

**I MUA I TE KOOTI TAIAO O AOTEAROA ENV-2019-AKL-117
TĀMAKI MAKAU RAU**

**BEFORE THE ENVIRONMENT COURT
AUCKLAND REGISTRY**

UNDER the Resource Management Act 1991 (the **RMA**)

AND

IN THE MATTER of an appeal under clause 14(1), Schedule 1 of
the RMA

AND

IN THE MATTER of section 274 of the RMA

**BETWEEN BAY OF ISLANDS MARITIME PARK
INCORPORATED V NORTHLAND REGIONAL
COUNCIL**

ENV-2019-AKL-117

**THE ROYAL FOREST AND BIRD PROTECTION
SOCIETY INCORPORATED V NORTHLAND
REGIONAL COUNCIL**

ENV-2019-1KL-127

Appellants

AND NORTHLAND REGIONAL COUNCIL

Respondent

**UPDATED BRIEF OF EVIDENCE OF KIM LAWRENCE
DRUMMOND ON BEHALF OF TE OHU KAI MOANA TRUSTEE
LIMITED**

~~17 MAY 2021~~ 22 JUNE 2021



Solicitor M M E Wikaira

P 027 646 7797

E maia@whaialegal.co.nz

PO Box 910 WELLINGTON 6140 www.whaialegal.co.nz

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INTRODUCTION

1. My name is Kim Lawrence Drummond.
2. I am the Kūrae Moana (Fisheries and Aquaculture Policy Manager) at Te Ohu Kai Moana Trust (**Te Ohu Kaimoana**). The party to these proceedings is the corporate trustee of Te Ohu Kaimoana, Te Ohu Kai Moana Trustee Limited.
3. I have been employed at Te Ohu Kaimoana since December 2017.

Qualifications and Experience

4. My post graduate qualifications include a Graduate Diploma in Fisheries Technology and a Master's Degree in Applied Science (Fisheries) from the Australian Maritime College, and a Master's Degree in Public Administration (Executive) from Te Herenga Waka - Victoria University of Wellington.
5. I have previously worked within the public sector at the Ministry of Fisheries (and its predecessor the Ministry of Agriculture and Fisheries) and in local government for the Canterbury Regional Council (**Environment Canterbury**).
6. From the period of 1989 to 1995 I held the position of Fisheries Scientist in Nelson at the Ministry for Agriculture and Fisheries. In this role I was responsible for the central region fisheries research programme and the southern scallop fishery enhancement programme.
7. With the formation of the Ministry of Fisheries in 1995, my role switched to a combination of fisheries management and fisheries policy. I held a number of senior roles, including responsibility for advice to the Minister of Fisheries for fisheries management decisions for Central New Zealand and for a period I had an additional responsibility for Northern New Zealand. My roles required working across the interface

between the Resource Management Act 1991 (**RMA**) and the Fisheries Act 1996 (**Fisheries Act**) in relation to both wild capture fisheries and aquaculture.

8. I was also responsible for forming the Pou Takawaenga Unit at the Ministry of Fisheries. Their role was to work directly with iwi and hapū to develop their aspirations for the use of the Māori customary (non-commercial) management tools and integrate those tools with their commercial fishing interests.
9. At Environment Canterbury I held the position of Director Regulation and, following an organisational restructure, an expanded role of Director Resource Management. Both positions formed part of the Executive Team and reported to the Chief Executive. These roles had powers delegated under the RMA, the Biosecurity Act 1993, and the Maritime Transport Act 1994 (including responsibility for the employment of the Regional Harbourmaster). While at Environment Canterbury I retained my interest in fisheries management by being an elected officer of 'Our Fishing Future', an Incorporated Society established to improve the management of recreational fisheries with the support of Te Ohu Kaimoana, the Ministry for Primary Industries (**MPI**) and the Department of Conservation.
10. As part of my current role at Te Ohu Kaimoana, I am a Director of both the Eel Enhancement Company and the Deepwater Group. I am also an alternate Director on the Board of Seafood New Zealand.
11. My core role at Te Ohu Kaimoana is to lead a policy team that provides fisheries management and policy advice to, and on behalf of, Mandated Iwi Organisations (**MIOs**). Both MIOs and Te Ohu Kaimoana are entities established under the Māori Fisheries Act 2004. Once a MIO has been established, they

can apply to be an Iwi Aquaculture Organisation under the Māori Commercial Aquaculture Claims Settlement Act 2004. That Act sets up the Takutai Trust for which Te Ohu Kaimoana Trustee Limited is also the corporate trustee.

12. In addition to having a statutory mandate, Te Ohu Kaimoana is guided by a Māori Fisheries Strategy endorsed by MIOs at a Special General Meeting in 2017. Lisa Te Heuheu speaks to this in her evidence.
13. Te Ohu Kaimoana acknowledges and supports those Northland MIOs that are separately represented in these proceedings, Te Rūnanga Ā Iwi O Ngāpuhi and Ngātiwai Trust Board.

PURPOSE AND SCOPE OF EVIDENCE

14. The purpose of this evidence is to:
 - (a) provide an overview of the New Zealand's fisheries management framework;
 - (b) explain certain features of the Quota Management System (**QMS**) as it relates to the Deed of Settlement;
 - (c) Refer to the concept of, 'Te hā o Tangaroa kia ora ai taua' and explain how this supports Te Ohu Kaimoana's approach to marine policy;
 - (d) provide a snapshot of Māori fisheries in Aotearoa, and explain the relationship between MIOs s under the Māori Fisheries Act 2004 and Te Ohu Kaimoana;
 - (e) assess the impact of the fishing controls sought by the Appellants on Māori fishing and Māori fishing rights;
 - (f) set out alternative customary management tools available to the Appellants, and explain their utility;

- (g) Discuss how kaitiaki currently provide input into and participate in fisheries management;
- (h) respond to evidence of other parties in these proceedings; and
- (i) provide concluding remarks in regard to current approaches to marine protection areas in Aotearoa

EXECUTIVE SUMMARY

15. In summary, my conclusions are as follows:

- (a) New Zealand has a comprehensive and integrated fisheries management framework that applies to all aquatic life in the aquatic environment. That framework protects and gives effect to Treaty rights and interests, and has tools required to respond appropriately to the effects of fishing and address concerns for ensuring sustainability of aquatic life, including protecting indigenous biodiversity.
- (b) When the Fisheries Settlement was signed in 1992, Māori specifically endorsed the QMS (as eventually provided for in the Fisheries Act 1996) as being the tool to manage customary (commercial) fisheries in a Treaty compliant way. Therefore, the Fisheries Settlement is inextricably linked with the Fisheries Act and accompanying regulations. Tino rangatiratanga in respect of Māori fishing rights is fully expressed in the Fisheries Act and the broader fisheries management regime.
- (c) The Fisheries Settlement also required the Crown to work with Māori to develop regulations that provided for Kaitiaki to manage customary non-commercial food gathering. This function is now devolved to Kaitiaki under the Fisheries Act and associated

regulations, giving Kaitiaki and their hapū representatives authority to issue customary permits. There is no such devolution available through the RMA.

- (d) There are alternative options to address the Appellant's and Te Uri o Hikihiki's concerns, including under the Fisheries Act and customary regulations. These alternatives provide greater flexibility and scope for the customary interests of hapū to preserve, maintain and exercise their rangatiratanga and control over their rohe moana. In contrast, the Resource Management Act 1991 is not an appropriate framework to preserve rangatiratanga over the rohe moana, or impose controls that will affect or undermine the Treaty rights envisaged in the 1992 Fisheries Settlement.
- (e) If the proposed marine protection areas are established under the Resource Management Act 1991, they will have a direct and immediate customary (commercial and non-commercial) impact on all Māori in the Deed of Settlement, including the rights under the Fisheries Settlement 1992.
- (f) Current approaches to Marine Protected Areas do not reflect what is required in Aotearoa and fail to identify the management issues and appropriately balance rights and interests. Respectfully, Dr Denne's evidence lacks the sophistication and analysis required to assess impacts on the rights provided for in Te Tiriti and confirmed and reflected in the Fisheries Settlement. Also, in response to Dr Shear's evidence, the Fisheries Act does not establish a 'single species approach' to fisheries management. Rather it

provides for the integrated management of fisheries where explicit obligations define how aquatic biodiversity and its key components including habitat are to be managed.

NZ'S FISHERIES MANAGEMENT FRAMEWORK

16. New Zealand's fisheries management framework is governed by the Fisheries Act. The Act's scope is broad, in that it applies to all "aquatic life", which in accordance with s 2(1) is defined as follows:

Aquatic life -

- (a) means any species of plant or animal life that, at any stage in its life history, must inhabit water, whether living or dead; and
- (b) includes seabirds (whether or not in the aquatic environment).

