BEFORE THE ENVIRONMENT COURT
AT AUCKLAND

I MUA I TE KŌTI TAIAO O AOTEAROA
KI TĀMAKI MAKAURAU

IN THE MATTER	of the Resource Management Act 1991(the **Act**)
AND	
IN THE MATTER	of appeals under clause 14 of the First Schedule to the Act
BETWEEN	**BAY OF ISLAND MARITIME PARK INCORPORATED** (ENV-2019-AKL-000117)
	ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND INCORPORATED (ENV-2019-AKL-000127)
	Appellants
AND	**NORTHLAND REGIONAL COUNCIL**
	Respondent

STATEMENT OF EVIDENCE OF JONATHAN CLIVE HOLDSWORTH
ON BEHALF OF THE NEW ZEALAND SPORT FISHING COUNCIL INC
(MARINE & FISHERIES SCIENCE)
Dated 14 May 2021

BROOKFIELDS
LAWYERS
A Green / R Ashton
Telephone No. 09 979 2210
Fax No. 09 379 3224
P O Box 240
DX CP24134
AUCKLAND

1. INTRODUCTION

1.1 My full name is Jonathan Clive Holdsworth, Fisheries Consultant.

1.2 My evidence is given on behalf of the New Zealand Sport Fishing Council (**NZSFC**).

2. EXECUTIVE SUMMARY

2.1 My evidence addresses how threats from fishing activity to marine ecosystems and biodiversity have been sought to be managed under the Fisheries Act 1996 (**FA**), both in a general sense and in the specific areas of interest in these appeals

2.2 Fisheries management has shifted from input to controls, such as fishing area and method restrictions, to mainly output controls under the Quota Management System (**QMS**) established in 1986. Where sufficient data is available, modern quantitative stock assessments are used to estimate the status of a stock relative to a management target and limit reference points. Total Allowable Catch (**TAC**) is set to move that stock toward the target level. However, only a handful of inshore species have this type of assessment and the assessments don't take into account interconnections with other species and the environment.

2.3 There are quantitative assessments for snapper and rock lobster stocks in Northland. East Northland and the Bay of Islands in particular, have more old and large snapper than the Hauraki Gulf or Bay of Plenty, but the stock was estimated to be at 24% of the unfished biomass at the time of the last assessment (2013). The 2019 red rock lobster (*Jasus edwardsii*) stock assessment revealed sustainability concerns and the Total Allowable Commercial Catch (**TACC**) was reduced by 16% and the recreational allowance was reduced by 36% in 2020. However, there has been a significant increase in the number of packhorse rock lobster (*Jasus verreauxi*) on the north east coast over the last 20 years and following a stock assessment in 2020 the TACC was increased by 9 tonnes (22%) in 2021.

2.4 A recently published study compiled over 40 years of red rock lobster monitoring data and examined long-term trends in three relatively small marine reserves in northern New Zealand. In all three reserves, lobster density initially increased by at least a factor of three following protection. However, over the last 10 years, lobster populations have experienced large

declines in all three reserves with densities now well below historic levels. I agree with the study conclusions that small marine reserves do not provide a safeguard against overfishing.

2.5 Surveys of shallow rocky reef habitat have shown that kina/urchin barrens have been increasing in many areas. Evidence from the recent re-survey in Maunganui Bay concludes that the Rāhui has led to an increase in the number and size of the main predators of kina. However, no evidence is presented as to the whether the primary predators responsible for the decline in kina barrens are large snapper, large rock lobster, or the ongoing removal of urchins by divers (to feed snapper) and by hapu members.

2.6 In my opinion a wider Ecosystem Base Fisheries Management (**EBFM**) approach, which better reflects the interconnections between species and with the environment, is required to better recognise Te Ao Maori. Removing trawling and dredging from the inshore zone in all of Fisheries Management Area 1 (**FMA 1**) would be a step change in protecting benthic biodiversity and increase marine productivity across the board. Implementation of EBFM would be the catalyst to making this change.

3. QUALIFICATIONS AND EXPERIENCE

3.1 I am self-employed as a Consultant in marine & fisheries science and fisheries management. I am a director of Blue Water Marine Research Limited based in Matapouri, Northland. I have held this position for 24 years. Prior to this I was employed by the Ministry of Fisheries as a science technician and a fisheries policy analyst for 11 years based in Whangārei. I hold a Batchelor of Science (Zoology) from the University of Auckland.

3.2 I have been a member of fisheries assessment working groups, which peer review research projects funded by Fisheries New Zealand. The working groups relevant to my evidence are the Inshore Fisheries Assessment Working Group, Rock Lobster Fisheries Assessment Working Group, and Marine Amateur Fisheries Working Group.

3.3 I was principal scientist for the following relevant projects for Fisheries New Zealand (and its predecessors):

(a) Selectivity of recreational catches of snapper in SNA1 (2005–06, 2006–07);

(b) Catch-at-age of kingfish caught by recreational fishers in KIN1 (2009–10, 2014–15); and

(c) Rock lobster amateur harvest estimates for Northland CRA1 (2013–14).

3.4 I was also project manager and co-author on the project Estimating Marine Recreational Fishing's Economic Contributions in New Zealand (2014–15).

3.5 I was a member of the multi-stakeholder Snapper 1 Strategy Group during 2014 and 2015 representing the NZSFC and the recreational fishing sector and I am currently a member of the National Rock Lobster Management Group which provides rock lobster management advice for the Oceans and Fisheries Minister.

4. CODE OF CONDUCT

4.1 I have read the Code of Conduct for Expert Witnesses outlined in the Environment Court's Practice Note (2014) (**Code**) and have complied with it in preparing this evidence. I also agree to follow the Code when presenting evidence to the Court. I confirm that the issues addressed in this brief of evidence are within my area of expertise, except where I state that I rely upon the evidence of other expert witnesses. I also confirm that I have not omitted to consider material facts known to me that might alter or detract from my opinions.

5. SCOPE OF EVIDENCE

5.1 In preparing this evidence, I have read the evidence in chief filed on behalf of Bay of Islands Maritime Park Incorporated (**BIOMP**), Royal Forest and Bird Protection Society of New Zealand Incorporated (**Forest and Bird**) and the hapū of Ngāti Kuta ki Te Rawhiti (**Ngāti Kuta**), the hapū Te Uri o Hikihiki (**Te Uri o Hikihiki**) and the Northland Regional Council (**NRC**).

5.2 This statement of evidence covers the following:

(a) A summary of my evidence (**Executive Summary**);

(b) Overview and ecology;

(c) Fisheries management in New Zealand;

(d) Snapper and rock lobster fisheries;

(e) Forage species;

(f) Economic contribution of recreational fishing;

(g) Comment on the proposed Marine Protected Areas (**MPAs**); and

(h) Conclusion.

6. OVERVIEW AND ECOLOGY

6.1 A number of important points are made in evidence from Ngāti Kuta, including that in Te Ao Māori everything is connected. All life and the environment are interconnected and interrelated. This a holistic understanding that includes people as a part of the natural system. However, since the arrival of humans in New Zealand there have been significant changes to indigenous biodiversity and the environment.

6.2 Tangata whenua accept an intergenerational duty to maintain the mauri (life force, vitality) of our land and water, and to nurture the reciprocal relationship between tangata (people) and the whenua (land). Evidence from Ngāti Kuta states:[1]

> The many islands, rocks, reefs, and outcrops which lie within our rohe moana are tino taonga. They have spiritual, cultural and historic importance for us and of course sustain our social wellbeing as a community.
>
> We know these places because we are the fishing people. We have ahi kā of these places. Our hapū controlled the times and season of fishing on the different species as we understood the environment.

6.3 For the reasons that are addressed in my evidence, in my opinion an ecosystem based fisheries management approach which better reflects the interconnections between species and with the environment is required to better reflect Te Ao Māori.

6.4 The interconnected view of the environment is also reflected in the western canon. In 1971 Barry Commoner, a leading ecologist and one of the founders of the modern environmental movement, proposed four laws of ecology in his book The Closing Circle: Nature, Man, and Technology:

---

[1] Statement Of Evidence Of Matutaera Te Nana Clendon, Robert Sydney Willoughby And George Frederick Riley On Behalf Of Themselves And The Hapū Of Ngāti Kuta Ki Te Rawhiti at paragraphs 17 and 18.

1. ***Everything is connected to everything else***. There is one ecosphere for all living organisms and what affects one, affects all.

2. ***Everything must go somewhere***. There is no "waste" in nature and there is no "away" to which things can be thrown.

3. ***Nature knows best***. Humankind has fashioned technology to improve upon nature, but such change in a natural system is, says Commoner, "likely to be detrimental to that system."

4. ***There Is No Such Thing as a Free Lunch***. Exploitation of nature will inevitably involve the conversion of resources from useful to useless forms.

