked during longlining, caught in trawl nets, or struck by trawl warps (Abraham and Thompson 2011). Between 2002–03 and 2016–17 in trawls targeting snapper, there were only seven observed captures of seabirds (three flesh-footed shearwater, one black petrel, and one common diving petrel) and eleven observed deck strikes (five common diving petrels, one flesh-footed shearwater, one New Zealand white-faced storm petrel, one Buller's shearwater, one cape petrel, one Cook's petrel, and one grey-faced petrel). However, low observer coverage of inshore trawlers (average 1.47% in FMAs 1 and 9 between 2002–03 and 2016–17, Thompson et al 2016) means that the frequency of interactions is highly uncertain (Fisheries New Zealand 2020).

38. The estimated number of total incidental captures of all seabirds in the snapper bottom longline fishery declined from 3436 in 2000–01 to 247–644 in 2003–04 (depending on the model used, estimates from MacKenzie & Fletcher 2006, Baird & Smith 2007, 2008, Abraham & Thompson 2010). The estimated number of captures between 2003–04 and 2006–07 appears to have been relatively stable at about 400–600 birds each year. Seabirds observed captured in snapper longline fisheries were mostly taken in Northland and the Hauraki Gulf (93%) (Fisheries New Zealand 2020).

39. The evidence of Dr Rebecca Stirnemann contains a more complete description of abundance and distribution of seabirds in the Bay of Islands and Mimiwhangata area and the threats arising as a consequence of fishing. It is clear from her evidence that the Cape Brett to Mimiwhangata area and broader North Eastern Northland region are highly important for seabirds, and that many of the seabirds utilising and breeding in this area are Threatened or At Risk with declining populations. The availability of food resources (which are reduced through fishing) and direct mortality through interactions with fishing gears appear to be significant issues.

40. Between 2002–03 and 2014–15 there was a single observed capture of a green turtle in the snapper bottom longline fishery occurring in the Northland and Hauraki Gulf fishing area. Observer records documented the green turtle as captured and released alive. In the same period, there

were no captures of turtles in the snapper trawl fishery (Fisheries New Zealand 2020).

Changes in population size structure

41. Fishing (recreational, customary and commercial) alters the age and size structure of populations. A consequence of fishing is an altered demography. Older and larger fish often are removed first, and remaining older cohorts experience more cumulative fishing, and the population becomes more and more dependent on small, newly recruited individuals to support the fishery (Figure. 3). In many ecosystems, large piscivorous species were the initial targets of fishing. After the "fishing down" of those populations, the fisheries shifted to smaller species at lower trophic levels (Pauly et al. 1998). The net effect is a major change in community structure through altered trophic interactions. Not only do fish abundances and biomasses decline, but the entire ecosystem structure can be changed. (National Research Council 1999).

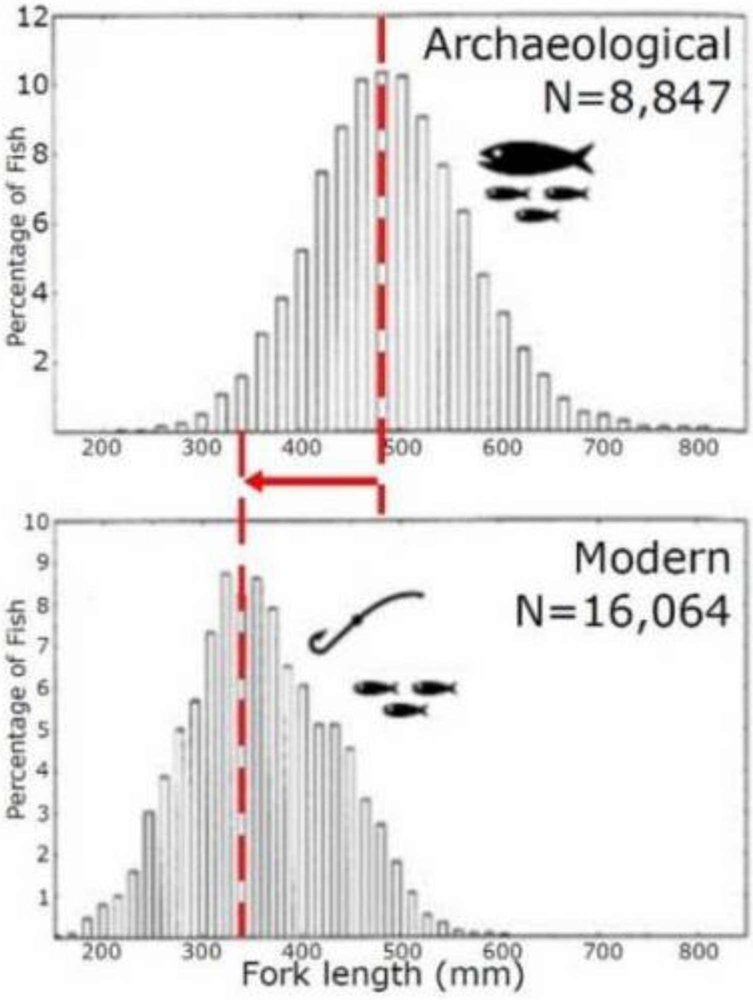

Figure 3 Size-frequency histograms of snapper from archaeological collections (above) show that fish were larger when compared to sizes found in the modern fishery (below).[11]

Impacts of trawling and dredging on seafloor biodiversity

42. Fishing methods that involve dragging fishing gear across the seafloor will modify the seafloor and can alter seafloor biodiversity (Figures 4-8). The magnitude of impacts will vary with the type of seafloor, species present and type of fishing gear used.

43. This type of fishing impact is primarily associated with commercial fisheries which utilise a variety of trawls and dredges which contact the seafloor. Recreational fishers are also permitted to use scallop dredges which similarly impact on seafloor biodiversity but at a reduced spatial scale.

44. A single boat bottom otter trawl is a cone-shaped net consisting of a body, normally made from two, four and sometimes more panels, closed by one or two cod ends and with lateral wings extending forward from the opening (Figure 5). A bottom trawl is kept open horizontally by two otter boards (Figures 5 and 6). A boat can be rigged to tow a single or two parallel trawls from the stern or from two outriggers. Bottom trawls usually have an extended top panel (square) to prevent fish from escaping upwards over the top of the net.

45. The mouth of the trawl is framed by a headline with floats to open the trawl vertically and a ground gear along the foot of the net. The ground gear is designed according to the bottom condition on the fishing ground to maximise the capture of targets living close to the bottom and at the same time protect the gear from damage and facilitate the movement of the net across uneven seafloor.[12]

46. Otter trawls interact physically with the bottom sediment, which might result in removal or damage of sedentary living organisms (including seaweed, sponges or coral) and in the case of uneven bottom surface displacement of stones or other larger objects. On flat sandy/muddy

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[11] https://www.royalsociety.org.nz/research/has-intensive-fishing-has-shaped-snapper-evolution/

[12] http://www.fao.org/fishery/geartype/306/en

bottom the sediments might be whirled up into the water masses and suspended.

47. In areas of seabed that are continually disturbed, long-lived slow growing species will be replaced by more opportunist species that are good dispersers, fast growing and better adapted to a high disturbance environment.

48. There have been few attempts to quantify the impacts of trawling in New Zealand. The most notable is a study published by Thrush et al. in 1998 documented biodiversity across a gradient of fishing pressure.