The Quota Management System

17. A key feature of New Zealand's fisheries management framework is the QMS. The QMS was introduced by the Government in 1986, in response to widespread recognition, including by the fishing industry, that a new fisheries management system was needed to ensure sustainable fishing.
18. The Fisheries Act provides for the integrated management of fisheries where explicit laws define how aquatic biodiversity and its components are to be managed. In particular, the Minister responsible for implementing the law is required to determine that a stock or species of aquatic life is subject to management under the QMS where current management is either:

- (a) not ensuring the sustainability of the stock or species;
or
 - (b) not providing for the utilisation of the stock or species.
19. In this context, "utilisation" is defined by s 8 the Fisheries Act as "conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural well-being".
20. In making this determination, the Minister of Fisheries (the **Minister**) must act in accordance with the purpose and principles of the Fisheries Act, which contain a set of explicit environmental principles that the Minister must take into account. Under s 9, these include as follows:
- (j) associated or dependent species should be maintained above a level that ensures their long-term viability:
 - (k) biological diversity of the aquatic environment should be maintained:
 - (l) habitat of particular significance for fisheries management should be protected.
21. The QMS remains the only regime endorsed by Māori for the management of commercial fishing in Aotearoa. The 1992 Māori Fisheries Deed of Settlement (**Deed of Settlement**) endorsed what was at immediate issue - the QMS - and required Māori customary (non-commercial) interests to be addressed. A Fisheries Task Force established in 1991, was then responsible for developing a framework for a more comprehensive Fisheries Act that aligned with the Deed of Settlement. Ongoing involvement in the evolution of the QMS by Māori as the Treaty Partner is, in Te Ohu's view, part of the compact agreed through the Deed of Settlement.
22. The performance of the QMS has been substantively reviewed

on a 10-year cycle. The most recent review was undertaken by The Nature Conservancy in 2017 working with New Zealand-based consultants "*Learning from New Zealand's 30 years of Experience Managing Fisheries under a Quota Management System*". The reviews highlight the ongoing sophistication of the QMS as an increasingly effective tool for managing commercial fisheries within the context of an extensive range of obligations that ensure sustainable use of the aquatic environment, which includes managing the effects of fishing.

23. Broadly speaking, the QMS utilises quota as a tradeable commodity to manage commercial catch for every fish stock. The QMS operates within a yearly catch limit for each fish stock within a quota management area (**QMA**), called the Total Allowable Catch (**TAC**). A subset of the TAC is the Total Allowable Commercial Catch (**TACC**), which sets a yearly limit for commercial catch for the relevant fish stock.¹
24. Each fish stock entered into the QMS has 100 million quota shares.² The quota shares equate to individual transferable quotas (**ITQs**) in a given fish stock, which give a share of the TACC for a fish stock to the holder.
25. ITQs generate what is called Annual Catch Entitlement (**ACE**), which is the total weight of a fish stock that is allowed to be caught by the holder of the ACE in a fishing year (usually 1 October to 30 September, the following year).
26. In general terms, a TAC is proposed by the Minister of Fisheries in accordance with sections 12 and 13 of the Fisheries Act 1996. That involves direct consultation with

¹ A TACC is set for every fish stock in the QMS and if not already set, a TAC must be set when a TACC is reviewed but recreational and customary catch are not included in the QMS. This recognises that the QMS came before Part 3 of the Act ('Sustainability Measures') meaning that there are some stocks that have a TACC but not yet a TAC. The Act accepts that, but requires a TAC to be set if and when a TACC is reviewed.

² In most cases, the quota shares were originally allocated to commercial fishers based on past historical catch (i.e., catch prior to the introduction of the relevant fish stock into the QMS).

those having an interest in the aquatic environment in the area concerned, including Māori.³ The Minister must also provide for the “input and participation of tangata whenua”.⁴

27. Te Ohu Kaimoana, as representative of mandated iwi organisations, is consulted before a TAC is set or varied. Te Ohu Kaimoana gives a view on the TAC, including the customary and recreational provisions. After consultation, the Minister sets or varies the TAC by Gazette notice.

Protecting the marine environment

28. A brief stocktake of actions taken consistent with the purpose and principles of the Fisheries Act demonstrates how the responsible Minister has acted to establish and regulate the use of aquatic biological diversity under fisheries law across all species.
29. At the time of the signing of the Deed of Settlement, some 26 species of aquatic life or 153 stocks were subject to management under the QMS.
30. The following year (1993) a blanket moratorium was placed on the issuing of permits to take any aquatic life for commercial sale in New Zealand waters (with the notable exception of highly migratory stocks of pelagic tuna). This was a sweeping reform and has no precedent elsewhere in the world. In practice, it prohibited the issue of any commercial permits for most of the 13,000 species of aquatic life found in New Zealand waters. What this measure achieved was to protect all aquatic life in New Zealand waters not already managed under the QMS from economic development, pending the Minister’s determination of whether the species or stocks concerned required management.

³ Fisheries Act 1996, s12(1)(a).

⁴ Section 12(1)(b).

31. At the present time there are now approximately 642 stocks under quota management. All are subject to sustainable catch limits – but around half of these have zero or negligible catch limits pending further evaluation on what catches, if any, might be sustainable.
32. In addition, an extensive range of areas, including many that can be considered areas of particular significance for fisheries management, are closed to some or all methods of fishing that may affect important habitat. There are a range of inshore areas closed to various forms of fishing that date back to the Fisheries Act 1908 and Fisheries Act 1993. These closures were incorporated into modern-day fisheries management under ss 297 and 298 of the Fisheries Act 1996. In contrast, as few such areas were defined for the deepwater fishery under the Fisheries Act 1983 they have since been put in place under the Fisheries Act 1996. They are generally referred to as 'sea mount closures' and 'benthic protection area closures'. In addition, as the information on the importance of key areas has been made available, the industry has acted to restrict or prevent fishing in other areas, where necessary. Examples of this include the hoki fisheries management areas. Key, in this regard, has been the framework of the Fisheries Act, that supports collective action to put these arrangements in place.
33. The Minister has also determined a range of species and species complexes that will not be subject to quota management or commercial fishing. These are specified in Schedule 4C of the Fisheries Act.
34. The fisheries management process is dynamic and revisions to the management settings to better meet the purpose of the Fisheries Act are ongoing, as information and understanding of ecosystem function improves. Risk-based approaches to assessing compliance with management

objectives and the use of stakeholder-led planning approaches are increasingly being applied to the management process.

35. The Fisheries Act also provides a suite of tools that work in with management under the QMS to ensure sustainability. These tools are largely set out in s 11 and include area and method restrictions, seasons, size limits (minimum and/or maximums) and in specified circumstances the spatial separation of fishing sectors. Many of these are achieved through regulation.
36. Part 3 of the Fisheries Act sets out both the tools and the process to be followed if the Minister sees a need to better meet the purpose of the Act, including ensuring sustainability. The entry point for that is s 11(1) which provides for the Minister, from time to time, to set or vary a sustainability measure for one or more stocks or areas. There are specified matters that the Minister must take into account before consulting on the use of a particular tool, or combination of tools. In addition to the matters that must be taken into account under s11(1), the Minister must have regard to a range of matters set out under s11(2). These include any regional policy statement, regional plan, or proposed regional plan under the RMA. In this way the Minister is able to benefit from the knowledge of significant ecological areas that may be identified in those policy statements and plans, and evaluate the quality of the information in accordance with the information principles set out under s 10 of the Fisheries Act.
37. In addition to the tools available to the Minister, as a result of the Deed of Settlement, Māori as Treaty Partners are also able to call on a range of tools that are provided either in the Fisheries Act or through the customary regulations that it authorises, to address any concerns for ensuring sustainability of aquatic life, including protecting indigenous

biodiversity. I explore these further below.

THE FISHERIES ACT AND FISHERIES SETTLEMENT

38. Since the Fisheries Settlement, Iwi have become an intrinsic part of the commercial fishing industry and Māori customary rights have become codified within the customary frameworks.
39. By entering into the Deed of Settlement, the Crown recognised that fisheries are important to Māori and that the Crown's Treaty duty is to develop policies to recognise Māori use and management practices, and to enable Māori to exercise rangatiratanga over traditional fisheries (both commercial and non-commercial elements).
40. The Deed of Settlement is given legal effect through the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992, Fisheries Act 1996, Māori Fisheries Act 2004, and Māori Commercial Aquaculture Claims Settlement Act 2004. The Deed of Settlement is specifically embedded into the Fisheries Act through s 5(b):

This Act shall be interpreted, and all persons exercising or performing functions, duties, or powers conferred or imposed by or under it shall act, in a manner consistent with -

...