6.5 Marine ecosystems and biodiversity are subject to numerous threats, including:

(a) land based pollution such as sediment;

(b) climate change; and

(c) fishing - particularly excessive harvest of target species, bycatch, and methods that disturb the benthic environment.

6.6 My evidence now addresses how threats from fishing activity to marine ecosystems and biodiversity have been sought to be managed under the FA, both in a general sense and in the specific areas of interest in these appeals.

7. FISHERIES MANAGEMENT IN NEW ZEALAND

7.1 Fisheries management in New Zealand is largely defined by the FA and Fisheries NZ policy and standards.

Purpose and principles

7.2 The purpose of the FA in section 8 is:

> to provide for the utilisation of fisheries resources while ensuring sustainability.

7.3 Utilisation and ensuring sustainability are defined as follows:

> **ensuring sustainability** means—

> (a) maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations; and
>
> (b) avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment
>
> **utilisation means** conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural well-being.

7.4 Section 9 of the FA relates to the environmental principles that need to be taken into account when exercising or performing functions, duties, or powers under the FA, in relation to the utilisation of fisheries resources or ensuring sustainability. These are:

> (a) associated or dependent species should be maintained above a level that ensures their long-term viability:
>
> (b) biological diversity of the aquatic environment should be maintained:
>
> (c) habitat of particular significance for fisheries management should be protected.

Total allowable catch

7.5 Section 13 of the FA relates to setting the TAC for fish species that are subject to the QMS and states that:

> The Minister shall set a total allowable catch that maintains the stock at or above a level that can produce the maximum sustainable yield, having regard to the interdependence of stocks.

7.6 Since 1996 a large number of new species have been introduced to the QMS. The management areas typically include all of East Northland, Hauraki Gulf and Bay of Plenty, while some also include the northern half of the west coast of the North Island (Tirau Point to North Cape). There have been relatively few management changes in Quota Management Areas (**QMA**) that include East Northland. Changes since 1996 for the main inshore species are set out in Table 1 below:

Table 1: Changes to TACCs for inshore species in northern QMAs since 1996.

Species (and QMA)	Year	TACC	Change	Change in amateur regulations
Snapper (SNA 1)	1996	4500	9% reduction	MLS increased to 30 cm and DBL reduced to 7 in 2014
Kahawai (KAH 1)	2005	1075	22.5% less than catch history	
Rock Lobster (CRA 1)	2020	110	16% reduction	
Kingfish (KIN 1)	2003	91	20% less than catch history	MLS increased to 75 cm and DBL reduced to 3
Tarakihi (TAR 1)	2007	1447	3% increase	
Tarakihi (TAR 1)	2018-19	1097	24% reduction	
Flounder (Flatfish 1)	2018	890	25% reduction	

Other sustainability measures

7.7 The TAC is one of the central sustainability measures under Part 3 of the FA. However, the TAC is broad scale tool by nature. Sustainability measures under Part 3 of the FA can also include more granular measures such as:

(a) areas or seasons fished;

(b) minimum legal size; and

(c) fishing methods by which any fish, aquatic life, or seaweed of any stock may be taken or that may be used in any area.

7.8 These more granular sustainability measures are imposed under section 298 of the FA relating to sustainability measures.

7.9 A relatively high number of fishing regulations of method and area-based restrictions apply to the Bay of Islands and from Whangaruru to Mimiwhangata in recognition of the high use and amenity values of these areas. There are 18 amateur and commercial fishing method and area-based restrictions that apply in the Bay of Islands and six that apply specifically to the Whangaruru to Mimiwhangata area. All of these regulations were implemented before 1996, apart from three areas established by Hapū:

(a) the Waikare Taiāpure was established in 1997 under section 175 of the FA:

(b) the Rāhui at Maunganui Bay was first established in 2010 by Ngāti Kuta and Patukeha ki Te Rawhiti under section 186A of the FA: and

(c) the Te Puna Mātatitai which was established in 2013 by Ngā Hapū o Taiamai ki Te Marangai under section 23 of the Kaimoana Customary Fishing Regulations 1998.

Stock assessment

7.10 The FA allows the sustainable utilisation of most marine species at a level that maintains stocks at or above the biomass that can produce the maximum sustainable yield (B_{msy}). Determining the current status of a stock in relation to B_{msy} is achieved using stock assessment models that use long term catch history by method, life history parameters such as growth rates and maximum age, and trends in relative abundance. The latter is a key input and can usually be estimated by standardising commercial catch per unit effort (**CPUE**) which for most species starts in 1990, when detailed Catch Effort returns were fully implemented. However, many stocks had been fished down by 1990, and prior to 1986 catches were under reported and uncertain.

7.11 In 2008 Fisheries NZ published their Harvest Strategy Standard for New Zealand Fisheries (**HSS**) with operational guidelines to guide setting B_{msy} compatible management targets based on the biology of a species. This has provided a consistent and transparent framework for setting limit reference points that, if breached, trigger a formal rebuild plan.

7.12 Software and computing power continue to improve, and statistical models are more complex and better at estimating uncertainty. While fisheries assessments are only single species models, they can usually measure the cumulative effects of changes in fishing pressure and the ecosystem on stock size in a species. Quantitative stock assessments constitute the best available information for fisheries management but are only available for a few inshore stocks in QMAs that include Northland. Snapper and red rock lobster are relatively data rich, compared to other species, and they have stock assessments specific to Northland. Kahawai and packhorse rock lobster assessments cover North Cape to Cape Runaway. Tarakihi includes East Northland as part of a single stock that covers the east coast of the North and South Islands. The national bluenose stock assessment is currently being revised. The problem for other species is there is insufficient data and/or there is not a reliable index of relative abundance, such as CPUE.

7.13 In my experience a high-quality stock assessment does not always lead to an appropriate management response. East Northland was the most depleted region identified in the 2018 tarakihi stock assessment and the whole east coast of the North and South Islands was estimated to be about 17% of the unfished biomass level. The HHS specifies that a stock which is below 20% of the unfished biomass triggers a requirement for a formal, time constrained rebuild plan to the target of 40% of unfished biomass. The recommended rebuild time frame for this tarakihi stock was 10 years. The stock assessment estimated that a 55% reduction in overall TACC would be required to rebuild the tarakihi stock within 10 years. Instead, commercial fishers and Te Ohu Kaimoana developed their own management plan and the Minister reduced the TACC 20% and agreed to some new research and reporting requirements outlined in the plan. The rebuild timeframe is uncertain.

8. SNAPPER AND ROCK LOBSTER FISHERIES

8.1 A recuring theme in much of the Appellants' and supporting parties' evidence is the current lack of large snapper (**SNA**) and rock lobster (**CRA**), and their role as predators which reduce the numbers of large kina (*Evechinus chloroticus*) that create and maintain kina barrens. This effect is highlighted in many of the statements of evidence in the appeal.[2]

8.2 I was an active member of the Fisheries NZ science working groups that contributed to the SNA 1 stock assessment in 2013 and the CRA 1 stock assessment in 2019. I was also the principal scientist for several projects that provided detailed information on recreational catch used in these assessments.

8.3 These stock assessments show that the total weight (biomass) of snapper and rock lobster has declined as these stocks were fished, and at times over fished. Unfished populations of relatively long-lived species like snapper (up to 60 years) and rock lobster (up to 30 years) were dominated by large old fish that eat a lot but grow little. In theory there is a carrying capacity of the environment that will support a limited biomass of these species. In reality, there would have been natural ebbs and flows in biomass. As a stock is fished the old fish are gradually replaced by faster growing young fish which have less competition for space and food from old fish. Fisheries models can

[2] Evidence from Ngāti Kuta, Dr Shears, Ms Froude, Mr Kerr, Mr Johnstone, Ms Riddle, Mr Jongejans.

generate estimates of the sustainable annual yield (harvest weight) from a stock at different levels of biomass (Figure 1). In modern fisheries management less emphasis is placed on the estimates of maximum sustainable yield, which in theory can be achieved at quite low biomass, and more conservative “real world” management targets are used such as those in the Harvest Strategy Standard.