> *"Samples along a putative gradient of fishing pressure were collected from 18 sites in the Hauraki Gulf, New Zealand. After accounting for the effects of location and sediment characteristics, 15–20% of the variability in the macrofauna community composition sampled in the cores and grab/suction dredge samples was attributed to fishing. With decreasing fishing pressure we observed increases in the density of echinoderms, long-lived surface dwellers, total number of species and individuals, and the Shannon-Weiner diversity index. Our data provide evidence of broad-scale changes in benthic communities that can be directly related to fishing. As these changes were identifiable over broad spatial scales they are likely to have important ramifications for ecosystem management and the development of sustainable fisheries."*

49. Dr Rebecca Stirnemann presents further evidence of protected Black Coral (as well as other corals and sponges) on the Cape Brett to Mimiwhangata coast being significantly damaged by fishing activity.[13]

50. The following review of trawling impacts is provided in the Ministry for Primary Industries' (**MPI**) 2019 publication - Protecting New Zealand's Seabed from the impacts of trawling.

    a. **"*Fishing can damage the seabed and the corals, sponges and other life found there, particularly when bottom trawl or dredge fishing gear is used.*** *How much damage occurs depends on a number of factors, including the type of seabed habitat that is being fished and the particular trawl gear being used. The Fisheries New Zealand closely monitors bottom trawling as part of a comprehensive fisheries management regime. Controls on bottom trawling include closed areas*

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[13] Evidence in chief of Rebecca Stirnemann, at paragraph 72.

and regular monitoring of where fishing vessels have fished, and the type and quantity of marine species, such as corals and sponges, which are caught."[14]

b. ***"What is important is that these activities are monitored to ensure that impacts are managed*** *and kept to an acceptable level. In New Zealand one of the ways this is achieved on land is by setting aside large areas as national parks, where activities such as intensive farming are not permitted. In the marine environment the approach is no different. Large areas of the seabed have been closed to bottom trawling, and many of the corals and other species that are damaged by this method of fishing also live at greater depths where trawling does not occur*."[15]

c. "*Now that BPAs are in place over large areas of the deepwater environment,* ***Fisheries New Zealand is focusing on ensuring that the effects of bottom trawling in shallower waters closer to shore are also managed."*** [16]

51. Benthic protected areas cover 1.2 million km^2 of the New Zealand seabed including 52% of seamounts (underwater mountains over 1000 m in height) and 88% of active hydrothermal vents. No areas of inshore seafloor biodiversity are protected by BPAs (Figure 9).

52. Even though MPI states that it "*is important is that these activities are monitored to ensure that impacts are managed*" I am not aware of any monitoring programme in the New Zealand CMA that provides a genuine understanding of the ongoing effects of trawling and dredging.

53. In East Northland, a portion of the commercial catch of snapper is taken using bottom trawls with at least 90% of trawls occurring in less than 100 m depth (Baird et al 2011). Trawling for snapper, like trawling for other demersal species, is likely to have effects on benthic community structure and function (e.g., Thrush et al 1998, Rice 2006) and there may be consequences for benthic productivity (e.g., Jennings 2001, Hermsen et al 2003, Hiddink et al 2006, Reiss et al 2009).

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[14] Ministry for Primary Industries, Protecting New Zealand's Seabed from the impacts of bottom trawling, May 2019, page 1.

[15] Ministry for Primary Industries, Protecting New Zealand's Seabed from the impacts of bottom trawling, May 2019, page 2.

[16] Ministry for Primary Industries, Protecting New Zealand's Seabed from the impacts of bottom trawling, May 2019, page 2.

54. Scallops are commercially dredged in both Northland and Coromandel using the self-tipping box dredge (Figure. 7), usually at between 10 and 30 m depth (Bull 1989, Cryer & Momson 1997, Cryer 2001). The box dredge is considered by commercial fishers to be better suited to the hard bottom characteristic of the north east coast than the ring-bag dredges in the South Island scallop fishery (Beentjes and Baird 2004). The box dredge leaves a clearly defined track formed by the tines digging into the substrate (Cryer & Morrison 1997). If the dredge becomes full, it begins to 'bulldoze' sediment ahead of the dredge and ceases to function effectively. Often the dredge will fly up when it is full and this is obvious to the fisher who will then haul the gear. Beentjes and Baird (2004) reported observations of crabs moving into the dredge track within minutes to prey on damaged scallops, epifauna, or exposed infauna.

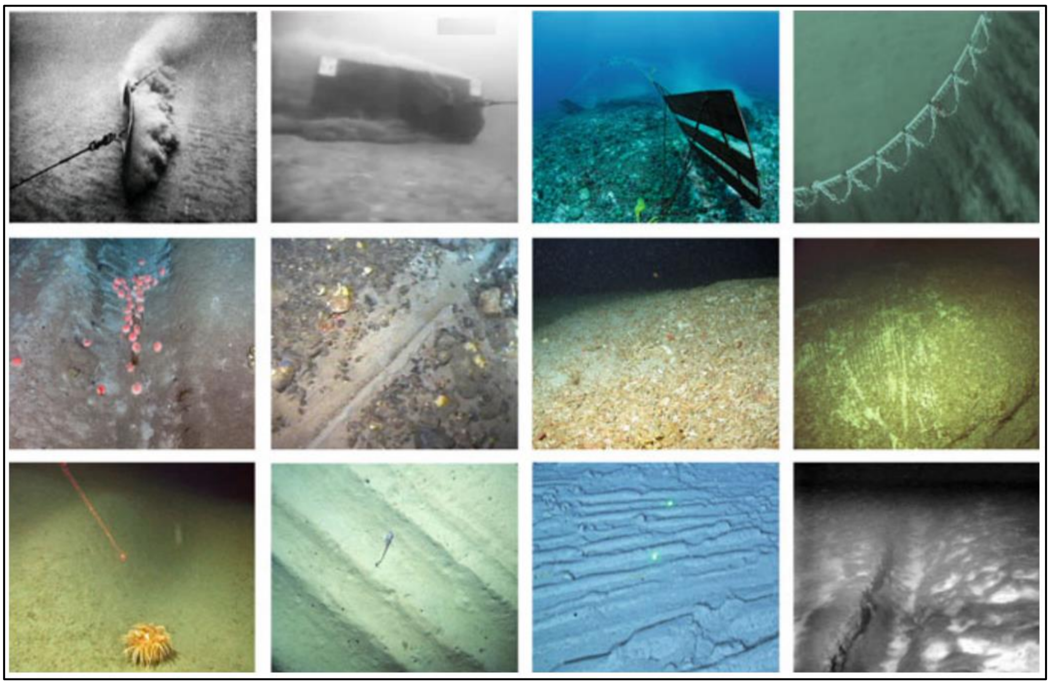

Figure 4 Underwater photography of bottom trawling effects. Upper row Trawling doors and a fishing net ploughing the seabed and resuspending sediment. Middle row (left to right) Trawling marks in mud, sandy and gravel, coralline, and bedrock substrate. Lower row (left to right) Gently undulating, wavy, jagged, and deeply incised (0.5 m deep) seabed surfaces.[17]

55. A study of the sponge and bryozoan community between North Cape and Cape Reinga and the extent to which fishing affected benthic community

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[17] Oberle et al. 2018.

structure, was carried out in 1999 (Cryer et al. 2000). The epibenthic communities of sponges and bryozoans were found to be diverse, comprising many endemic species. Comparisons with epibenthic fauna (organisms that live on or just above the bottom sediments) bycatch from scallop dredging between 1996 and 1998, indicated that sponges and other epibenthic filter feeding colonial animals were most affected by scallop dredging in this region, with a marked decline in richness of sponges. The results of the survey suggest that scallop dredging has had a significant impact on the diversity and richness of epibenthic fauna in this area and by inference other areas in Northland that are more heavily fished.