- (a) the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992

41. There is no such requirement embedded into the RMA or associated environmental legislation. This is a critical difference between the Fisheries Act and the RMA.
42. The Fisheries Act has design features that enable Māori to exercise both rangatiratanga and kaitiakitanga.

TE HĀ O TANGAROA KIA ORA AI TĀUA

43. For Te Ohu, our key concern is to create marine policy that supports an ongoing relationship with Tangaroa and ensures the Deed of Settlement endures.
44. The concept of 'Te hā o Tangaroa kia ora ai tāua' (the breath of Tangaroa sustains us), outlined in the evidence of Lisa Te Heuheu, underpins the work of Te Ohu.
45. 'Te hā o Tangaroa kia ora ai tāua' contains the principles we use to analyse and develop modern fisheries policy, and other policies that may affect the rights and responsibilities of Iwi under the Deed of Settlement.
46. The purpose of the Fisheries Act 1996 is "to provide for the utilisation of fisheries resources while ensuring sustainability."⁵ The purpose and principles of the Act echo 'Te Hā o Tangaroa kia ora ai tāua'. Protection of the reciprocal relationship between Māori and Tangaroa is an inherent part of the Deed of Settlement – it's an important and relevant part of modern fisheries management for Aotearoa.

A SNAPSHOT OF MĀORI FISHERIES

47. There are 56 MIOs who represent iwi who have interests in Māori settlement quota. MIOs are iwi organisations that are established by and represent iwi for the purposes of the Fisheries Settlement. MIOs are listed in Schedule 3 of the Māori Fisheries Act 2004, in order to receive settlement assets. In addition to the MIOs, there are two recognised iwi organisations (**RIOs**) who are progressing towards MIO status, and for whom Te Ohu Kai Moana hold settlement quota on trust.

⁵ Fisheries Act 1996, section 8(1).

MIOs and Te Ohu entities

48. The evidence of Lisa te Heuheu sets out the Te Ohu Kai Moana group structure, identifying the various Te Ohu entities and their relationship with one another.
49. There is a direct connection between MIOs and the Te Ohu entities. The Māori Fisheries Act 2004 requires each MIO to establish and maintain an asset holding company (**AHC**), which must remain wholly owned by the relevant MIO. 80% of the total income shares in Aotearoa Fisheries Limited, trading as Moana New Zealand (**Moana**), is set aside for allocation to AHCs. Te Ohu holds the balance of income shares in its own right. This includes income shares held in trust for RIOs. Income shares held on trust for RIOs are allocated once a MIO is established in accordance with the Māori Fisheries Act 2004.
50. Income shareholdings of iwi were determined as part of the process of identifying iwi and determining a method for the allocation of what we refer to as 'post-settlement assets', being assets received by Te Ohu Kaimoana subsequent to the Fisheries Settlement being signed by the Crown and Māori in 1992.
51. It was eventually determined that the allocation of income shares in Moana be based on a retention by Te Ohu of 20% income shares with 80% income shares to be allocated to iwi.⁶ The 80% set aside for iwi is allocated to each AHC based on the notional population of iwi in the 2004 census. The majority of the 80% income shares have been allocated to iwi, with the exception of a minor number of income shares Te Ohu Kaimoana holds in trust for RIOs, and where MIOs are yet to

⁶ As recorded in s 67 of the Māori Fisheries Act 2004.

agree on coastline boundaries.

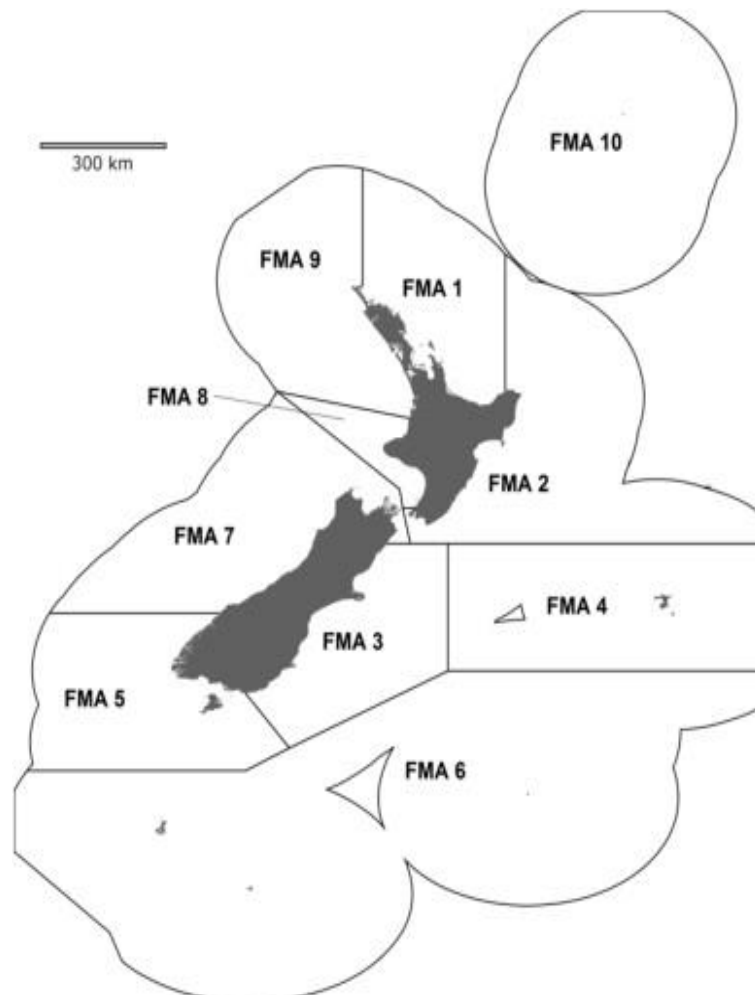
52. The effect of an iwi being allocated and holding income shares is that dividends from Moana are distributed directly to the AHC of an iwi in proportion to each AHC's income shareholding. In addition, Te Ohu Kaimoana has resolved to annually distribute to iwi the dividend it receives from the 20% income shareholding it holds in its own right, subject to any legal requirements that must be met prior to any distribution being made.⁷ This means that iwi, including Ngāpuhi and Ngātiwai, and through them the iwi members they represent, further benefit from the Fisheries Settlement.
53. Te Ohu also holds 100% of the voting shares in Moana as per s 66(2) of the Māori Fisheries Act, and appoints directors to Moana. Iwi have, however, passed a non-binding resolution at a Special General Meeting of Te Ohu to have all control shares transferred to iwi, including a direct right to appoint directors to Moana. That requires an amendment to the Māori Fisheries Act, which we are currently progressing with the Crown.

Settlement assets of iwi

54. The settlement assets of iwi under the Māori Fisheries Act 2004 include settlement quota received by Te Ohu for all fish stocks introduced into the QMS, which is then either allocated out to MIOs or held on trust for RIOs until those entities achieve MIO status.
55. Settlement quota for deep-sea fish stocks are distributed to MIOs based on the notional population in the 2004 census. For inshore fish stocks, settlement quota is allocated based on a combination of:

⁷ Including the solvency test under the Companies Act 1993.

- (a) the extent of an Iwi's coastline interests, which is determined in accordance with Schedule 6 of the Māori Fisheries Act, and can be exclusive or shared with other neighbouring iwi groups; and
- (b) the notional population of an iwi recorded in the 2004 census.
56. Te Ohu determines whether a fish stock is to be classified as an inshore fish stock or a deep-sea fish stock in accordance with ss 7 to 9 of the Māori Fisheries Act. Once that determination is made, Te Ohu then allocates to iwi according to the Act.
57. The controls the Appellants and Te Uri o Hikihiki are seeking to introduce are within Fisheries Management Area 1 (**FMA 1**). FMA 1, is one of the 10 Fisheries Management Areas of New Zealand's Exclusive Economic Zone. New Zealand's FMAs are set out in Schedule 1 of the Fisheries Act 1996 and are based on administrative considerations covered in the Fisheries Act.