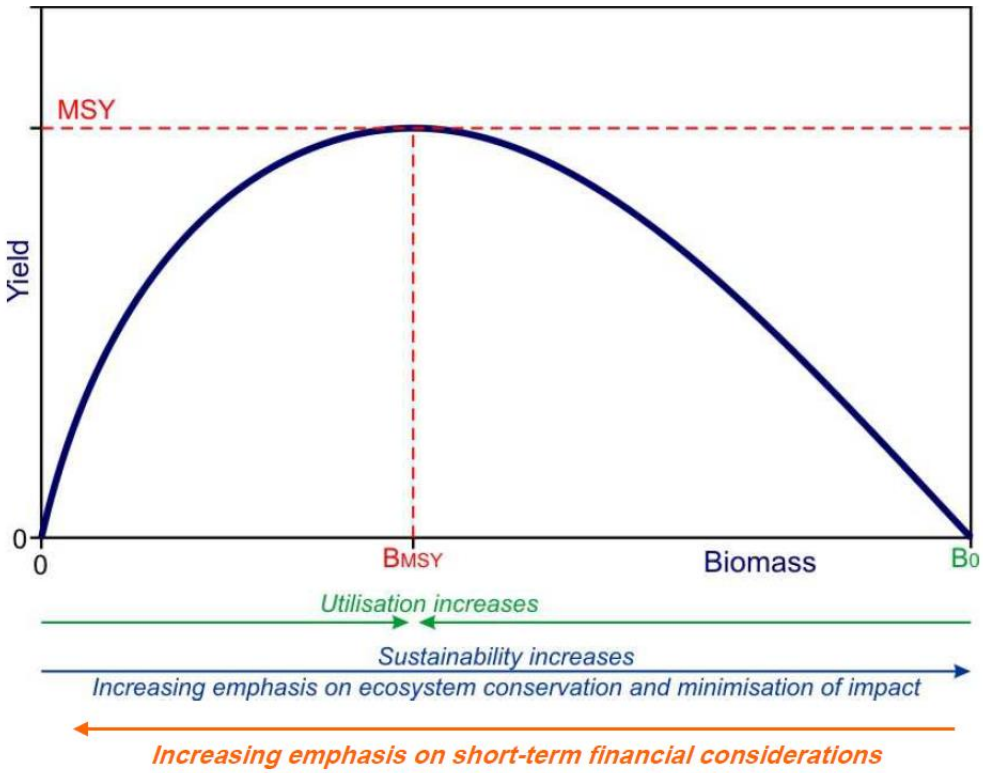

Figure 1: Theoretical relationship between stock biomass (maximum biomass at B0 on the right) and sustainable annual yield used to estimate the biomass that will produce the maximum sustainable yield (BMSY).

8.4 The relevant point is that stock biomass is reduced at almost any level of fishing and it is the large old fish that are replaced by younger faster growing fish. This is not because large old fish are targeted, but because once caught they take much longer to be replaced. In fact, markets often prefer small or medium sized fish, especially when solid whole rather than processed.

8.5 Almost all rock lobster exports are sent live to China and fishers get the highest price for fish under 1.5 kg. Commercial fishers are allowed to release rock lobster[3] and often choose to release large fish to maximise the value of their catch. Some commercial fishers have been accused of high grading their snapper catch when the port price was high by releasing large fish alive and

[3] Using provisions in section 72(2) and Schedule 6 of the Fisheries Act 1996.

dumping fish that are damaged or dead, although this is prohibited for this quota species.[4]

8.6 Recreational fishers have become more aware of the intrinsic value of large snapper in the ecosystem and breeding population and are much more likely to release these fish (as they are allowed to do) than 15 years ago. Magazines, television fishing programmes and social media have all played a role in promoting this. LegaSea and NZSFC have developed the FishCare programme to promote best practice techniques for handling and releasing fish caught by recreational fishers.[5]

Snapper SNA 1 stock assessment

8.7 SNA 1 is an important stock that has been the focus of many research projects over the last 50 years. SNA 1 encompasses a large area from East Northland through to the Bay of Plenty. Snapper have been the main target species for the inshore longline fleet which provides good quality catch per unit effort data that tracks changes in relative abundance. There is sufficient data and valid distinguishing characteristics for assessing the East Northland snapper stock separately from Hauraki Gulf and Bay of Plenty.

8.8 The 2013 assessment estimated that snapper spawning stock biomass was about 16,000 tonnes, or around 24% of the unfished biomass. The snapper retained catch by all methods in 2011-12 was about 1750 tonnes from East Northland, with longline, trawl and Danish seine being the main commercial methods.[6] A national survey of marine recreational fishers in 2011-12 estimated the retained 700 tonnes of snapper in East Northland (Figure 2).

---

4 Simmons et al. 2016. Reconstruction of marine fisheries catches for New Zealand (1950-2010). Sea Around Us, Global Fisheries Cluster, Institute for the Oceans and Fisheries, University of British Columbia, Vancouver, BC, Canada.

5 https://fishcare.co.nz/principle-2-maximising-survival-of-fish-released/

6 Francis R.I.C.C.; McKenzie, J.R. (2015). Assessment of the SNA 1 stocks in 2013. *New Zealand Fisheries Assessment Report 2015/76.*

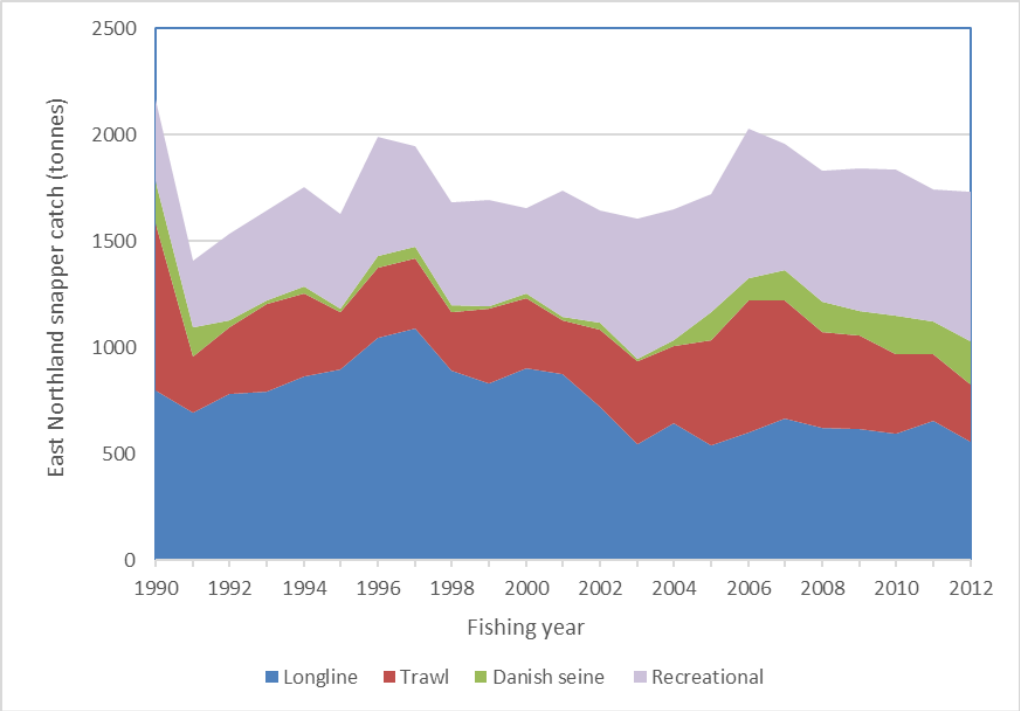

Figure 2: East Northland snapper landed catch by fishing method and fishing year used in the 2013 SNA 1 stock assessment.

8.9 Catch sampling of the commercial catch in SNA 1 shows there are more old snapper (30 years and older) in East Northland than in Hauraki Gulf or Bay of Plenty since the modern catch-at-age sampling started in the early 1990s. This is still the case as shown in the 2017–18 catch sampling (Figure 3).[7]

[7] Walsh, C.; Parsons, D.; Bian, R.; Armiger, H.; Buckthought, D.; Smith, M.; Rush, N. (2019). Age composition of commercial snapper landings in SNA 1, 2017–18. New Zealand Fisheries Assessment Report 2019/45. 62 p.