56. There are a range of smaller scallop dredges designed for use by recreational fishers (Figure 8). The impacts of these recreational dredges are likely to be comparable to commercial gear, although each track will have a narrower width.

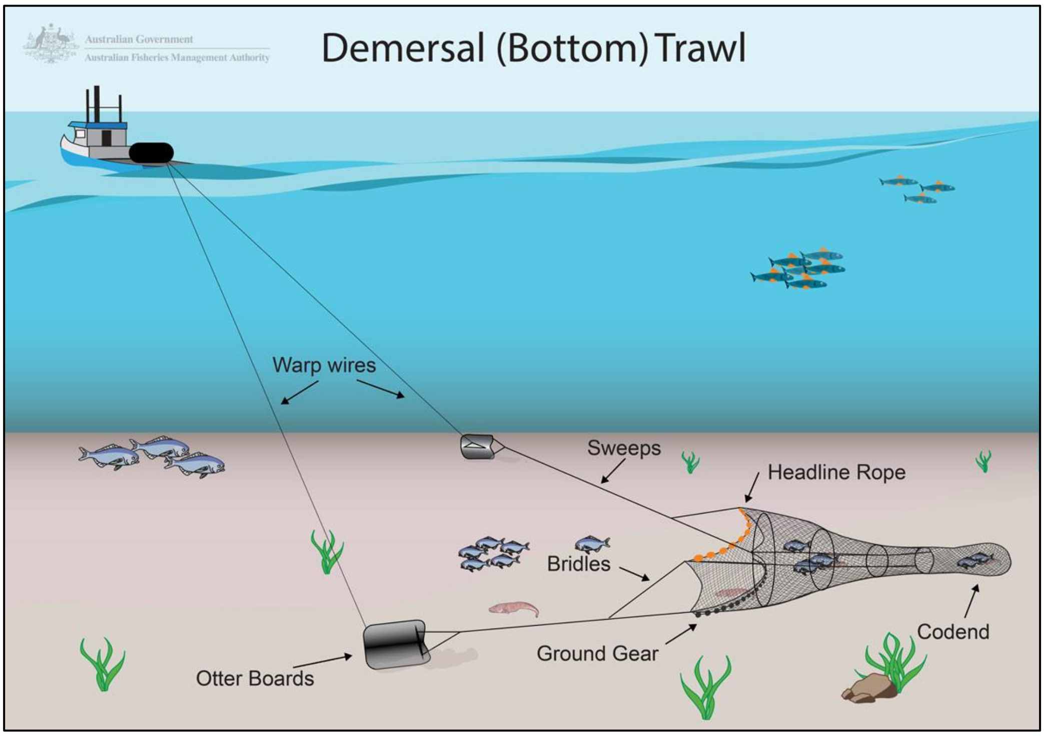

Figure 5 Bottom trawls (also known as demersal trawl) are used to catch fish and prawns that live on or near the sea floor.[18]

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[18] https://www.afma.gov.au/fisheries-management/methods-and-gear/trawling

Figure 6 Trawl door (otter board) and net[19]

Figure 7 Example of a box dredge typical of those used in the Northland SCA 1 and Coromandel SCA CS commercial scallop fisheries in northeastern NZ

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[19] https://www.stuff.co.nz/environment/122895114/trawl-gear-damages-fragile-coral-reefs-so-why-is-the-government-sanctioning-more-hauls

Figure 8 Recreational scallop dredges

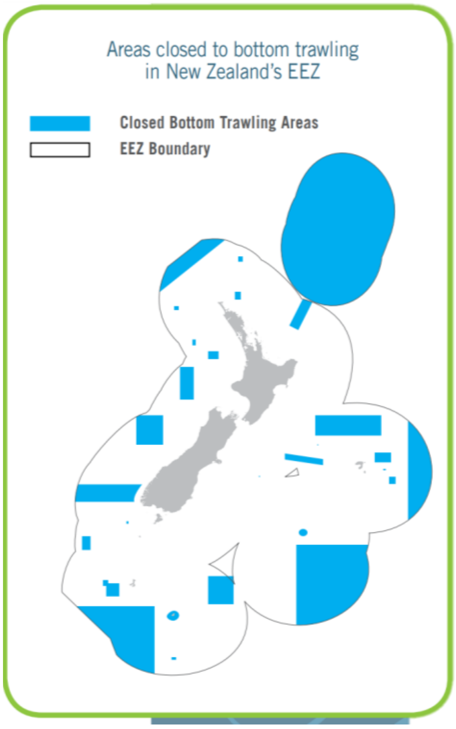

Figure 9 The locations of Benthic Protection Areas (BPAs) within New Zealand's exclusive economic zone.

57. There are indigenous ecosystems and habitats found in the East Northland coastal environment which are particularly vulnerable to modification by trawling and dredging. Dr Mark Morrison in his evidence describes subtidal seagrass beds (a nationally rare habitat), soft sediment macroalgal meadows, horse mussel beds and rhodolith beds, in the inner Bay of Islands, all of which support high biodiversity and are vulnerable to modification through trawling and dredging (Fig. 10).

Figure 10 Subtidal seagrass (left) and horse mussel bed (right)

58. For juvenile snapper, it is likely that certain habitats, or locations, are critical to successful recruitment of snapper. Post settlement juvenile snapper (10–70 mm fork length) associate strongly with three-dimensional structured habitats in estuaries, harbours and sheltered coastal areas (such as beds of seagrass and horse mussels, Morrison unpublished data, Thrush et al 2002, Parsons et al 2009).

59. Offshore from the Bay of Islands and Mimiwhangata (the Ipipiri-Rakaumangamanga and Te Au o Morunga Protection Areas), the seabed consists of large areas of soft sediment and rocky reef, and an unknown (but probably considerably smaller) area of biogenic reef[20].

60. These reef systems and adjoining reef edges of soft-bottom habitat score as a high ranking ecological areas. This reef system is extensive and with large areas of shallow reefs connected to a large and complex deep reef systems that may extend more than13 km offshore. These complex reefs, coastline and small islands create a significant sequence of high quality marine habitats. In addition, the Eastern Bay of Islands and Cape Brett creates an ecological sequence and connectivity with important conservation areas in this group of islands and the Cape Brett Peninsula.[21]

61. In his evidence, Mr Vince Kerr describes the biodiversity present on deeper reefs on the Northland coast, which includes, long-lived coral species that are highly vulnerable to disturbance (Figures 11 - 14).

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[20] Northland Marine Habitats Mapbook - https://www.nrc.govt.nz/Northlandmarinehabitats

[21] Northland Regional Council, Significant Ecological Marine Area Assessment Sheet, Eastern Bay of Islands and Cape Brett Coast.

Figure 11 Invertebrate communities on deeps reefs (50 m depth) approximately 1.5 km off Rimiriki Island. Photo from Vince Kerr EIC.