58. FMA 1 covers the inshore waters and harbours along the north-eastern coast of the North Island from North Cape to Cape Runaway. It includes the eastern coast of Northland, the Hauraki Gulf, the Coromandel and the Bay of Plenty. The fisheries of the region, including the iconic snapper fishery, are some of the most highly valued in New Zealand by Māori customary (non-commercial), recreational and commercial fishers alike.
59. Both Ngāpuhi and Ngātiwai hold settlement quota for approximately 100 fish stocks each in FMA 1.
60. At the start of each fishing year, Ngāpuhi and Ngātiwai's settlement quota generates ACE which determines how much of that fish stock can be fished in a fishing year (in most cases from 1 October to 30 September). The more quota (settlement, or non-settlement) that a quota owner holds, the more ACE is generated, allowing the holder of the ACE the ability to catch a greater weight of the relevant fish stock and receive economic benefits from the sale of that catch.
61. Te Ohu Kaimoana also holds settlement quota, which has not yet been distributed under the Māori Fisheries Act 2004, as trustee for and on behalf of certain groups in FMA 1. These include Te Whānau a Apanui, and groups claiming interests in Mōtītī Island, including Ngāi Te Rangi, Te Arawa, Ngāti Pukenga and Ngāti Tai.
62. The Deed of Settlement also confirmed non-commercial customary rights. These are authorised through the role of approximately 480 tangata kaitiaki/tangata tiaki (**Kaitiaki**) who authorise customary non-commercial fishing. Kaitiaki are appointed by the Minister of Fisheries under the Fisheries

(Kaimoana Customary Fishing) Regulations 1998 (**Kaimoana Regulations**), or the Fisheries (South Island Customary Fishing) Regulations 1999 (**South Island Regulations**). Once appointed, the day-to-day management of customary non-commercial food gathering is devolved to Kaitiaki. This is a special and important feature of the Fisheries Act and one that speaks to tino rangatiratanga. My understanding is that under the RMA there is no similar default devolvement of management to kaitiaki. Instead, I understand that very limited voluntary devolutions of powers exist, and those that do are largely a result of localised Treaty-settlement arrangements.

63. In terms of commercial interests, Te Ohu Kaimoana estimates that Māori own approximately 27% of all quota (settlement and non-settlement) by volume and value. It is sometimes mistakenly claimed that Māori own 40% of quota on the basis that all quota held by Sealord can be linked directly to Māori, rather than 50% of that. Our figure of 27% is based on an analysis of quota holdings drawn from records from Commercial Fisheries Services Limited (**FishServe**). FishServe is an industry-owned body that manages all quota dealings on behalf of the Crown under a contractual arrangement with the Crown.
64. In accordance with a number of iwi resolutions in 2016, Te Ohu Kaimoana is working with the Crown to devolve some of Te Ohu Kaimoana's current statutory functions to iwi. That process contemplates amendments being made to the Māori Fisheries Act to give MIOs more direct control over Te Ohu Kaimoana and Moana, including, for example, the ability to appoint directors of Moana. The purpose is to deliver on the rangatiratanga protected by the Fisheries Settlement, which is discussed in the evidence of Tā Tipene O'Regan and Whaimutu Dewes.

65. Total value of New Zealand quota is approximately \$4 billion and the total value of Māori-owned quota is around \$1 billion. Māori ownership is strongest in North Island eels (50%), pāua (40%) and rock lobster (30%).
66. Yields on quota (i.e., returns on ACE) are around 6% per annum and the Māori fishing assets return approximately \$60 million per year. Of this return, about half is retained for re-investment and half supports MIOs and the distribution programmes that they are developing and operating – ultimately for the benefit of their people. This is based on an internal analysis that Te Ohu Kaimoana commissioned and the relevant details are covered in a report we provided to the Primary Production Select Committee. A copy of that report is attached as **Appendix A**.

The fishing activity of Moana

67. Moana employs a range of sustainable fishing methods on its vessels, and wherever possible minimises the impact on the marine environment. These include, by way of example:
- (a) Precision harvesting, which is a prototype harvesting system that targets specific species and fish sizes.
 - (b) Bird mitigation devices on all long-line fishing as well as bafflers on trawlers to minimise bird mortality as a result of trawling activity.
 - (c) Data link underwater catch and release projects. This allows fishers to track and/or detect marine mammals inside the cod-end (i.e., the trawl net) and the ability to release all of the catch at the depth they were caught in.
68. Moana have placed electronic monitoring systems on trawlers for the past seven years, on all of its operators' vessels. The

benefits of this include the ability to retrospectively view the fishing activity in the event that a protected species is found washed up on a beach.

Commercial impact of the controls

69. We have, with the support of our subsidiary Moana, undertaken a high-level analysis of the commercial impact of controls as they affect Moana. At one level, the proposed controls, insofar as they limit fishing, affect the utilisation (and therefore the value) of ACE. Any impact that decreases the value of ACE also has a consequential impact on the value of quota, and in this case on Fisheries Settlement quota.
70. Moana leases ACE from a number of iwi for FMA 1 fish stocks, including through an ACE consortium known as an Iwi Collective Partnership (**ICP**). ICP includes a number of AHCs that represent iwi, including Ngāi Te Rangi, Ngāti Awa, Ngāti Manawa, Ngāti Porou, Ngāti Ruanui, Ngāti Tūwharetoa, Ngāti Whare, Rongowhakaata, Taranaki Iwi, Te Aitanga a Māhaki, Te Arawa, Te Rarawa and Whakatōhea. Moana also separately leases ACE from iwi directly, including from Ngāpuhi, Te Aupōuri, Whaingaroa, Ngāti Kahu, Ngāti Kuri, Ngātiwai, Pare Hauraki, Tainui, Te Whanau a Apanui, as well as quota held by Te Ohu Kaimoana.
71. Not all ACE leased by Moana for FMA 1 fish stocks is fished within the proposed protection areas. However, some commercial fishing does take place there. It is important to note that in any one year, or indeed for longer periods, the reliance on a particular fishing ground varies.
72. Quota is allocated at the scale of a QMA and so the area within that where fishing takes place is a function of a number of factors. These include:
 - (a) fish abundance at a localised scale;

- (b) the quality and condition of fish at a particular site at that time of year;
 - (c) proximity to markets;
 - (d) availability and type of vessels; and
 - (e) where crew are drawn from.
73. Hence it is important not to make generalised assumptions on the consequences of losing access to particular fishing grounds within a QMA. What is clear is that loss of access inevitably translates to a reduction in the potential value of both ACE and quota over time.
74. We have received information from Moana that shows that 53 commercial fish species were fished by Moana in the protection areas from 2017 to 2019. Figures for 2020 are not yet available.

| Method | Year | | |
|--|-----------------------------------|----------------------------------|----------------------------------|
| | 2017 | 2018 | 2019 |
| Bottom long lining | 9,527 kg 14,142 kg | 2,951 kg 3,207kg | 107 kg 910kg |
| Bottom trawling | 31,634 kg 47,507kg | 20,613 kg 26,158kg | 12,518 kg 13,058kg |
| Precision Seafood Harvesting (Bottom Trawling) | 17,190 kg 17,355kg | 6,684 kg 7,289kg | 8,648 kg 7,423kg |
| Danish Seine | 42kg | N/A | N/A |
| Totals | 58, 351 kg 79,046kg | 30,248 kg 36,654kg | 21,273 kg 21,391kg |

75. The value of catch in terms of freight on board price (which is the retail price minus costs, such as air freight and packaging) is relatively small for each of these years. We would estimate approximately \$100,000 in 2019, \$150,000 in 2018 and

~~\$300,000 in 2017. However, these estimated figures only relate to Moana and not other commercial fishing operators, so do not provide a picture of commercial impact generally. In 2019, the value of catch was \$157,000. In 2018 the value of catch was \$216,000. In 2017 the value of catch was \$487,000 (freight on board price, which is the retail price minus costs, such as air freight and packaging). Those figures only relate to Moana and not other commercial fishing operators, so do not provide a picture of commercial impact generally.~~

76. It is however clear that there is some immediate commercial impact if the areas were closed, and to the extent that the measures impact on Moana's balance sheet, that impact is shared by all iwi and Te Ohu Kaimoana as income shareholders.
77. Furthermore, a consequence of the proposed measures is their impact on utilisation (and therefore value) of ACE. To the extent that the ability to fish ACE is prohibited in an area, ACE has a spatial dimension. The effect is, that in order to maintain the utilisation and value of ACE, fishers inevitably will fish in other areas where they are not prohibited from doing so, creating fishing pressure elsewhere.
78. What is more, a key element of the Fisheries Settlement is recognition that iwi shall receive a share in new species that are included in the QMS over time. In that regard, the right is dynamic and evolving. A blanket Marine Protected Area (**MPA**) approach banning fishing undermines this Treaty right to benefit from the harvesting (or management of non-harvesting where TACCs are set at or near zero) of both existing QMS stocks as well as new stocks that may be introduced into the QMS in the future.
79. There is also an impact on other initiatives that are put in

place to support iwi as beneficiaries of the Fisheries Settlement during times of need. One such initiative is a Pātaka, which involves collaboration between Kaitiaki, their whānau and hapū communities and commercial fishing operators. Pātaka are established at the request of Kaitiaki with the collaboration and agreement of the commercial fishing operator. When a Pātaka is established, fish are caught in the rohe moana of an iwi by a commercial fishing operator for the benefit of the relevant iwi or hapū and treated as customary catch. The catch is transferred to a land-based pātaka for subsequent distribution by Kaitiaki, to whānau and marae. Pātaka were used extensively during the COVID-19 lockdown, for example, and are used regularly during tangihanga. There is a risk that the controls could prevent the establishment of a Pātaka in the area.