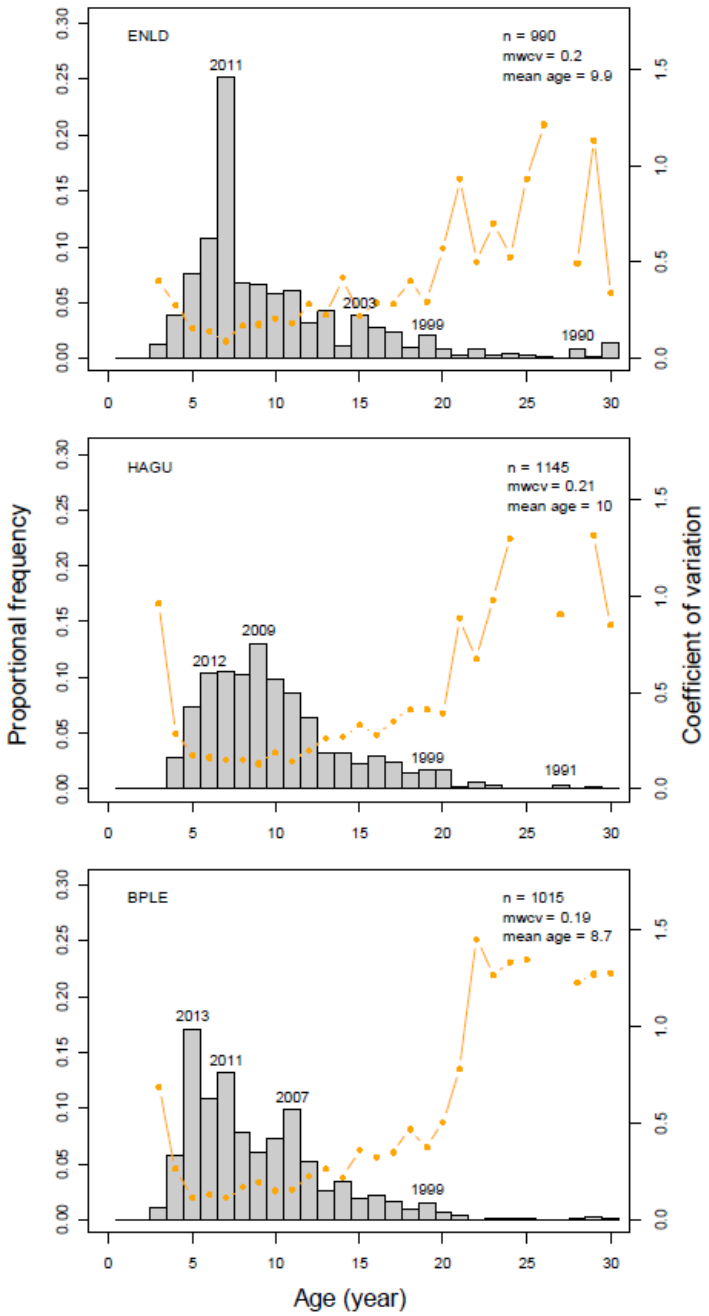

Figure 3: The age distributions of snapper in 2017–18 catch by commercial longline by region (ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty). East Northland has a strong year class from spawning in 2011 and the highest proportion of snapper 30 years or older.

8.10 Fisheries New Zealand (**FNZ**) has the detailed commercial catch data by fishing method in the Bay of Islands to Mimiwhangata area. My observation is that there has been very little trawling and Danish seine fishing in any of the areas identified by the Appellants and commercial longline fishing effort in the Bay of Islands has decreased significantly since the 1980s.

8.11 Non-commercial catch (customary and recreational) is now the dominant fishing method in the Bay of Islands to Mimiwhangata area. Blue Water

Marine Research completed a survey of the size and condition of snapper caught by recreational fishers in SNA 1 in 2006–07. This included fish measured at sea and released. The size of snapper in East Northland recreational catch was dominated by fish smaller than 33 cm but there were also more large fish present (60 cm plus) than recorded in Hauraki Gulf and East Northland (Figure 4).[8]

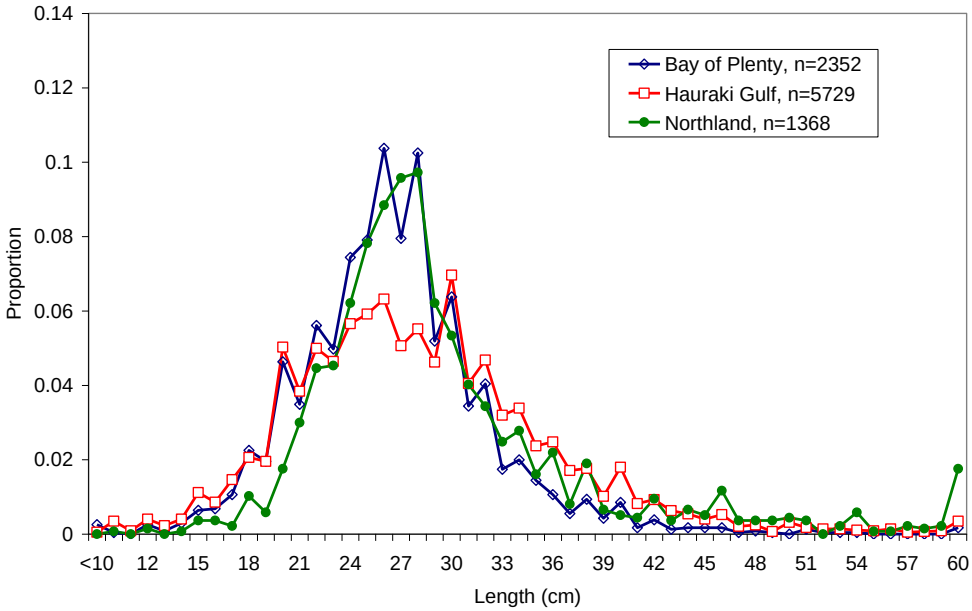

Figure 4: Length frequency of all snapper caught by recreational fishers sampled in 2006–07 by region.

8.12 The survey data on recreational landed catch was used to estimate the size of fish that were taken by this method each year in the stock assessment model. This selectivity by fishing method is an important component of the assessment model to find the best fit to the length and age data collected by research projects. There is a marked difference between the shape of the selectivity curve estimated for recreational fishing compared to the selectivity estimated for commercial longline fishing in SNA 1 (Figure 5).

8.13 The dome shape for recreational fishing shows high selectivity for snapper around 27 cm and much lower selectivity for snapper larger than 50 cm compared to their presence in the population. In contrast the selectivity for commercial longline peaks about 30 cm and stays high, even for the largest

8 Holdsworth, J.C.; Boyd, R.O. 2008. Size condition and estimated release mortality of snapper caught in the SNA 1 recreational fishery, 2006-07. *New Zealand Fisheries Assessment Report 2008/53*.

fish.[9] This means that the longline fishery catches large snapper almost in proportion to their abundance in an area.

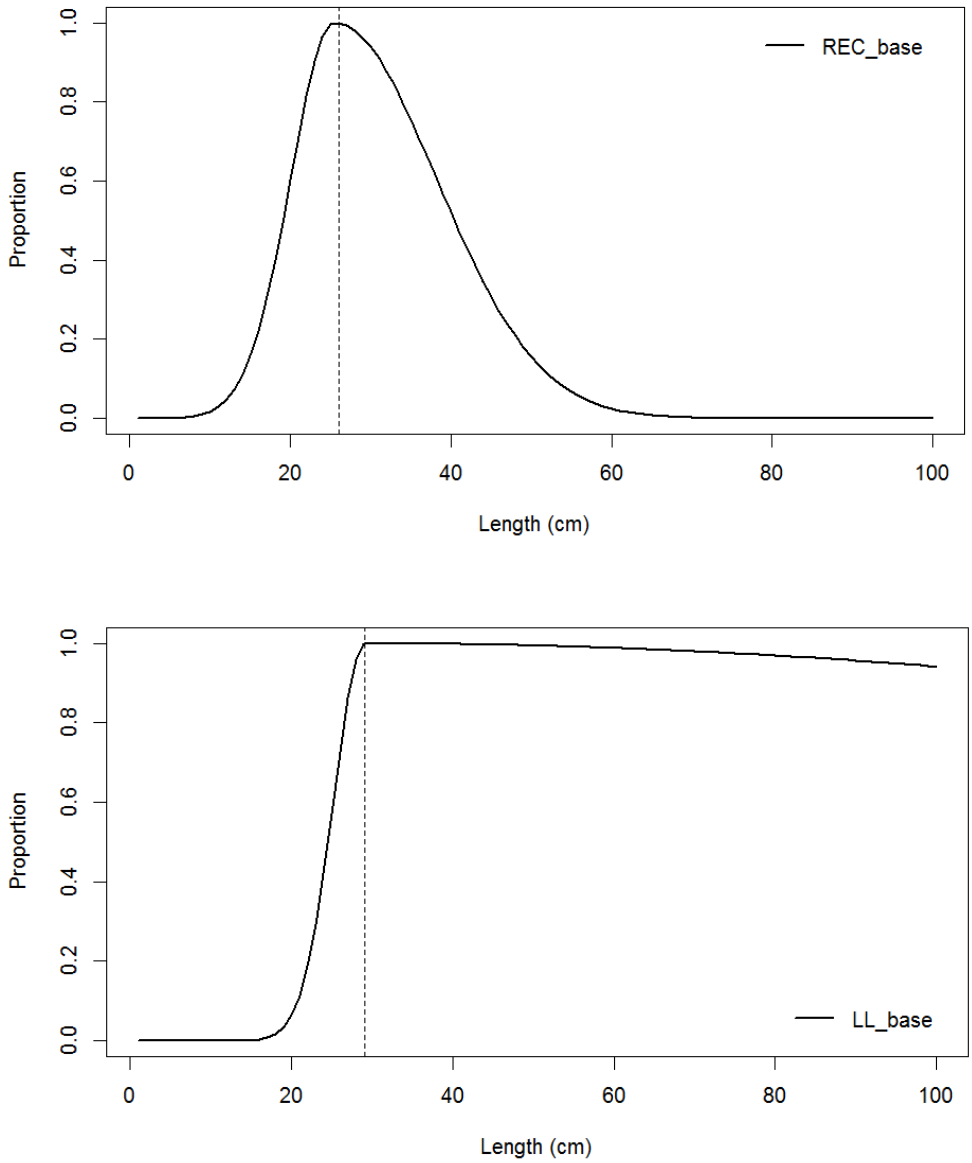

Figure 5: SNA 1 stock assessment model estimates of the size of snapper selected by recreational fishing methods (top) and size of snapper selected by commercial longline (bottom).