62. While species present on larger high relief reef systems are unlikely to be trawled, they do occur on low lying flat reefs, small patch reefs (Figures 12 and 14) and biogenic reefs which could be trawled.

63. Due to the challenges associated with conducting surveys on deep reefs, the biodiversity of these reef systems is largely unknown. For example, one of my 3rd year students at the University of Waikato recently used a drop camera to survey a small section (< 100 m transect) of reef in the outer Bay of Plenty. At a depth of 40-50m, she recorded at least 99 species, including ten possibly new and two probably new sponge and ascidian species and four naturally rare and six naturally uncommon sponge species.

64. A recent piece of research conducted by NIWA and funded by MPI through the Biodiversity Research Advisory Group aimed to map biodiversity and determine the significance of biogenic habitats around the New Zealand coast (Jones et al. 2016). One of the methods used in this study was the mapping of local ecological knowledge held by commercial fishers.

65. Fishers described areas of black coral, coral and sponges offshore and to the north of the Bay of Islands.

> "*Fishers made comments about a decline in occurrence of these types of bycatch, or that they were aware that early fishing activities had resulted in the destruction of these habitats.*"

66. Jones et al. (2016) identified a lack of fisher information for the area between the Cavalli Island region and the Poor Knights, which coincides with potentially extensive areas of deep reef. The lack of fisher-drawn areas along this stretch of coast possibly reflects a gap in coverage, i.e. the fishers they interviewed did not have detailed fishing experience of this section of coast.

67. Habitat maps for the coastline that includes Cape Brett and Mimiwhangata show considerable areas of reef between depths of 30-200m meaning much of area is difficult or impossible to trawl /dredge (Kerr 2009)

68. A recent report based on the Oceans 2020 Bay of Islands cruise data (Grange 2021) provides some information about the soft sediment habitats in the proposed Ipipiri-Rakaumangamanga Protection Area:

> "*…the area is surprisingly uniform, comprising over 90% soft sediment (sand and mud) supporting a variety of burrowing animals… The rock outcrops support a large variety of species, many of which could not be identified to species level either because the photographs were not sufficiently high resolution, or because the species appear to be rare or not recorded in the formal scientific literature previously. The widespread occurrence of the glass sponge (Symplectella rowi) is an example of a species widespread in the area, but previous recorded only from North Cape and sporadically in the unique environment of Fiordland). The abundance of this species in these photographs was surprising. Similarly, the occurrence of black coral colonies, one of NZ's few fully protected marine invertebrates, had not been recorded in the area previously. Apart from the black coral (Antipathes lilliei) that is known from the wider Northland area, a second, smaller and more busy species with pink polyps was identified in some photographs and is likely to be a new species*."

Figure 12 Tarakihi associated algae and sponges growing on an old ladder from the wreck of the Canterbury in Maunganui Bay (Dive Northland)

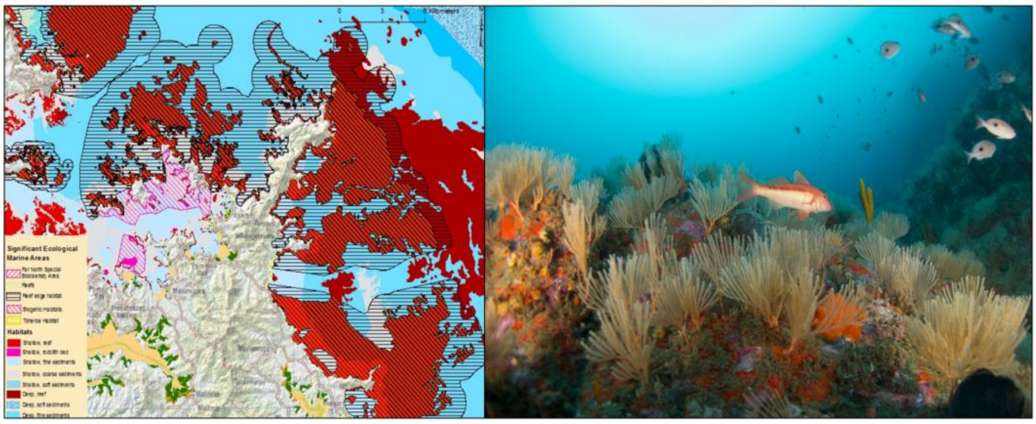

Figure 13 Ecologically significant reef systems in the eastern Bay of Islands and Cape Brett area (left) and marine biodiversity typical of reefs greater than 30m depth at Cape Brett. Photo credit: Northland Dive.