ALTERNATIVE OPTIONS FOR HAPŪ MANAGEMENT

80. Te Uri o Hikihiki are seeking “customary marine management” by hapū, whānau or marae to be provided for in an Area B management plan. The Council has indicated, in the evidence of James Griffin that it is unlikely to support it for planning or legal reasons, specifically:⁸
- (a) Te Uri o Hikihiki’s proposal process for preparing a management plan and linking rules to the output of the management plan.
 - (b) Proposed rules in the Te Uri o Hikihiki proposal providing an exception for “customary marine management”.
 - (c) Te Uri o Hikihiki’s proposed species-specific restrictions (such as prohibitions on catching certain types of shark).

⁸ Brief of evidence of James Griffin, at paragraph 29(d).

81. Mr Griffin says (at paragraph 91 of his brief of evidence) that Te Uri o Hikihiki's customary marine management proposal is "contrary to good planning practice" and "seeks to avoid the Schedule 1 process". Mr Griffin has also noted that "the status of activities could be changed without the Northland community having a say".
82. With respect, the Council's position illustrates precisely Te Ohu's concerns about the inadequacy and inappropriateness of the RMA framework for managing fishing. Specifically, the RMA does not allow iwi and hapū groups to exercise rangatiratanga over their rohe moana. On the contrary, the tools available to the Appellants in the Fisheries Act and customary regulations, in our view, provide greater flexibility and scope for hapū engagement, both from a legal point of view, but also in terms of practical application.
83. Māori customary (non-commercial) fishing in New Zealand is primarily set out in Part 9 of the Fisheries Act, and a suite of regulations. These include sections 50 and 51 of the Fishing (Amateur Fishing) Regulations 2013, the Kaimoana Regulations, the South Island Regulations, the Te Arawa Lakes (Fisheries) Regulations 2006 and the Waikato-Tainui (Waikato River Fisheries) Regulations 2011.
84. Te Ohu supports iwi at a national level, and where iwi request assistance to deal with regional issues. This can include support for proposals to establish customary non-commercial spatial management measures, such as taiāpure, mātaimai and rāhui.
85. Taiāpure first appeared in the Māori Fisheries Act 1989. The mātaimai and Rāhui tools were introduced in the Fisheries Regulations 1996. Those customary management tools are consistent with the Fisheries Settlement as they provide for direct input and management by tangata kaitiaki/tangata.

86. A number of these tools have been utilised in surrounding areas in Northland with apparent success.

Taiāpure

87. A taiāpure is a local management tool that was created to ensure better provision for the recognition of rangatiratanga and of the right secured in relation to fisheries by Article II of the Treaty of Waitangi. Taiāpure can be established over areas of New Zealand fisheries waters (being estuarine or littoral coastal waters) that have customarily been of special significance to any iwi or hapū, either as a source of food or for spiritual or cultural reasons.⁹
88. Any person may submit a proposal for the establishment of a taiāpure-local fishery to the Chief Executive of the Ministry for Primary Industries (**MPI**). Any proposal must:¹⁰
- (a) contain a description of the proposed taiāpure-local fishery, which description shall include particulars of the location, area, and boundaries of the proposed taiāpure-local fishery;
 - (b) describe Māori, traditional, recreational, commercial, and other interests in the proposed taiāpure-local fishery; and the species of fish, aquatic life, or seaweed in the proposed taiāpure-local fishery that are of particular importance or interest;
 - (c) state why the area to which the proposal relates has customarily been of special significance to an iwi or hapū, either as a source of food or for spiritual or cultural reasons; and
 - (d) set out the policies and objectives of the proposal.

⁹ Fisheries Act 1996, section 174.

¹⁰ Fisheries Act 1996, section 177.

89. If the Minister responsible for the Fisheries Act, after consulting with the Minister for Māori Development, agrees in principle with the proposal then notice of the proposal is to be published in the Gazette and in local newspapers.¹¹ Any person may make a submission objecting to, supporting, or proposing alterations to the proposal.¹² Where submissions are received, a public tribunal – conducted by a tribunal consisting of a Judge of the Māori Land Court – is conducted to hear all submissions on the proposal.¹³
90. On completion of the inquiry the Tribunal must make a report and recommendations to the Minister on the objections and submissions made to it, which may include recommended amendments to the proposal or recommend to the Minister that no action be taken because of the objections and submissions made to it. Where the Minister decides the proposal to create a taiāpure should proceed, the establishment of that taiāpure will be declared in the Gazette.
91. Following the establishment of a taiāpure, the Minister must then appoint a committee of management for the taiāpure-local fishery based on the nomination of persons who appear to the Minister to be representative of the local Māori community.¹⁴
92. The committee of management may propose regulations for the conservation and management of the fish, aquatic life or seaweed in the taiāpure-local fishery. All regulations made by the committee of management must apply equally to all people and cannot be used to refuse anyone entry to a taiāpure-local fisheries management area.¹⁵
93. Accordingly, this process can accommodate management

¹¹ Fisheries Act 1996, section 178(2).

¹² Fisheries Act 1996, section 180.

¹³ Fisheries Act 1996, section 181.

¹⁴ Fisheries Act 1996, section 184.

¹⁵ Fisheries Act 1996, section 185.

such as that proposed by Te Uri o Hikihiki, but importantly, any committee of management would involve other relevant hapū and iwi who have a relationship with the proposed taiāpure area, as the focus is on the 'local Māori community'.¹⁶

94. Furthermore, the types of regulations able to be implemented under a taiāpure are broad, including the ability to regulate or control fishing, and the possession, processing, and disposal of fish, aquatic life, or seaweed.¹⁷ There is a strong correlation between what Te Uri o Hikihiki are seeking in these proceedings and the existing regulations available if a taiāpure was established. Furthermore, the taiāpure provisions would be more appropriate given the Council have indicated they are unlikely to support a management plan such as that proposed by Te Uri o Hikihiki.

Mātaitai reserves

95. The Fisheries Act provides for the establishment of mātaitai reserves, which are areas over which commercial fishing is prohibited (but may be subsequently allowed), and Kaitiaki have management control to make bylaws.¹⁸
96. The South Island Regulations allow for tangata whenua to apply for a mātaitai reserve without first having established the boundaries of their customary gathering area / rohe moana under the Regulations.¹⁹ The Kaimoana Regulations, however, only allow for confirmed Kaitiaki, or the tangata whenua who notified the confirmed Kaitiaki for their customary gathering area / rohe moana, to apply for a mātaitai.
97. Tangata whenua and Kaitiaki can apply to the Minister for a

¹⁶ Fisheries Act 1996, section 184(3).

¹⁷ A committee of management has the power under s 185(1) of the Fisheries Act 1996 to, amongst other things, recommend a range of controls under s 297 of that Act.

¹⁸ Fisheries Act 1996, section 186.

¹⁹ South Island Regulations, regulation 17.

mātaïtai reserve to be established over any part of the customary gathering area/ rohe moana for which they are the tangata whenua or Tangata Kaitiaki/Tiaki. When making an application, tangata whenua must identify the name of the person or persons being nominated as Kaitiaki for the mātaïtai reserve.

98. On receipt of an application to establish a mātaïtai reserve, the Minister must publicly notify the application; invite written submissions to be made by the local community; and, together with the tangata whenua applying for the proposed mātaïtai reserve, hold a public meeting to consult with the local community.²⁰
99. Following consultation, the Minister must declare an area to be a mātaïtai reserve if satisfied that:²¹
- (a) there is a special relationship between the tangata whenua making the application and the proposed mātaïtai reserve;
 - (b) the reserve is consistent with sustainable management of the fishery;
 - (c) the proposed mātaïtai reserve is an identified traditional fishing ground and is of a size appropriate to effective management by tangata whenua; and
 - (d) the mātaïtai reserve will not unreasonably affect local non-commercial fishing or prevent commercial fishing if quota is issued for that area.
100. Where a mātaïtai reserve is established, Kaitiaki can make bylaws restricting or prohibiting the taking of fisheries resources from within the whole or any part of a mātaïtai

²⁰ South Island Regulations, regulations 18 and 19; Kaimoana Regulations, regulations 19 and 20.