8.14 The Bay of Islands has a reputation for the presence of larger snapper. Survey data shows that recreational fishing does catch some large snapper but overall fishing during the day with rod and reel is not that efficient at targeting large fish. Commercial catch sampling shows East Northland has a higher proportion of older and probably larger snapper than the Hauraki Gulf or the Bay of Plenty. There are probably more large snapper in the Bay of Islands

[9] Francis R.I.C.C.; McKenzie, J.R. (2015). Assessment of the SNA 1 stocks in 2013. *New Zealand Fisheries Assessment Report 2015/76.*

than most other areas in SNA 1. If the number of large snapper in the Bay of Islands is not sufficient to slow the spread of kina barrens then this is a stock wide problem that needs a stock wide solution.

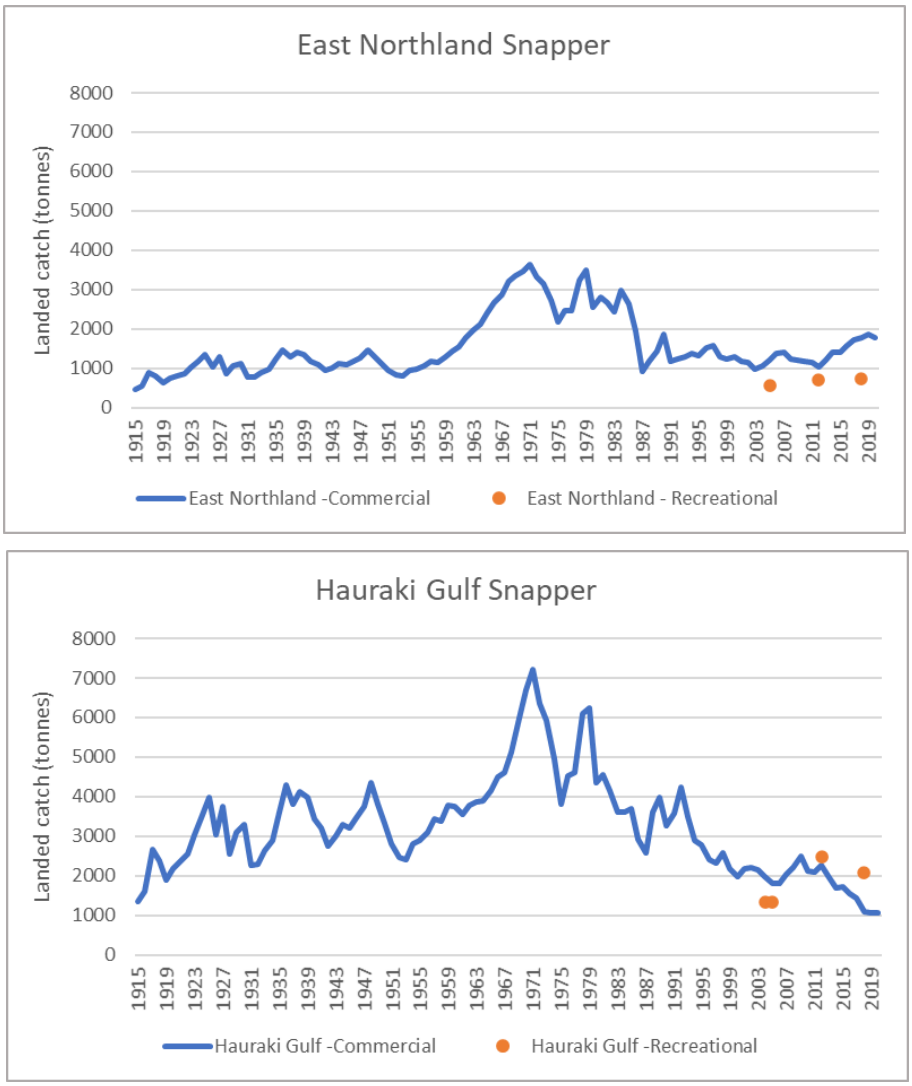

Figure 6: The snapper catch estimates used in the SNA 1 stock assessment for the commercial fishery (updated by NIWA to 2020) and from surveys of amateur harvest.

8.15 There was comment in the media this year that the amateur harvest of snapper in the Hauraki Gulf was twice that of the reported commercial catch.[10] This statement was used in the evidence of Mr Ross to imply an increasing impact by recreational fishing in the Hauraki Gulf. While the amateur harvest of snapper in the Hauraki Gulf has increased over the last 20 years it declined by about 422 tonnes (17%) between surveys in 2012 and 2018, while the commercial landings declined by about 1,173 tonnes (52%) over the same period (Figure 6). The amateur harvest of snapper in East Northland

10 TVNZ 1 Sunday interview 7 March 2021.

increased by about 12 tonnes (2%) between 2012 and 2018, while the commercial landings increased by about 725 tonnes (69%) over the same period.

Rock lobster CRA 1 stock assessment

8.16 The CRA 1 QMA covers the east and west coast of Northland including offshore Islands such as the Three Kings and Princess Group. Historically catch and effort data used in the stock assessment has been aggregated by FNZ statistical area (Figure 7). The Bay of Islands and Mimiwhangata are in statistical area 904 which extends from Takou Bay to Bream Bay. Rock lobster are caught in pots and CPUE is measured in kilos per pot lift per day. It is illegal to land rock lobster that have just moulted (soft shell) or while they are in berry (females with eggs). Eggs are carried for most of autumn and winter so fewer female rock lobster are kept and their abundance is higher than males.

8.17 Red rock lobster (*Jasus edwardsii*) stock assessments estimate the vulnerable biomass, which is mostly males of minimum legal size at the start of the 1 April fishing year, and the spawning stock biomass, which is the weight of mature females above and below the minimum legal size. The most recent stock assessment, completed in 2019, estimated the vulnerable biomass to be 15.5% of unfished biomass and likely to decline in future. The spawning stock biomass was 37% of unfished biomass and likely to stay at that level. A single management option (other than status quo) went out for consultation in 2020 and the Minister decided that a 21 tonne (16%) reduction in the TACC was appropriate. In addition, the recreational allowance was reduced by 18 tonnes (36%) and the allowance for illegal take and other fishing related mortality was reduced by 31 tonnes (43%). A proposal consulted on in 2021 to reduce the TACC by 10 tonnes (9%) was not supported by the Minister. The current TAC and allowances for CRA 1 are TAC 203 tonnes, TACC 110 tonnes, Customary Māori 20 tonnes, Recreational 32 tonnes, Other mortality 41 tonnes.

8.18 Commercial catch rates per pot lift by area are used in the stock assessment to represent changes in rock lobster abundance. Areas with the highest weight of catch have the most influence. The Three Kings area (901) has the highest catch rate followed by the Far North (902). CPUE from the area Takou Bay to

Bream Bay (904) has been consistently low at around half a kilo per pot lift (Figure 8).

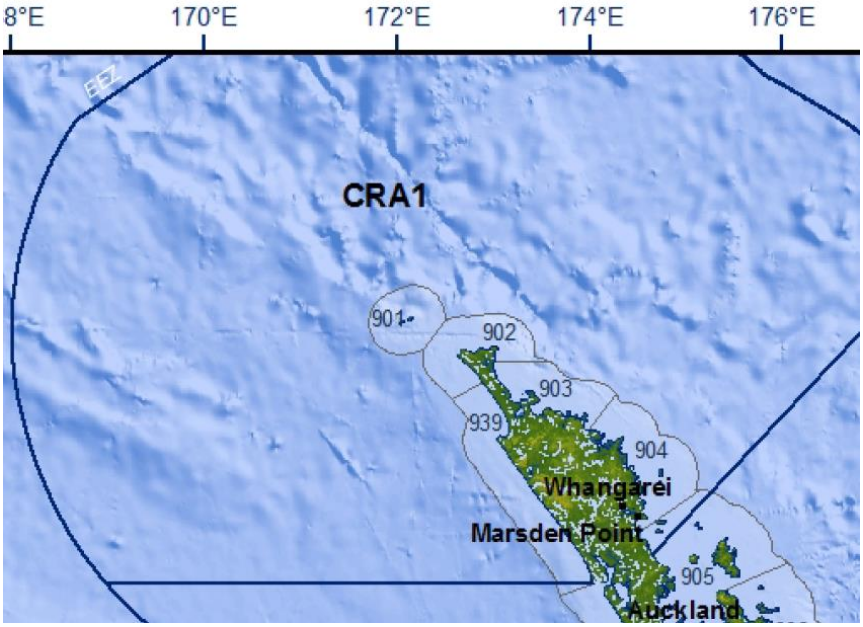

Figure 7: The CRA 1 quota management area and numbered statistical areas.