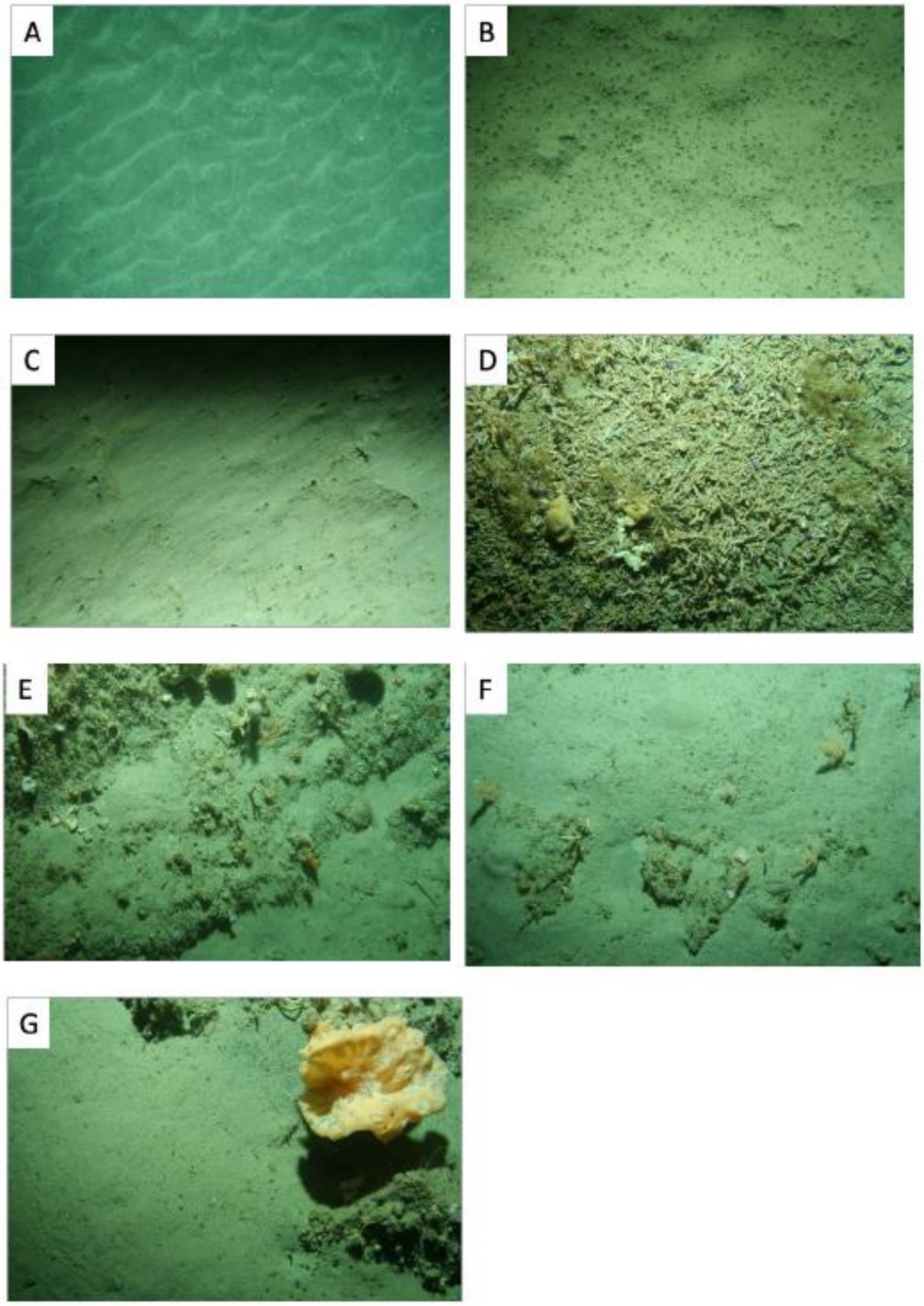

Figure 14 Representative photos of the seafloor from the Bay of Islands Oceans 20/20 expedition. A. Rippled sand, 120 m depth off Cape Brett; B. Typical sandy mud showing worm burrows; C. Similar sediment to B, but disturbance possibly due to trawling; D. Large clump of biogenic habitat dominated by the calcareous tubeworm, Galeolaria. Some damage is also apparent with scattered broken tubes; E. Typical small rock outcrop with cup corals (some broken and lying over), fragile bryozoan colonies, small sponges, soft coral and a circular saw shell; F. Sediment covered small rock outcrop with pink Antipatharian black coral, sponges and bryozoan colonies; G. Large glass sponge (Symplectella rowi) on a rock outcrop. (Grange 2021)

69. While commercial bottom trawling is permitted in outer parts of the Bay of Islands, it cannot take place over heavily-reefed areas[22]. It can, however, still take place over ‘coral’ (usually bryozoan-dominated) and similar such typically highly bio-diverse, biogenic features on soft bottoms (e.g., Bradstock & Gordon 1983; Grange et al. 2003). In his 2020 report to Bay of Islands Maritime Park Inc., Booth reported that general spatial overviews of fine-scale trawl catch and effort in Statistical Area 003 (the broader finfish management area in which the Bay of Islands is located), and within the Bay itself, for the 2007–08 to 2012–13 fishing years (the most-recent data routinely available) show an average of fewer than a dozen individual trawl shots each year, which is a low level of effort when compared with other parts of Northland and further south (see Booth 2017; Figure 15). There seems little reason to think that this situation has changed much since 2012–13. Booth’s research suggests that trawling within the Bay of Islands is not particularly intensive (large areas are closed to trawlers; high relief reef structure negates trawling in many places; and fishing-events take place at relatively low frequencies - up to about one per year) and that towed video sampling systems used in the 2009 Oceans 2020 surveys (http://www.os2020.org.nz/) recorded no indications of trawl tracks or damage to the seabed. Booth concludes that bottom trawling has never been particularly intensive within the Bay of Islands “*and certainly not for at least the past 30 years*” – meaning that much of the soft-bottom seafloor may be little modified from its pristine condition.

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[22] Northland Regional Council, Significant Ecological Marine Area Assessment Sheet, Eastern Bay of Islands and Cape Brett Coast.

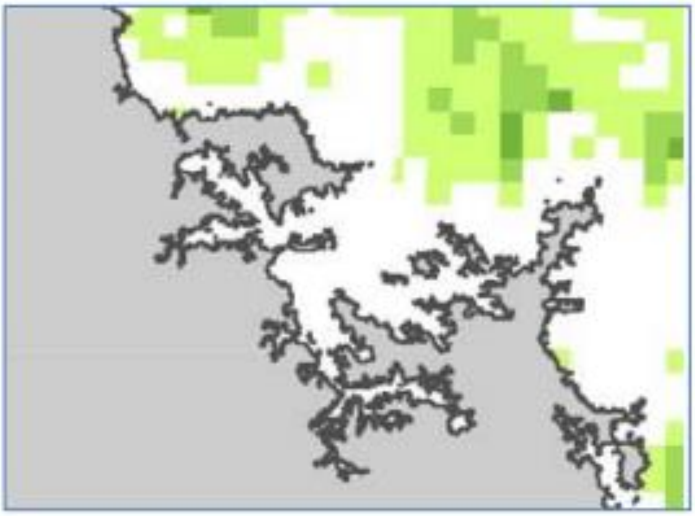

Figure 15 Spatial pattern of average annual number of trawl events starting in each 1 nautical mile grid for 1 October fishing years 2007–08 to 2012–13 in and near the Bay of Islands (from Booth 2017). The five categories, from lightest green, are 0–1 event, 1–2 events, 2–3 events, 3–5 events and >5 events. The level of trawl-effort being applied in this area is low when compared with other parts of Northland and further south (see Booth 2017: 36).

Indirect impacts of fishing

70. One of the indirect effects of fishing is **the alteration in food supplies**. The removal of smaller prey species through fishing may limit the diet of larger species and therefore carrying capacity for that species in an environment. Alternatively, the removal of larger predatory species may release smaller fish from predation pressure increasing food supply.

71. Fishing induced reductions in the abundance of pelagic fish such as anchovies and mackerel (jack and blue) appear to be particularly important for seabirds that are poor divers and specialise in foraging in association with fish work ups. For example, Buller's shearwaters which only breed at the Poor Knights Islands now travel to the eastern South Island to gather food and have reduced breeding success. Red-billed gull colonies in the Hauraki Gulf have declined substantially since the 1960s. For example, less than 100 pairs nested on the Mokohinau Island group in 2015 whereas this colony had >20,000 birds in the early 1960's. Red-billed gulls on the outer island colonies depend on krill and small fish brought to the sea surface by large schools of fish (Department of Conservation 2016).

72. In the evidence of Ngati Kuta, the following quotes describe changes in bird life over time in the Bay of Islands:[23]

a. "*Years ago there was a lot of birdlife around Ōrongo and Matauwhi Bay. Lots of kararo (black-backed gulls) and kawau (shags) used to nest at Elephant Head and Mill Island and at nesting time those islands would be full of all the seagulls and shags, don't think they've been nesting out there since the early 1980s. Used to get poaka (pied stilts) a lot more then, fly back and forth to the Waikare. Matuku-hūrepo (bitterns) on the shore around the streams but haven't seen one of those for years*."

b. *"There used to be lots of schools of Aua (Yellow-eyed Mullet, Herring) in Ōrongo Bay, schools of kahawai would come in chasing them. I remember big schools of kahawai coming in chasing schools of aua and hundreds of little terns, that used to roost on the barges, joining in on the big boil-ups. The Health Department shut the oyster farm down once because of all the faecal matter in the water from some boil-ups (work-ups). That hasn't happened for ages, aren't enough fish or birds to create that level of contamination in the water now."*

73. The loss of habitat through fishing can also have impacts throughout an ecosystem as described in the evidence of Ngati Kuta:[24]

> *"Takeke (piper) breed in the sea grass. Takeke breeding in Ipipiri has become erratic because in many areas the once abundant sea grass beds have been destroyed."*
>
> *"The absence of prolific schools of takeke (piper) has reduced the abundance of all the bigger schooling fish that feed on them, like kahawai and warehunga (kingfish)."*
>
> *"The huge schools of ana (herrings) and the associated kahawai, kuparu (john dory) and warehunga (kingfish) have not been seen in the Inner Bays of Ipipiri since the later years of the 1970s"*

74. Fishing also can alter the genetic structure of fished populations. Although the immediate results of such genetic alteration might be hard to detect, the large-scale changes that can occur in widespread fish species, especially those with discrete subpopulations, can substantially reduce

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[23] Evidence in chief of Matutaera Te Nana Clendon, Robert Sydney Willoughby and George Frederick Riley, at paragraph 57(c).