²¹ South Island Regulations, regulation 20; Kaimoana Regulations, regulation 23.

reserve for any purpose that they consider is necessary for the sustainable utilisation (the Kaimoana Regulations) / sustainable management (the South Island Regulations) of the fisheries resources in that mātaítai reserve. Any bylaws may impose restrictions or prohibitions relating to any of the following matters:²²

- (a) the species of fish, aquatic life, or seaweed that may be taken;
- (b) the quantity of each species that may be taken;
- (c) size limits relating to each species to be taken;
- (d) the method by which each species may be taken; and
- (e) the area or areas in which each species may be taken.

101. While all bylaws made by Kaitiaki must apply to all persons, Kaitiaki are able to authorise special takings of fisheries resources for the purpose of sustaining the functions of a marae.²³

102. As commercial fishing is automatically prohibited in any mātaítai reserve, Kaitiaki can request that the Minister recommend the making of regulations to allow the commercial taking of specified species of fisheries resources, by quantity or time period, within that mātaítai reserve.²⁴

103. Kaitiaki are also able to authorise the moving of fish stocks from within one part of a mātaítai reserve to another, for the purpose of enhancing the stock(s).²⁵

The participation of Kaitiaki in fisheries management

²² South Island Regulations, regulation 25; Kaimoana Regulations, regulation 28.

²³ South Island Regulations, regulation 27; Kaimoana Regulations, regulation 30.

²⁴ South Island Regulations, regulation 24(3); Kaimoana Regulations, regulation 27(3).

²⁵ South Island Regulations, regulation 29; Kaimoana Regulations, regulation 32.

104. The regulations framework that supports Part 7 of the Fisheries Act enables Kaitiaki to provide input into and participate in the process of setting or varying sustainability measures, or developing management measures concerning the whole or any part of the customary gathering area / rohe moana for which they have been appointed. The regulations provide for Kaitiaki participation in this process by requiring that they provide MPI with quarterly summaries of all authorisations that they have issued and all fisheries resources taken pursuant to those authorisations.
105. Kaitiaki are also able to participate in fisheries management by preparing a management plan or strategy for the customary gathering area / rohe moana for which they have authority. Where a plan is prepared by a Kaitiaki, and that plan is agreed to be authorised by the tangata whenua of the customary gathering area / rohe moana for which the Kaitiaki was appointed, the plan:²⁶
- (a) may be treated as a planning document recognised by an iwi authority for the purposes of the Resource Management Act 1991, if it meets the requirements of that Act;
 - (b) must be considered by the Minister for the purposes of section 10(b) of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992, which requires them to consult with tangata whenua about and develop policies to help recognise the use and management practices of Māori in the exercise of non-commercial fishing rights.

Rāhui - temporary closures

106. Sections 186A and 186B of the Fisheries Act allow for

²⁶ South Island Regulations, regulation 16; Kaimoana Regulations, regulation 16.

temporary closures. Section 186B applies to the South Island fisheries waters,²⁷ and section 186A applies to all other New Zealand fisheries waters.

107. Section 186A enables the Minister to temporarily close any area of New Zealand fisheries waters (other than South Island fisheries waters) in respect of any species of fish, aquatic life, or seaweed; or to restrict or prohibit the use of any fishing method in that same area and any species of fish, aquatic life, or seaweed. The Minister may only impose such closures, restrictions or prohibitions if they are able to recognise and make provision for the use and management practices of tangata whenua in the exercise of their non-commercial fishing rights. The Minister can make provision for these rights by either improving the availability or size (or both) of a species of fish, aquatic life, or seaweed in the area subject to the closure, restriction, or prohibition; or by recognising a customary fishing practice in that area.
108. If requesting a rāhui/temporary closure, an application must:
 - (a) describe tangata whenua non-commercial customary fishing use and management practices.
 - (b) provide reasons for requesting the temporary closure.
 - (c) explain how the customary use and management practices are being impacted upon.
 - (d) indicate how a s186A temporary closure, for up to two years, will recognise use and management practices through improving the availability and/or size of a species, or recognising a customary fishing practice.
 - (e) indicate how a s186B temporary closure, for up to two years, will likely assist in replenishing the stock of a

²⁷ As defined in section 297 of the Ngāi Tahu Claims Settlement Act 1998.

species or recognise and provide for the use and management practices of tangata whenua in the exercise of their customary rights.

- (f) describe the proposed area/s and boundaries.
 - (g) list the species at issue.
 - (h) describe the fishing method and how this is having an adverse effect.
 - (i) define the length of time for the temporary closure, method restriction or prohibition proposed.
 - (j) outline the consultation already undertaken with other stakeholders, especially with tangata whenua.
109. If put in place, temporary closures last for a period of two years. If resources have not replenished within that time, a request can be made for the closure be reinstated for another two years.
110. The Ngāti Kuta evidence at paragraphs 89-90 says that the 2-year timeframe is insufficient. However, in practice, once a rāhui is implemented, it gives tangata whenua significant say about whether the rāhui remains in place beyond the 2-year timeframe.
111. Tangata whenua have considerable influence in whether a rāhui is reinstated beyond the two-year timeframe. In Kaikoura, for example, tangata whenua successfully reinstated a rāhui for repeated successive two-year periods out of a concern to rebuild pāua and rock lobster stocks in an area that is close to the township. It was reinstated out of a concern that measures proposed by the wider community and amateur fishing interest groups to be implemented under the Amateur fishing regulations would not allow those stocks to sufficiently

replenish. Tangata whenua consider this important as, to open a fishery after a period of replenishment without managing an entirely predictable surge in participants seeking to take advantage of increased abundance, would be inappropriate.

112. This experience provides two important insights for me.
- (a) The first is that, once a rāhui is put in place, the proponents have a higher degree of influence over its duration than is generally appreciated.
 - (b) Secondly, it highlights the importance of utilising a management tool within the wider context of meeting the purpose of the Fisheries Act, in a manner consistent with the Fisheries Settlement.

ECONOMIC EFFECTS OF ESTABLISHING MPAS

113. The evidence of Dr Denne purports to identify the expected economic effects of establishing new MPAs under the RMA on “commercial and recreational fishers, divers and snorkelers, and on the wider community” using Cost Benefit Analysis.
114. Dr Denne’s analysis contains a range of limitations and flaws. It is notable that Dr Denne has no analysis of the effects of these factors on Māori rights or interests in the marine environment. Dr Denne defines “customary” rights separately from Māori commercial interests. That is incorrect. Māori rights in fisheries under the Fisheries Settlement are customary (commercial and non-commercial) rights guaranteed by Article II of Te Tiriti. In addition, customary rights, extend not just to the right to harvest but also rangatiratanga to manage the fishery. Dr Denne’s evidence, which sees MPA establishment as a benefit to customary fishing, consequently, ignores the costs that are incurred, including loss of rangatiratanga. This reduces the value of the

rights that have been otherwise recognised (as noted below).

115. As a result, in my view, Dr Denne's evidence does not provide the empirical information to justify the conclusions arrived at. The typology of costs is narrowly defined, and the evidence notes that no analysis or data is available to provide any assessment of the benefits and costs identified in this typology. Further, no effort is made to find a common currency to allow costs and benefits to be compared (e.g. ACE price and "existence values" are not measured in a comparable way). No analysis of the existence value of the Fisheries Settlement has been undertaken. The evidence, with respect, appears to apply value judgements about benefits and costs.
116. Dr Denne's evidence also does not consider the costs of MPA establishment has on the value of quota rights allocated to Māori under the Deed of Settlement 1992 (and on wider quota interests). His analysis is instead restricted to consideration of effects on ACE price and on the ability to catch fish that can be balanced by ACE. He maintains that the costs of MPAs will increase the cost of fishing and not reduce revenue. With respect, I consider that he needs more information and perhaps a better understanding of the way that commercial fishing operates before he can draw any such conclusion.
117. Of concern is the assumption that impacts on quota value either do not exist or are a cost that should be ignored. Such impacts, caused by reduced ACE value or by reducing the security of the quota property right through "expropriation", is, from a fisheries rights perspective, arguably the most important factor to consider. International studies have shown that significant economic impacts occur as a consequence of such changes. In the New Zealand context, this is because quota value is the Net Present Value of all future ACE payments which means that a small reduction in

ACE price will result in a large reduction in quota price. This is an impact that will be dispersed across all quota holders in a particular fishery where an MPA is established.²⁸

118. There are also downstream consequences in the value chain if such impacts occur. This effect is explained in the report, *'An analysis of the impact on Māori property rights in fisheries of marine protected areas and recreational fisheries outside the quota management system'*, commissioned and published by Te Ohu Kaimoana. This is attached as **Appendix B**.