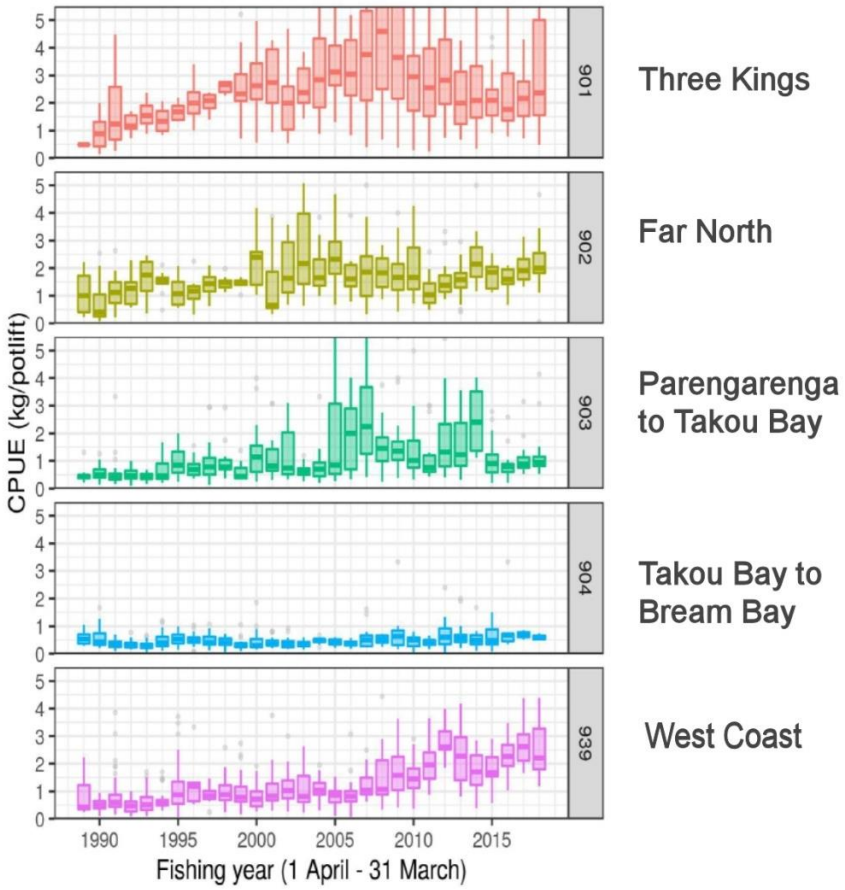

Figure 8: Rock lobster catch per unit effort (kg per pot lift) by statistical area in CRA 1.

8.19 Blue Water Marine Research was contracted by FNZ to estimate the amateur harvest of rock lobster in CRA 1 for the 2013–14 fishing year. This survey covered almost all boat access points between Rangiputa and Mangawhai Heads in East Northland using a mix of fixed and roving interviewers. The harvest estimates for boat based amateur fishers in the survey area were: rock lobster 25.4 tonnes; kahawai 167 tonnes; trevally 41 tonnes; red gurnard 4 tonnes; and packhorse rock lobster 5 tonnes. Snapper were not included in the survey. The results from the National Panel Survey were used to expand the boat-based harvest estimates of rock lobster from within the survey area to account for harvest in the whole QMA and by land based fishers. The amateur harvest estimate for CRA 1 is 37 tonnes (CV 0.17). In addition, there were 4.4 tonnes of recreational harvest reported by commercial fishers under section 111 of the FA (which permits recreational harvest from registered commercial vessels in certain circumstances).

8.20 Twelve launch sites and two marinas were surveyed in the Bay of Islands and the rock lobster harvest by amateur fishers on boats in 2013–14 was estimated at 3080 kg.[11] There was sufficient data to calculate the proportion of rock lobster harvest from the three main survey strata (Figure 9). The northern side of the Bay of Islands (**BLA**) accounted for 42% of rock lobster catch, the central area around the islands (**RAW** and **RUS**) accounted for 44% while the eastern section from Rawhiti Point to Cape Brett accounted for 14% of harvest.

[11] Holdsworth, J.C. 2014. Rock lobster amateur harvest estimates for CRA 1 in Northland, New Zealand in 2013–14. *New Zealand Fisheries Assessment Report 2014/70.*

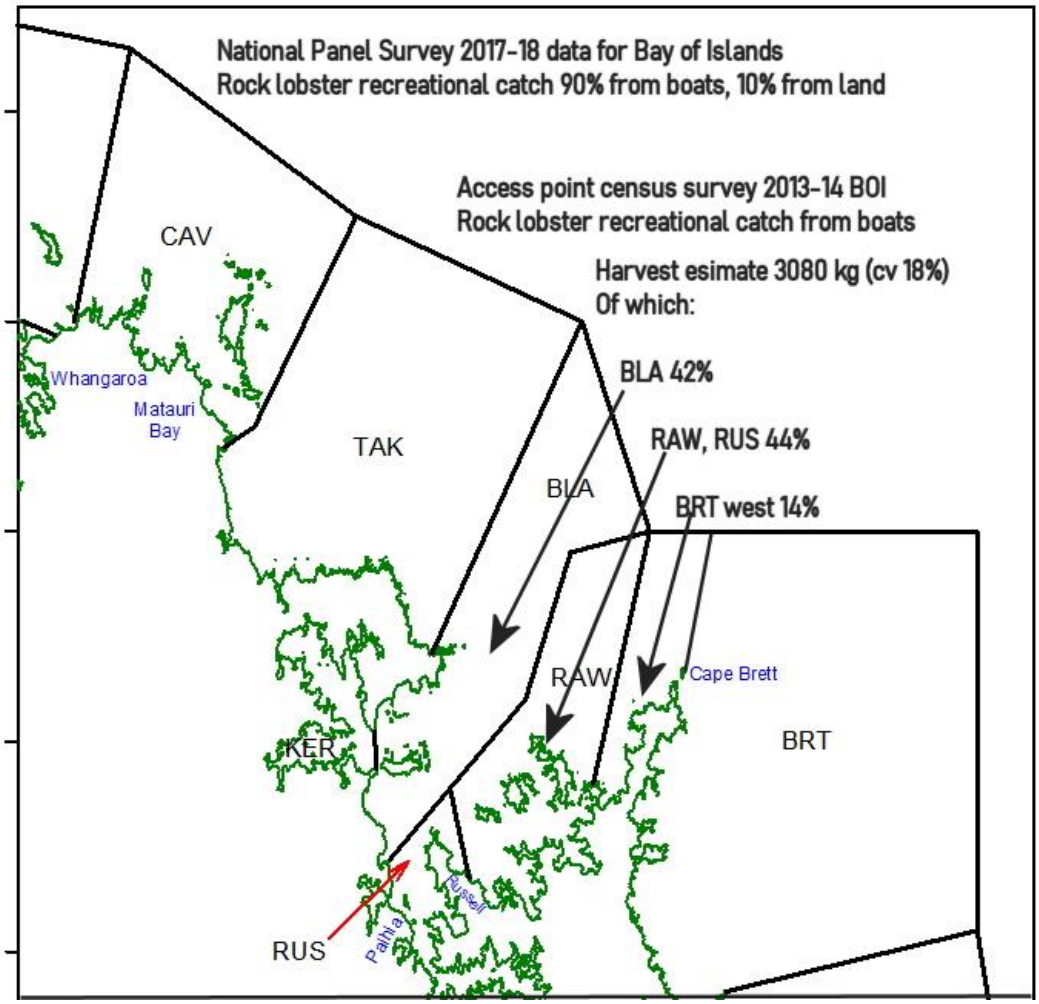

Figure 9: Rock lobster amateur harvest estimated in the Bay of Islands from the 2013-14 access point survey.

Packhorse rock lobster PHC 1 stock assessment

8.21 Packhorse (*Jasus verreauxi*) are the largest species of rock lobster and can reach 15 kg in weight. There is one national QMA, but they are mainly found in Northern New Zealand. They are less abundant than red rock lobster and numbers were particularly low in the 1980s to the mid-1990s, consequentially there is much less data to use in a stock assessment. Commercial CPUE has increased significantly over the last 25 years and their range has expanded further South. Packhorse form spawning aggregations in the far north of New Zealand in October to December and larval stages are dispersed by currents. Tagging data shows that as packhorse mature, they migrate north mainly along the northeast coast of the North Island.