[24] Evidence in chief of Matutaera Te Nana Clendon, Robert Sydney Willoughby and George Frederick Riley, at paragraphs 100-102.

the species' ability to recover from the effects of depletion due to fishing and other causes. Phenotypic evolution in traits such as size-at-age and age-at-maturation are thought to be caused to some extent by fishing (Law 2000).

75. Fishing is almost always non-random. Typically, gear is designed to remove some kinds of individuals in preference to others, usually individuals that are larger and therefore older. The evolutionary selection pressure generated by fishing gear is strong in heavily exploited fish stocks, and the spatial location of fishing can also cause strong selection. The success of selective breeding in aquaculture indicates how quickly production-related traits can evolve in fish populations. Of particular importance in this context are phenotypic traits related to yield, such as growth rate, length- and age-at-sexual maturation, and fecundity. Simply through the action of fishing, fishers generate selection, causing evolution (Law 2000).

76. There is currently a research project based out of Victoria University trying to determine if intensive fishing has shaped snapper evolution. Researchers have determined that present day snapper are on average smaller than snapper populations represented in archaeological middens (Figure 3) and are now attempting to determine if there is a genetic basis for these changes and if the changes are reversible[25].

77. Interactions between species will be altered when top predators are removed from a system. For example, New Zealand Fur Seals and sharks were formerly more abundant in Northern New Zealand than they are now and Hapuku are now only found in deeper waters (Smith 2002; Paulin 2007). Close to 80% of snapper biomass has been removed from the northeast coast of New Zealand and the remaining fish are on average smaller than historic populations. Total crayfish biomass in CRA1 as of 2019 was sitting at approximately 26%[26]. Changes in the abundance and functionality of different components of a food web will change as a consequence of intensive fishing and will result in the proliferation of some species and the decline of others. Some of the consequences are well

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[25] https://www.royalsociety.org.nz/research/has-intensive-fishing-has-shaped-snapper-evolution/

[26] Review of Rock Lobster Sustainability Measures for 2021/22 https://www.mpi.govt.nz/dmsdocument/43003-Review-of-Rock-Lobster-Sustainability-Measures-for-202122

studied, while others are completely unknown. The most well studied indirect ecosystem effect of fishing in New Zealand is the **snapper/crayfish – urchin – kelp trophic cascade**. This cascade involves the expansion of urchin (kina) populations and urchin barrens in some locations (and corresponding loss of shallow kelp forests and associated biodiversity and productivity) as a consequence of urchin predators (large snapper and crayfish) being functionally absent or of reduced importance in kelp forest ecosystems. This trophic cascade and the mechanisms that result in extensive urchin barrens are well described in the evidence of Dr Nick Shears.

78. Ngati Kuta in their evidence describe first appearance of urchin barrens in Ipipiri during the 1970's and their replacement of much of the shallow kelp forest by the end of that decade.[27]

79. Carmen Hetaraka of Te Uri o Hikihiki also talks about urchin barrens being a tohu, or indicator of a system being that is out of balance:[28]

> "*Rimurimu, the kelp or forest of the sea. Tane is the architect of te Ao in that Tane separated Papatuanuku and Ranginui. Rimurimu holds the same role in te moana. We are seeing the violation of our moana and the loss of our kelp forests through the proliferation of kina barrens.* ***The kina barrens are the tohu***"

80. Extensive urchin barrens in East Northland as described by Dr Nick Shears, Vince Kerr, tangata whenua and dive industry are both a consequence of the ecological changes that have occurred due to fishing and, as described by Carmen Hetaraka, they are a tohu or indicator of an altered ecosystem.

How the current management of the Coastal Marine Area (CMA) gives effect to New Zealand Coastal Policy Statement (NZCPS)?

81. Policy 11.a. of the NZCPS relates to the protection of threatened, at risk or rare species, habitats or ecosystems. Species such as Black Spotted Grouper (*Epinephelus daemelii*) and Coral species that are rare or

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[27] Evidence in chief of Matutaera Te Nana Clendon, Robert Sydney Willoughby and George Frederick Riley, at paragraphs 103-104.

[28] Evidence in chief of Carmen Hetaraka, at paragraph 54(d).

protected as described in the evidence of Mr Vince Kerr and Dr Rebecca Stirnemann.

82. Rhodolith beds (described in evidence of Dr Mark Morrison) are both a species and a habitat that also falls into this category.

83. For the deeper reefs (below 30 m depth) we do know that rare and protected coral species are present (refer to evidence of Dr Rebecca Stirnemann and Mr Vince Kerr), but we have an incomplete understanding of the biodiversity of these reefs and no real idea of exactly how much rare biodiversity occurs in these habitats.

84. Policy 11.b. relates to all other (not rare or threatened) marine species, habitats and ecosystems.

85. 11.b.i refers to the need to protect areas of predominantly indigenous vegetation. This describes all shallow coastal reefs and seagrass meadows. The threats to these habitats are described in the evidence of Dr Nick Shears and Dr Mark Morrison.

86. 11.b.ii refers to habitats in the coastal environment that are important during the vulnerable life stages of indigenous species. It is probably reasonable to suggest that all marine habitats fit this description as there are species that have evolved to occupy and be reliant on each of these habitats.

87. 11.b.iii refers to indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification. Dr Nick Shears has described how coastal kelp forests have been modified through the removal of keystone species, Dr Mark Morrison has described the vulnerabilities of seagrass, shellfish and rhodolith beds to dredging, and Mr Vince Kerr, Dr Rebecca Stirnemann and I have summarised vulnerability of deeper seafloor habitats to trawling and dredging.

88. 11.b.iv refers to habitats of indigenous species in the coastal environment that are important for recreational, commercial, traditional or cultural purposes. The evidence of Ngati Kuta describes the relationship between the seagrass habitat and important fish species including takeke (piper), kahawai and warehunga (kingfish). This is in addition to the role that seagrass is known to play as a nursery for juvenile snapper. Paua and

crayfish rely on rocky reef habitats, and kina have limited value as a customary species when harvested ‘skinny’ from an urchin barren where they have little to eat.

89. It is my opinion that the current fisheries and environmental management regulations in the Bay of Islands, Cape Brett and Mimiwhangata areas do not provide the level of protection needed to safeguard the indigenous biodiversity describe above from the impacts of fishing.

90. Most coastal rocky reefs are not protected from the ecosystem effects of fishing, as evidenced by the presence of extensive and persistent urchin barrens. There is only one small area of rocky reef (Maunganui Bay) which is afforded partial protection via a rahui. The rahui area is small, and while it has resulted in some ecological restoration (see Ngati Kuta evidence[29] and Dive Industry evidence of Ms Julia Riddle[30] and Mr Craig Johnston[31]), the recovery has not been to the same extent as observed in other larger marine protected areas (refer to evidence of Dr Nick Shears). The Mimiwhangata Marine Park does not appear to have been effective at all in protecting or restoring biodiversity as fishing is permitted in this protected area (as discussed in evidence of Dr Nick Shears and Mr Vince Kerr).