FISHERIES MANAGEMENT NOT A "SINGLE SPECIES APPROACH"

119. The ecological evidence of Dr Shears is founded on the assumption that fisheries management in New Zealand is an activity carried out under a "single species approach" where sustainability targets are set according to what he describes as "fishery rather than biodiversity values". He maintains that this approach does not maintain natural and biological processes in the marine environment. He provides only one case study in support of this position, which is that current management of snapper and rock lobster stocks is leading to the depletion of kelp beds. He identifies a loss of large fish species, namely snapper, as the cause of kelp loss due to the fact that such fish predate sea urchins which eat the kelp.
120. As noted earlier in my evidence, the Fisheries Act does not establish a single species approach to fisheries management. Rather, it provides for the integrated management of fisheries where explicit obligations define how aquatic biodiversity and its key components (including habitat) are to be managed.

²⁸ Christopher Costello and Corbett Grainger, *Capitalizing property rights in insecurity in natural resource assets*. *Journal of Environmental Economics and Management*, 2014, vol. 67, issue 2, 224-240.

121. It is nonetheless true that maintaining the balance between utilisation and sustainability of marine resources is a complex task. The example provided by Dr Spears may be justification for intervention if it is indeed a scarcity of large predators of kina that is the source of the problem. However, I am also aware of kelp loss being a problem in areas like the Marlborough Sounds where commercial fishing for snapper is largely regulated against and amateur fishers have significantly lower daily limits of snapper in order to ensure high abundance. Further, studies within marine reserves where large snapper are considered abundant also reveal the presence of kina barrens as well as healthy kelp habitat. This suggests to me that the answer to kina barrens may not be as simple as preventing fishing at a localised scale.
122. If, however, the problem was found to be due to an absence of large snapper (and/or large rock lobster) the case would still be amenable to being addressed under the framework of the Fisheries Act by protecting large fish. There are already examples of this approach being used in New Zealand (freshwater eels over four kilograms in size cannot be retained if caught), and I am also aware of this approach being used in Australia for snapper. Such controls can be applied to amateur and commercial fishers alike. Therefore Fisheries Act management measures are capable of dealing appropriately with these issues.

OBSERVATIONS OF THE APPROACH TO MPAs

123. It is my view that the call for MPAs is one dimensional and does not reflect what is required in Aotearoa. Current approaches to MPAs fail to identify the management problems to be addressed and evaluate the best option for resolving them.
124. Te Ohu Kaimoana commissioned Professor Gary Libecap to

lead a team of researchers so that we could better understand the impact on fisheries of MPAs. The study evaluated the effectiveness of MPAs throughout the world. A key conclusion of the study was that MPAs run counter to ongoing fishery management trends. For a range of reasons rights-based or incentive-based systems were found to be much more effective at delivering on the objectives that sit behind MPAs. Their report is attached as **Appendix B**.

125. In other proposals to place marine areas seeking protection under other conservation legislation, we have generally seen no robust rationale for seeking protection outside the Fisheries Act 1996, including whether current management frameworks are already sufficient to manage those risks in the context of the impact on Māori fishing rights under the Deed of Settlement. As I have identified above, decision-makers under the RMA are not required to act consistently with the Fisheries Settlement.

CONCLUSION

126. Māori rights and interests in fisheries, affirmed through Te Tiriti o Waitangi 1840, and implemented through the Fisheries Settlement and Fisheries Act 1996, were hard-fought. To that end, I consider that where there are effects of fishing to be managed that engage the Settlement, the analysis should necessarily involve confirming whether current management frameworks are already sufficient to manage those risks, in the context of the impact on Māori fishing rights under the Deed of Settlement.



K L Drummond
~~17 May 2021~~
22 June 2021



Name of Contact: Michelle Sheriff
Title of Contact: Clerk of Committee
Primary Production Select Committee

Email: michelle.sheriff@parliament.govt.nz

Building on the Fisheries Settlement

Introduction

1. Thank you for providing an opportunity for Te Ohu Kaimoana to comment on the participation of Māori in the fishing sector. Please note that this submission does not detract from any submissions independently provided by iwi.

Summary

2. The 1992 Deed of Settlement continues to shape Māori participation in the Aotearoa New Zealand fishing sector. It guaranteed customary fishing rights while also laying the foundation for the delivery of commercial quota and assets to iwi. In order to continue to develop these assets and generate value for Māori, a two-pronged approach is being adopted: improving value chain performance through co-operation and improving management through collaboration.

Who are we?

3. Te Ohu Kaimoana was established to implement and protect the Fisheries Settlement. Its purpose, set out in section 32 of the Māori Fisheries Act, is to “advance the interests of iwi, individually and collectively, primarily in the development of fisheries, fishing and fisheries-related activities, in order to-
 - Ultimately benefit the members of iwi and Māori generally; and
 - Further the agreements made in the Deed of Settlement; and
 - Assist the Crown to discharge its obligations under the Deed of Settlement and the Treaty of Waitangi; and
 - Contribute to the achievement of an enduring settlement of the claims and grievances referred to in the Deed of Settlement.
4. Mandated Iwi Organisations (MIOs) have approved a Māori Fisheries Strategy and three-year strategic plan for Te Ohu Kaimoana, which has as its goal “that MIOs collectively lead the development of Aotearoa’s marine and environmental policy affecting fisheries management through Te Ohu Kaimoana as their mandated agent”.

Current Status of Māori Fishing

5. Māori Involvement in fishing today is overwhelmingly shaped by the 1992 Deed of Settlement and its legacy. Prior to the Deed of Settlement, customary and commercial fishing were indistinguishable. While the 1992 Deed of Settlement enshrined Māori fishing rights within the current fisheries management system, it created an artificial separation between customary and commercial fishing.

PO Box 3277, Level 4
Woolstore Professional Centre
158 The Terrace
Wellington, New Zealand

P: +64 4 931 9500
E: ika@teohu.maori.nz

teohu.maori.nz

Structure and Participants

6. There are 58 MIOs covering all Māori who own the Fisheries Settlement Commercial Assets (Individual Transferable Quota and shares in Aotearoa Fisheries Limited which, in turn, owns 50% of Sealord Group). Around 450 tangata kaitiaki and tangata tiaki (appointed by MPI) authorise customary fishing. The Te Ohu Kaimoana Board is appointed by MIOs through an electoral college structure and has a range of statutory responsibilities under the Settlement including responsibility for the appointment of the Board of Aotearoa Fisheries Limited.

Customary Fishing

7. Customary take is provided for within Total Allowable Catches set for each fish stock. The responsibilities for customary fishing rest largely with hapū and marae and is carried out under the authority of tangata kaitiaki/tangata tiaki. Eleven Mātaitai (customary fishing areas) have been established in the North Island and thirty-three in the South Island. Ten Taiāpure (another form of customary fishing area) have been established nationally.
8. The activity of 'customary fishing' has existed in New Zealand for generations but was formalised with the passing of the customary fishing regulations in 1998 and 1999 (well before the law establishing MIOs was passed in 2004). This disjunct within the administrative arrangements for the commercial and customary aspects of the Fisheries Settlement can be challenging for iwi for several reasons. MIOs, nearly all of whom have received their commercial settlement assets, are developing their assets for the benefit of their people. However, MIOs are not necessarily responsible for managing customary fishing for an iwi as this typically rests with hapū and marae, as provided for under various fishing regulations.
9. The customary regulations can have the effect of undermining their efforts and the tribal structures they are working to build. For example, the process for the Minister to appoint kaitiaki in the North Island is carried out with no reference to relevant MIOs, despite them being part of the same tribal structures, and having interests in the same fisheries. This has caused tensions within iwi that need to be resolved by iwi themselves. Wittingly or not, Crown agencies including MPI maintain and strengthen these divisions when they fail to work through MIOs.
10. Te Ohu Kaimoana has a mandate from iwi to promote and protect Māori interests in all aspects of the Fisheries Settlement and fishing whether those interests are commercial, customary, fresh water or aquaculture. To that end, we are working with MIOs this year to review and report on how the Customary Fisheries Framework is operating across the country, and what enhancements could provide for better expression of customary non-commercial rights consistent with the Deed of Settlement.

Commercial Fishing

11. The main commercial fishing asset owned by Māori is Individual Transferable Quota. There are now 130 species and 638 stocks in the Quota Management System (QMS) but more than 90% of the value of quota is associated with the original 29 species introduced into the QMS in 1986 (and in which Māori received a 10% share).