8.22 The national packhorse TACC was set at 40.3 tonnes in 1992, but no allowances for non-commercial fishing or other mortality had been set until

this year. The first packhorse stock assessment was completed in 2020. There was insufficient data to split the assessment by sex or area, so the main data inputs were catch and commercial CPUE. The model estimates that packhorse biomass was about 510 tonnes in 2019 which is 79% of the estimated unfished levels. The Minister approved an increase of 9 tonnes to the TACC in 2021 and set allowances for, customary Māori at 10 tonnes, recreational 15 tonnes, and other mortality 5 tonnes.

8.23 My 2013-14 survey of boat-based fishers estimated the amateur harvest of packhorse in the East Northland survey area to be 4.9 tonnes with an average weight of 2.4 kg.

Conclusions – Red Rock and Packhorse Lobster

8.24 The relevant point about red rock lobster is that abundance is relatively low in the Bay of Islands to Mimiwhangata area, as indicated by commercial CPUE, but this is not a recent change. The stock assessment model shows a declining biomass, though this is mainly driven by changes in the Far North where most of the catch is coming from. Reductions in the CRA 1 TACC have resulted in a consolidation of fishing effort and catch in the Far North and West Coast with a reduction in effort in statistical areas 903 and 904 (Parengarenga to Bream Bay). Recreational catch of rock lobster close to population centres is still significant but appears to be decreasing due to fewer divers using scuba and an increase in free diving and spear fishing (pers. comm. Andy Stewart, NZ Underwater Association).

8.25 There has been a significant increase in the number of large packhorse rock lobster on the north east coast over the last 20 years. While packhorse do forage in shallow reef areas, they also tend to be less resident than red rock lobster and will likely come and go from the relatively small MPAs proposed by the Appellants.

9. FORAGE SPECIES

9.1 Forage species are prey species that form a vital link in the ecosystem between plankton and primary production and many larger fish, seabirds, and marine mammals. Typically, they are smaller, faster growing and more abundant than species higher up the food chain. Also important are some of the larger pelagic species that corral forage species and hold them at the surface. I agree with the evidence of the Appellants and NRC that seabird

numbers and the abundance of surface schooling fish has declined over the last 100 years around Cape Brett and Mimiwhangata. However, in my opinion the solution will require fisheries management on a stock wide scale, rather than the local scale proposed by the Appellants.

9.2 Bottom trawling does not catch forage species and there is little fishing with this gear around Cape Brett or Mimiwhangata because of the number of reefs in this area. Purse seining is the main harvest method for pelagic species in open water and concerns have been raised about the impact of this method in evidence of the Appellants and NRC.

9.3 I have met with purse seine fishers and FNZ at regular intervals and have a reasonable understanding of their fishing operation. Pilchard and a small amount of anchovy are taken by purse seine, almost exclusively from Bream Bay 60 kilometres south of Mimiwhangata. The coastal purse seine vessels are based in Tauranga and most of the jack mackerel and kahawai catch is taken in the Bay of Plenty because of the need to unload fresh chilled catch within 48 hours. There are blue mackerel schools taken by purse seine in spring in East Northland, including near Cape Brett. These are adult fish that can be seen feeding aggressively (foaming) on the surface for a short time before swimming down. Skipjack tuna are also taken off East Northland by purse seine. They are not forage species for inshore fishes but can hold krill close to the surface. These schools tend to be in oceanic waters further offshore. The commercial catch by all methods in 2018–19 (the last full year unaffected by Covid -19 disruptions) for key forage species is in Table 2.

Table 2: TACC and commercial catch for important forage and pelagic species.

Species (and QMA)	TACC	Commercial catch 2018-19
Yellow-eyed Mullet (YEM 1)	20	16
Piper (GAR 1)	25	16
Anchovy (ANC 1)	200	3
Kahawai (KAH 1)	1,075	1,046
Pilchard (PIL 1)	2,000	203
Blue mackerel (EMA 1)	7,630	7,630
Jack Mackerel (JMA 1)	10,000	4,332
Skipjack tuna	Open	5,519

9.4 Also mentioned in evidence are piper and yellow-eyed mullet (referred to as herring by Ngāti Kuta) that are found mainly in harbours and estuaries. There

have been piper and yellow-eyed mullet caught from East Northland harbours. Commercial and most recreational catch is taken by fine mesh beach seine nets. Commercial beach seine fishing is prohibited inside the islands of the Bay of Islands from 1 October to 30 April.

9.5 Purse seining has been responsible for fishing down the kahawai and trevally stocks in FMA 1 and despite reduced catch by this method the once common large surface schools of kahawai and trevally have not returned. However, the abundance of pilchard and anchovy have not been impacted directly by fishing based on current and historical catch data. The situation in New Zealand is different to that described in some of the international literature quoted in evidence by Ms Stirnemann, where overfishing of these forage fish had occurred.[12] The purse seine catch of mackerel and skipjack tuna is significant in FMA 1 forage fish could be offered greater protection by the removal of this method from inshore waters.

10. ECONOMIC CONTRIBUTION OF RECREATIONAL FISHING IN NEW ZEALAND

10.1 In 2014–15 I coordinated a project to estimate the economic contribution of marine recreational fishing in New Zealand. Southwick Associates, a leading company in fish and wildlife economics and statistics based in Florida, USA was engaged and high-quality data on the number of fishers and actual number of fishing trips made over 12 months from the National Panel Survey[13] were used to scale the survey results. The economic analysis used detailed input-output models supplied by Insight Economics, a New Zealand-based economics firm.

10.2 Saltwater fishing is one of the most popular outdoor activities in New Zealand. The survey estimated that $946 million was spent annually by more than 700,000 fishers, these dollars circulate through the national economy, supporting 8,100 full-time jobs, stimulating $1.7 billion in total economic activity, contributing $638 million in Gross Domestic Product and $342 million in salaries, wages and small business profits while adding $188 million in tax revenues. Nationally, snapper fishing was estimated to contribute $706 million

[12] Botsford, Louis & Carlos Castilla, Juan & H. Peterson, Charles. 1997: The Management of Fisheries and Marine Ecosystems. Science. 277. .5325.509.
Cury P.M., Boyd I.L., Bonhommeau S., Anker-Nilssen T., Crawford R.J.M., Furness R.W., Mills J.A., Sydeman W.J. 2001: Global seabird response to forage fish depletion-One third for the birds, Science, 334 (6063) pp. 1703-1706

in economic activity, $266 million in Gross Domestic Product and supported 3,400 full-time equivalent jobs.[14]

10.3 Sport NZ is a crown agency that promotes and supports quality experiences in play, active recreation and sport, to improve levels of physical activity. They fund the Active NZ survey which measures nationwide participation in play, active recreation and sport. The survey selects a person at random from households of New Zealanders on the electoral roll. The 2019 results are based on data collected from almost 27,000 people. Changes over time are based on data collected between 5 January 2017 and 4 January 2020 from over 90,000 people.

10.4 The total number of adult respondents (18 years and older) for the last three years was 74,160. Of these 10,717 (14.5%) participated in marine fishing which was on the main list of activities and 230 (0.3%) participated in SCUBA diving or snorkelling which had to be specified under other activities (Table 3).

Table 3: Active NZ survey results for the number of adult respondents that engaged in marine fishing and diving.

Year	Marine fishing	SCUBA diving	Snorkelling	Total diving
2017	4365	44	44	88
2018	3512	56	29	85
2019	2840	32	25	57
Total	10717	132	98	230

11. COMMENT ON THE PROPOSED MPAS

Maunganui Bay – Oke Bay, Rāhui Tapu and buffer zone

11.1 This is an important area for traditional and recreational fishing due to its proximity to sheltered waters behind the islands and access to relatively deep water (20 to 35 m) in the shelter of Cape Brett Peninsula and Rawhiti Peninsula. There is protection from prevailing winds from the northeast around to south west and Oke Bay is a popular anchorage close to the outer Bay of Islands with better holding for anchored vessels than in Maunganui Bay.

[14] Southwick, R.; Holdsworth, J.C.; Rea, T.; Bragg, L.; Thomas Allen, T. (2018). Estimating marine recreational fishing's economic contributions in New Zealand. *Fisheries Research 208*:116–123.

11.2 The evidence of Mr Torkington addresses how NZSFC has fully supported the initial Rāhui and all subsequent Rāhui applications for Maunganui Bay. The Rāhui enables Ngāti Kuta and Patukeha ki te Rawhiti to alter the management rules and permit the taking or culling of kina and sea urchin *Centrostephanus rodgersii*.

11.3 The supplementary evidence from Ms Froude describes a significant increase in the surveyed percentage cover of tall brown algae and a decrease in the percentage cover of kina barens inside the Rāhui area over the last five years. Reefs on the coast from Maungonui Bay to Oke Bay had a significant increase in the percentage cover of kina barens overall. However, this was not uniform, with the outer sections of Karerarera Bay and Whapukapirau Bay having a relatively high proportion of tall brown algae and a relatively narrow band of urchin barrens where it exists. These two deep bays may provide more sheltered or favourable conditions for tall brown algae in a similar way to Maunganui Bay (Deep Cove).