91. Vulnerable and important shallow seafloor habitats in the inner Bay of Islands (Ipipiri Benthic Protection Area) including seagrass meadows, rhodolith beds and shellfish beds are partially protected as there is already a prohibition of commercial trawling and dredging, and commercial fishing in Te Puna Mataitai. However, recreational scallop dredging is permitted and is a threat to these vulnerable habitats.

92. Deeper coastal reefs in the proposed Ipipiri-Rakaumangamanga and Te Au o Morunga Protection Areas are defined in the Coastal Plan as being ecologically significant but are currently unprotected[32]. Steeper, high relief reefs in this area cannot be easily trawled. However, low lying and small

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[29] Evidence in chief of Matutaera Te Nana Clendon, Robert Sydney Willoughby and George Frederick Riley, at paragraph 90.

[30] Evidence in chief of Julia Riddle, at paragraphs 8, 19-21.

[31] Evidence in chief of Craig Johnston, at paragraph 8.

[32] Northland Regional Council, Significant Ecological Marine Area Assessment Sheet, Eastern Bay of Islands and Cape Brett Coast.

patch reefs and biogenic reefs are vulnerable to the impacts of trawling and dredging as described above.

93. Deeper soft sediment habitats in the proposed Ipipiri-Rakaumangamanga and Te Au o Morunga Protection Areas are vulnerable to the impacts of trawling and dredging, although it is not clear to me how much fishing takes place in these areas and therefore how much of this risk is realised.

The proposed fishing control provisions

94. In my opinion, the fishing control provisions proposed for the Bay of Islands, Cape Brett and Mimiwhangata areas will significantly improve the protection of indigenous marine biodiversity.

95. **The Maunganui – Oke Bay Rahui Tapu and Mimiwhangata Rahui Tapu**

    a. The Maunganui – Oke Bay Rahui Tapu and Mimiwhangata Rahui Tapu will provide protection and facilitate restoration of species and habitats associated with these coastal rocky reefs and surrounding soft sediment habitats.

    b. It is an improvement on the current no-take area. While the proposed no-take area is relatively small at *c.* 6 km^2, it is larger than the current area and the design reduces the significance of edge effects relative to the existing rahui.

    c. Through the central part of the Rahui Tapu, the seaward boundary is only 350 m from Motuwheteke Island. Consequently, highly mobile species (fish and crayfish) are more likely to venture, or be enticed, out of the no-take area and be captured.

    d. However, as described in the evidence of Dr Nick Shears, the depth of water immediately adjacent to the Rahui Tapu may reduce this effect.

    ~~e. If the Maunganui Oke Bay Rahui Tapu Buffer Area was included in the no-take area this would be a considerable improvement in terms of MPA design. A buffer zone outside of a larger no-take area would probably result in better biodiversity outcomes and better recreational and customary fishing outcomes as the buffer~~

~~area would sit beside what would likely be a more effective protected area.~~

96. **Mimiwhangata Rahui Tapu**

    a. The design of this Mimiwhangata Rahui Tapu no-take area is sound and should be an effective tool for protecting and restoring biodiversity. The buffer zones further strengthen the design. The area is large, it incorporates a range of habitats including entire reef systems, and edge effects are small relative to the size of the no-take area. The merits of this Rahui Tapu are well covered in the evidence of Dr Nick Shears and I agree with his assessment.

97. **Ipipiri Benthic Protection Area**

    a. The prohibition of recreational dredging in the Ipipiri Benthic Protection Area will protect important seafloor habitats, including, seagrass, rhodolith and shellfish beds which provide shelter and food for a range of indigenous biodiversity.

98. **Ipipiri-Rakaumangamanga and Te Au o Morunga Protection Areas**

    a. The proposed fishing controls for the Ipipiri-Rakaumangamanga and Te Au o Morunga Protection Areas will protect indigenous marine biodiversity from the effects of trawling and dredging. While there has been no assessment of the current impact of trawling on deep seafloor diversity in this area, we know from previous research conducted in the Hauraki Gulf and Northland that trawling can and does impact on the diversity and richness of seafloor biodiversity (Thrush et al. in 1998; Cryer et al. 2000);

    b. The proposed fishing controls for the Ipipiri-Rakaumangamanga and Te Au o Morunga Protection Areas are consistent with MPA guidelines which call for representative areas of all coastal habitats to be protected;

    c. They are consistent with government policy to seek protection of 30% of marine areas[33];

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[33] Hon David Parker, Minister for Oceans and Fisheries, https://vimeo.com/510034238

d. Protecting these areas is also consistent with the MPI approach of using Benthic Protection Areas (**BPA**) in deeper waters and the MPI's commitment to "*ensuring that the effects of bottom trawling in shallower waters closer to shore are also managed*";

e. The Deepwater Group, who represent participants in New Zealand's major deepwater commercial fisheries, support the use of Benthic Protection Areas, not as a fisheries management tool, but to protect seafloor biodiversity[34];

> *"BPAs are recognised for their significant global contribution to marine biodiversity";*
>
> *"The wide range of benthic biodiversity in New Zealand waters is better protected with BPAs than without.";*
>
> *"Benthic Protection Areas (BPAs) are internationally-recognised as Marine Protected Areas (MPAs), and… MPAs are one of a number of tools for conserving marine biodiversity;*

f. The selection criteria used to establish Benthic Protection Areas in New Zealand's exclusive economic zone (**EEZ**) included that the areas were unmodified, large, simple, delivered government policy and were representative of marine habitats, depth ranges and topographical features;

g. With the available information, it is difficult to assess the degree to which marine biodiversity in the Ipipiri-Rakaumangamanga and Te Au o Morunga Protection Areas is modified or impacted by fishing. However, existing management tools and policies for managing marine biodiversity appear to be set up to protect both unmodified seascapes (with BPAs) and those that are in need of protection and restoration (as required by the NZCPS).

Conclusion

99. It is my opinion that the current fisheries and environmental management regulations in the Bay of Islands, Cape Brett and Mimiwhangata areas do not provide the level of protection needed to safeguard indigenous marine biodiversity from the impacts of fishing.

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[34] https://deepwatergroup.org/benthic-protection-areas-are-marine-protected-areas/

100. I believe that the proposed fishing control provisions will significantly improve the protection of marine biodiversity and that significant ecological benefits will result from the implementation of the proposed fishing controls

101. I consider that the proposed fishing controls are consistent with marine protected area design principles, government policy around marine protected areas, the approach currently taken by MPI to managing fishing impacts, and with MPI's commitment to managing the effects of bottom trawling in coastal waters.

………………………………

Philip Maxwell Ross

16 April 2021 (updated 22 June 2021)

Appendix 1: References

Abraham E, Thompson F (2011) Estimated capture of seabirds in New Zealand trawl and longline fisheries, 2002–03 to 2008–09. New Zealand Aquatic Environment and Biodiversity Report No. 79.

Baird SJ; Smith MH (2007) Incidental capture of seabird species in commercial fisheries in New Zealand waters, 2003–04 and 2004–05. New Zealand Aquatic Environment and Biodiversity Report No. 9. 108 p. Baird, S.J.; Smith, M.H. (2008). Incidental capture of seabird species in commercial fisheries in New Zealand waters, 2005–06. New Zealand Aquatic Environment and Biodiversity Report No. 18. 124 p Abraham & Thompson 2010

Baird SJ; Wood BA; Bagley NW (2011) Nature and extent of commercial fishing effort on or near the seafloor within the New Zealand 200 n. mile Exclusive Economic Zone, 1989–90 to 2004–05. New Zealand Aquatic Environment and Biodiversity Report 73. 143 p.

Beentjes M, Baird SJ (2004) Review of dredge fishing technologies and practice for application in New Zealand. New Zealand Fisheries Assessment Report 2004/37.

Booth J (2017) Recreational fishing in the Bay of Islands: intense pressure contributes to stress on fishstocks and to local ecological degradation. A paper prepared for Fish Forever.

Bradstock M, Gordon D (1983) Coral-like bryozoan growths in Tasman Bay, and their protection to conserve commercial fish stocks. New Zealand Journal of Marine and Freshwater Research. 17: 159-163.

Colenso, W. (1891). Vestiges: reminiscences: memorabilia of works, deeds, and sayings of the ancient Maoris. Transactions and Proceedings of the New Zealand Institute 24: 445–467.

Cryer, M.; O'Shea, S.; Gordon, D. et al. (2000). Distribution and structure of benthic invertebrate communities between North Cape and Cape Reinga. Final Research Report for Ministry of Fisheries Research Project ENV9805 Objectives 1-4. (Unpublished report held in NIWA library, Wellington.)

Department of Conservation (2016) Fisheries relevant to Buller’s shearwater and red-billed gull prey availability in North Eastern North Island https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/int2016-04-description-of-process.pdf

Fisheries New Zealand (2019) Protecting New Zealand’s Seabed from the impacts of trawling. file:///G:/My%20Drive/Personal/Consulting/NRC/Literature/MPI%202019-deep-sea-bottom-trawling-FS.pdf

Fisheries New Zealand (2020) Review of Rock Lobster Sustainability Measures for 2021/22. Discussion Document No: 2020/24 https://www.mpi.govt.nz/dmsdocument/43003-Review-of-Rock-Lobster-Sustainability-Measures-for-202122

Fisheries New Zealand (2020) Fisheries Assessment Plenary. Stock Assessment and Stock Status. Volume 3.

Grange, K.R., Tovey, A., Hill, A.F. (2003). The spatial extent and nature of the bryozoan communities at Separation Point, Tasman Bay. Ministry of Fisheries, Marine Biodiversity Biosecurity Report No. 4. 22pp.

Hermsen, J M; Collie, J S; Valentine, P C (2003) Mobile fishing gear reduces benthic megafaunal production on Georges Bank. Marine Ecology Progress Series 260: 97–108

Hiddink, J G; Jennings, S; Kaiser, M J; Queiros, A M; Duplisea, D E; Piet, G J (2006) Cumulative impacts of seabed trawl disturbance on benthic biomass, production, and species richness in different habitats. Canadian Journal of Fisheries and Aquatic Sciences 63:721–36

Jennings, S; Dinmore, T A; Duplisea, D E; Warr, K J; Lancaster, J E (2001) Trawling disturbance can modify benthic production processes. Journal of Animal Ecology, 70: 459–475.

Kendrick, T H; Francis, M P (2002) Fish assemblages in the Hauraki Gulf, New Zealand. New Zealand Journal of Marine and Freshwater Research. 36: 699–717.

Langley, A D (1995a) Trawl survey of snapper and associated species in the Hauraki Gulf, October–November 1994 (KAH9411). New Zealand Fisheries Data Report No. 61. 35 p.

Law R (2000) Fishing, selection, and phenotypic evolution. ICES Journal of Marine Science, 57: 659–668.

MacKenzie, D; Fletcher, D (2006) Characterisation of seabird captures in NZ fisheries. Final Research Report prepared for the Ministry of Fisheries, Proteus Wildlife Consultants. 99 p. (Unpublished report held by Fisheries New Zealand, Wellington.)

Matthews, RH (1911). Reminiscences of Maori life fifty years ago. Transactions and Proceedings of the New Zealand Institute 43: 598–604.

Morrison, M (1997) Trawl survey of snapper and associated species in the Bay of Plenty, February 1996 (KAH9601). NIWA Technical Report 2. 33 p.

Morrison, M A; Francis, M P (1997) Trawl survey of snapper and associated species in the Hauraki Gulf, October–November 1997 (KAH9720). NIWA Technical Report 58. 37 p

Morrison, M A; Stevenson, M L (2001) Review of west coast North Island trawl survey time series, 1986–96. NIWA Technical Report 107. 55 p.,

Morrison, M A; Francis, M P; Parkinson, D M (2002) Trawl survey of the Hauraki Gulf, 2000 (KAH0012). New Zealand Fisheries Assessment Report 2002/46. 48 p.

National Research Council (1999) Sustaining Marine Fisheries 1999. Chapter 3

Oberle FKJ, Puig P, Martín J (2018) Fishing Activities, in: Structural Geology and Tectonics Field Guidebook — Volume 1. Structural Geology and Tectonics Field Guidebook — Volume 1: 503–534.

Parsons DM, Morrison MA, MacDiarmid AB, Stirling B, Cleaver P, Smith IWG et al. 2009. Risks of shifting baselines highlighted by anecdotal accounts of New Zealand's snapper (Pagrus auratus) fishery. New Zealand Journal of Marine and Freshwater Research 43: 965–983.

Parsons DM, Sim-Smith CJ, Cryer M, Francis M, Hartill B, Jones EG, Le Port A, Lowe M, Morrison M, Paul L, Radford C, Ross PM, Spong KT, Trnski T, Usmar N, Walsh C, Zeldis J (2014) Snapper (Chrysophrys auratus): a review of life history and key vulnerabilities in New Zealand. New Zealand Journal of Marine and Freshwater Research. 48: 256-283.

Paulin C (2007) Perspectives of Mäori fishing history and techniques. Tuhinga 18: 11-47.

Pauly D, Christensen V, Dalsgaard J, Froese R, Torres Jr F.et al. (1998) Fishing down marine food webs. Science. 279: 860-863.

Reiss, H; Greenstreet, S P; Sieben, K; Ehrich, S; Piet, G J; Quirijns, F; Robinson, L; Wolff, W J; Kröncke, I (2009) Effects of fishing disturbance on benthic communities and secondary production within an intensively fished area. Marine Ecology Progress Series, 394, 201–213

Rice, J (2006) Impacts of Mobile Bottom Gears on Seafloor Habitats, Species, and Communities: A Review and Synthesis of Selected International Reviews. Canadian Science Advisory Secretariat Research Document 2006/057. 35 p. (available from http://www.dfo-mpo.gc.ca/CSAS/Csas/DocREC/2006/RES2006_057_e.pdf).

Thrush, S.F., Hewitt, J.E., Cummings, V.J., Dayton, P.K., Cryer, M., Turner, S.J., Funnell, G.A., Budd, R.G., Milburn, C.J., Wilkinson, M.R., (1998) Disturbance of the marine benthic habitat by commercial fishing

Thrush, S F; Schultz, D; Hewitt, J E; Talley, D (2002) Habitat structure in soft-sediment environments and abundance of juvenile snapper Pagrus auratus. Marine Ecology Progress Series 245: 273–280.