11.4 Ms Froude's supplementary evidence concludes that the Rāhui in Maunganui Bay has led to an increase in the number and size of the main predators of kina. However, no evidence is presented as to the whether the primary predators responsible for the decline in kina barrens are large snapper, large rock lobster, or the ongoing removal of urchins by divers (to feed snapper) and by hapu members[15]. Evidence from Craig Johnston, owner of Paihia Dive, is that his business takes 1,800 plus clients to Maunganui Bay a year.

11.5 Surveys of MPAs are very useful but some of the information provided is incomplete. Evidence is presented that there has been a significant increase in snapper at the Poor Knights and the rock lobster number and size has increased at Tāwharanui. I would like to see matching data on the trends in rock lobster numbers at the Poor Knights and snapper size and numbers at Tāwharanui, which are not provided in the Appellants' evidence.

11.6 A recently published study on rock lobster numbers inside and outside North Island MPAs concluded that small marine reserves do not provide a safeguard against overfishing.[16] In 2019 rock lobster densities inside marine reserves at Goat Island, Tawharanui and Hahei were less than 41% of peak levels

15 Supplementary evidence of Ms Froude paragraph 30.

16 LaScala-Gruenewald,D.E., Grace, R.V., Haggitt, T.R., Hanns, B.J., Kelly, S., MacDiarmid, A., Shears, N.T. 2021: Small marine reserves do not provide a safeguard against overfishing. *Conservation Science and Practice.* 3:2 12 p.

following protection and spawning stock biomass declined by between 51 and 86% across the reserves. These trends mirror declines in commercial CPUE in these areas. Previous studies have demonstrated initial increasing densities inside MPAs as rock lobsters generally exhibited site fidelity on shallow, nearshore reefs. However, rock lobster undertake seasonal movements to feed offshore where they were they are vulnerable to fishing.[17]

11.7 The density of rock lobster at fished sites adjacent to the reserves was low. In part this reflects low long-term recruitment in CRA 2 but also may reflect displacement of fishing effort from no-take MPAs to adjacent areas and a tendency to fish the boundary of MPAs in the hope of catching fish spilling over from the unfished area. In general, I do not support buffer zones with rules that are hard to define and difficult to enforce.

11.8 Snapper and other finfish have been reported at higher densities inside MPAs but also demonstrate seasonal movements for spawning and feeding. Northland wide snapper abundance is likely to be the most influential factor in the number of large snapper in the Bay of Islands. There has been a dramatic increase in southern and western snapper recruitment over the last 10 years, but it is not clear yet whether East Northland will get a similar boost.

11.9 While kina barrens are a concern in the 2 to 10 metre depth range there has been evidence presented by Dr Ross and Mr Kerr that many of the deep reefs still have high benthic biodiversity.

Ipipiri (Inner Bay of Islands) – Area B

11.10 I concur with the evidence from Ngāti Kuta that the inner Bay of Islands is a significant shallow water ecosystem vital to the productivity of the area as a whole. The presence of healthy seagrass beds is one of the key features and these need to be maintained. The decline in scallop numbers is a concern.

11.11 The evidence of Dr Morrison highlights the number and extent of seagrass meadows present, along with rare rhodolith beds and horse mussel beds in relatively good condition in this area. I concur that the remaining bottom contact fishing methods should be prohibited in the inner Bay of Islands - Area

[17] MacDiarmid, A. B. (1991). Seasonal changes in depth distribution, sex ratio and size frequency of spiny lobster *Jasus edwardsii* on a coastal reef in northern New Zealand. *Marine Ecology Progress Series, 70,* 129–141.

B. In my opinion this is best achieved as a method restriction under section 298 of the FA relating to sustainability measures.

11.12 Other shellfish beds in the inner Bay of Islands are also in decline. The pipi and cockle beds have been adversely affected by land runoff and sedimentation. These are indigenous ecosystems and habitats that are only found in the coastal environment which are particularly vulnerable to modification and deserve attention under policy 11.b.iii of the New Zealand Coastal Policy Statement 2010. The extensive green-lipped mussel beds throughout the Bay of Islands have gone. In my opinion the widespread and rapid decline of intertidal and subtidal beds points to a pathogen or environmental cause rather than harvesting.

Ipipiri – Rakaumangamanga – Area C

11.13 This encompasses most of the Bay of Islands and the area of the Ngāti Kuta rohe within a 9.26 kilometre radius from Cape Brett. It also includes parts of the rohe of Ngā Hapū o Taiāmai ki te Marangai. The proposal will exclude bulk harvesting and bottom contact fishing methods as well as rock lobster potting.

11.14 In my opinion increased benthic protection and a move to low impact fishing methods is consistent with the move toward Ecosystem Based Fisheries Management (**EBFM**). There is likely to be some displacement of fishing effort into other areas but that data is not available to me. I understand that this is in part a legal issue, however in my opinion the scale of the area and the type of the method restrictions proposed suggests to me that this is moving too far into the realm of fisheries management to be appropriate under the RMA.

Mimiwhangata Rāhui tapu and buffer zones

11.15 Miniwhangata is an important area for traditional and recreational fishing due to its proximity to Oakura and Whangaruru Harbour. Rimariki Island offers some shelter to fishers from south easterly winds and on the southern side from wind from the north and west. It was designated a Marine Park that would allow people to enjoy the area and collect limited species of kai moana using low impact fishing methods such as unweighted lines and single hooks. The size of the park, a few hundred metres either side of the island, was not likely to enhance the abundance of snapper and rock lobster but could protect resident reef species.

11.16 The area is a reasonable distance by road or water from the main population centres so non-commercial fishing effort is not as high as around Whangārei or the Bay of Islands. In 2004, the Department of Conservation proposed a marine reserve in much the same area as the Rāhui Tapu area proposed by Te Uri o Hikihiki. This proposal was met with public opposition and ultimately did not proceed.

11.17 As stated above, I think that expecting increases in snapper and rock lobster in small MPAs to levels that will greatly reduce kina barrens is not possible without stock wide increases in abundance. The recent study on rock lobster numbers inside and outside North Island MPAs concluded that small marine reserves do not provide a safeguard against overfishing (LaScala-Gruenewald et al. 2021). In 2019, rock lobster densities inside marine reserves at Goat Island, Tawharanui and Hahei were less than 41% of peak levels following protection and spawning stock biomass declined by between 51 and 86% across the reserves. These trends mirror declines in commercial CPUE in these areas. I believe that moving trawling and dredging out of the inshore zone in all of FMA 1 would be a step change in protecting benthic biodiversity and increase marine productivity across the board. Implementation of EBFM would be the catalyst to making this change.

11.18 The buffer zones in the proposal appear to be intended to give Te Uri o Hikihiki management control over harvesting of kai moana in these areas. The evidence from Mr Griffin for NRC states that management plans do not fit with the rules based approach in the Proposed Regional Plan for Northland. In my opinion Hapu management within their rohe moana is possible using the customary tools in the FA.

Rakaumangamanga to Mimiwhangata – Area C

11.19 In my opinion increased benthic protection and a move to low impact fishing methods is consistent with the move toward EBFM. There may be some displacement of fishing effort into other areas but data on the extent of this is not available to me. I understand that this is in part a legal issue, however in my opinion the scale of the area and the type of the method restrictions proposed suggests to me that this is moving too far into the realm of fisheries management to be appropriate under the RMA.

12. CONCLUSION

12.1 Marine ecosystems are complex and interconnected. The current state of fisheries science and fisheries management has largely focused on maximum sustainable yield from single species stocks. The primary management tool is an output control via changes to the TAC applied to large quota management areas.

12.2 The research and conservation of interdependent species in the marine environment has primarily been for air breathing species such as seabirds, turtles, and marine mammals, many of which are listed as threatened. There are international obligations, focused research projects, and funding from institutions and government to mitigate threats to these species. To a large degree there is support from the fishing industry and the public for these conservation efforts. Incidental mortality by fishing and depletion of forage species are valid concerns, among a range of other threats such as plastic and other pollutants in the ocean, climate change and ocean acidification.

12.3 Current government "policy" is to move toward ecosystem based fisheries management.[18] The first step in this approach should be to reduce total fishing mortality to allow fish populations to rebuild and become more resilient to a period of poor recruitment or wider environmental change. Small MPAs, like Goat Island Marine Reserve and Mimiwhangata Marine Park, can provide some local changes in community structure and protection of indigenous biodiversity but are still impacted by overall species abundance in the region.

Jonathan Clive Holdsworth
Dated 14 May 2021

18 Press release: Sustainable Seas National Science Challenge