12. The Māori stake in the industry has been expanded by two means. First, by the 1992 “Sealord Deal” in which the Government provided a total of \$150 million enabling Māori to purchase 50% of Sealord. Second, by acquisitions funded by retained earnings (notably Moana Pacific Fisheries, OPC Fish and Lobster Ltd., Ocean Ranch and Kia Ora Seafood). Total Government funding for the Fisheries Settlement (delivered from 1989 to 1994) was \$270 million.
13. Today, Māori own approximately 27% of all quota by volume and value. Total value of New Zealand quota is approximately \$4 billion, and the total value of Māori-owned quota is approximately \$1 billion. Higher estimates of the Māori position in the industry are frequently quoted but these rely upon Sealord quota being counted as 100% Māori owned (Sealord (through a holding company) owns 25% of New Zealand quota by volume). Māori ownership is strongest in North Island eels (50%), pāua (40%) and rock lobster (30%).
14. Financial returns from Individual Transferable Quota ownership have fallen as a percentage of quota value since 2004, reflecting generally falling interest rates in New Zealand over that period. Yields on quota are now around 6% per annum and the Māori fishing asset returns approximately \$60m per year (around \$100 per Māori). Of this return, about half is retained for re-investment and half supports MIOs and the distribution programmes they are developing and operating (ultimately for the benefit of all registered iwi members).

Aquaculture

15. Iwi have significant interests in the aquaculture sector through the assets delivered under the Māori Commercial Aquaculture Claims Settlement Act 2004 and by other means. Settlement assets stemming from regional aquaculture agreements under the Act are transferred to iwi through Te Ohu Kaimoana.
16. The current value of aquaculture settlements to Iwi Aquaculture Organisations exceeds \$200m. These settlements include 500+ hectares of mussel space in Tasman and the Hauraki Gulf and 60 hectares of fish farming space also in the Hauraki Gulf to iwi. Because the development of aquaculture will take place over several years, the value of it will not be realised for some time. As more new space becomes available for aquaculture, iwi are entitled to 20% of agreed space and Te Ohu Kaimoana works to ensure this is realised.

Increasing the Value of Our Fisheries

17. In the interest of increasing the value of iwi fisheries assets, a two-pronged approach is being adopted. The first is to lift economic performance and the second is to lift fisheries management performance. Both of these rely upon finding suitable models for collective action wherein Māori values can be expressed. The starting point for this co-operation in both cases is highly disaggregated quota ownership that is the initial outcome of the Fisheries Settlement.

Improving Economic Performance

18. Māori Quota Ownership is dispersed between 58 Iwi, Aotearoa Fisheries and Sealord. This dispersal was a deliberate and widely supported feature of the design of the Fisheries Settlement. Iwi ownership of relevant quota parcels maintains the connection between particular peoples and particular fisheries that are an important part of the maintenance of iwi identity. Ownership of quota

in this dispersed fashion delivers very modest rates of return. These economic returns can only be improved by active participation in the value chains using quota. Individual iwi do not have the scale for such successful participation. A co-operative pan-iwi approach to this investment is essential.

19. Commercial co-operation requires new relationships between iwi and new business structures that strike the culturally appropriate balance between individual iwi quota ownership and collective iwi value chain investments to carry Māori products with an authentic Māori story to the wider world. Considerable effort has already gone into the development of these arrangements. Perhaps the most notable success to date has been the Port Nicholson Fisheries structure involving 28 iwi and Aotearoa Fisheries Ltd. This model can be readily adapted for other sectors such as pāua and inshore finfish species.
20. A key to the further development of commercial co-operation within the sphere of the Fisheries Settlement is the establishment of more direct governance arrangements over Aotearoa Fisheries (and Sealord) by their iwi shareholders. The need for such governance adjustments to both Aotearoa Fisheries Limited and Te Ohu Kaimoana were the central findings of the 10-year statutory review of Fisheries Settlement structures. The main thing Parliament can do to reinforce this very positive co-operative trend is therefore to pass those revisions to the Māori Fisheries Act recommended by the Review (February 2015) that are strongly supported by iwi.

Improving Fisheries Management Performance

21. Increased collaboration is undoubtedly the key to improved value chain performance. Likewise, it is the key to improved fisheries management performance in New Zealand. Commercial co-operation in the value chain process need only occur between iwi to be successful. Fisheries Management requires inter-iwi co-operation but also with non-Māori quota owners and (in some fisheries) other sector representatives especially from the recreational fishing sector.
22. The dramatic expansion of stocks managed under the QMS has not been matched by the capacity of Ministry for Primary Industries (MPI) to efficiently support the QMS. The 2017 Sustainability round reviewed 12 fish stocks out of 638, including Pāua 4 (Chatham Islands) for the first time since 1986. However, the required response to this unsatisfactory situation is not an increase in MPI funding or a review of the Fisheries Act 1996. The answer is already available within the Fisheries Act in currently unused sections empowering the development and operation of Fisheries Plans.
23. Fisheries Plans provide the framework and impetus for a more customised and co-operative approach to the sustainable management of our fisheries. Te Ohu Kaimoana, Ngāti Mutunga o Wharekauri and Moriori strongly support the Pāua 4 Fisheries Plan that has been developed collectively by Māori, industry and the Chatham Island community for their fishery and is currently before the Minister of Fisheries. This enables finer scale management and responsibility by local communities and key stakeholders for achieving fisheries management outcomes.

Risks to Māori Fisheries Development

24. This strategy to increase the value of iwi fishing assets is under threat from actions that result in reduced access to the fishery. Issues such as marine spatial planning and marine protected area proposals which encompass a ban on fishing activities diminishes the rights guaranteed under the Deed of Settlement. This also serves to devalue the quota that iwi seek to enhance. One example of

this is the Rangitahuahua/Kermadec Ocean Sanctuary proposal, which would restrict the right of future generations to develop this fishery.

25. The biological characteristics of different species necessitates finer scale management than is currently practiced. The approach that iwi are pursuing to enhance the value of their fisheries assets recognises this by providing for greater stakeholder responsibility within the management regime. However, current practice fails to utilize mechanisms within the Fisheries Act to their fullest extent, preventing timely responses to changes in abundance.

Naku noa, nā



Jamie Tuuta
CHAIRMAN



Dion Tuuta
CHIEF EXECUTIVE

An Analysis of the Impact on Māori Property Rights

in Fisheries of Marine Protected Areas
and Recreational Fishing Outside the
Quota Management System



GARY D. LIBECAP
MICHAEL ARBUCKLE
CHESTER LINDLEY

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Te Ohu
Kaimoana


Published by Te Ohu Kaimoana in 2020
158 The Terrace, PO Box 3277
Wellington, Aotearoa New Zealand
www.teohu.maori.nz


ISBN 978-1-77550-502-0

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A catalogue record for this book is available from the National Library of New Zealand.



This project was commissioned to provide an independent analysis of ecosystem-based management (EBM) and marine protected area (MPA) application in New Zealand and the consequence of reallocation of fishing rights to recreational fishing, specifically focusing on the implications that these approaches have for Māori rights in fisheries. As the expansion of MPAs in New Zealand follows from international efforts to establish or expand MPAs and apply the concept of EBM more generally, this project begins by carrying out a critical overview of the adoption of these approaches worldwide. This international context is then used to examine the New Zealand experience and implications for Māori fisheries rights specifically.

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Foreword

A key expectation of the Deed of Settlement was to enable iwi to regain tino rangatiratanga over the access to, and use of, fisheries resources. Māori accepted the fishing rights they secured under the Fisheries Deed of Settlement are subject to a responsibility to ensure sustainability.

The acceptance of the Quota Management System (QMS) as a means of utilising marine resources for commercial purposes was founded on the expectation that the rights allocated under the QMS were secure.

However, despite the success of the QMS in reversing the decline of our inshore fisheries and in providing a framework for the development of deepwater fisheries, areas where we go fishing are at risk of being closed to fishing. Further, in some cases we are seeing proportional reductions in the access we have to sustainably available fisheries because of the lack of enforcement of recreational allowances.

We searched the world to find a suitably qualified person to investigate the impact that closing off areas to fishing could have on our rights guaranteed under the Deed of Settlement, along with the impact of managing recreational fishing outside the QMS.

Professor Gary Libecap is renowned for his work in environmental economics and Mike Arbuckle has extensive experience with the management of fisheries in Aotearoa New Zealand, including as a lead author in the review of the performance of the QMS during its first thirty years. Gary and Mike were ably assisted by Chester Lindley as the lead researcher for this work.

Are marine protected areas actually a successful tool for protecting ecosystems from risks? If they are indeed a successful way of safeguarding our ecosystems, we would need to incorporate this into our policy advice and discussions with iwi. If not, we need to ask: Why are marine protected areas still proposed as the primary response to ecosystem protection when the adverse impact on Māori rights, local communities and even the long-term effectiveness of alternative responses appears to outweigh the benefits?

The idea of 'protected areas' in the marine environment stems from the Convention on Biological Diversity. In Aotearoa, we are grappling with marine protected areas as a management tool: What are they and what problems are they intended to address?

These questions are central to the government's work on a new biodiversity strategy, its review of marine protected areas and its position on a new global framework for managing biodiversity, both within national jurisdictions and on the high seas. It is also central to its proposals to establish marine protected areas within several regions around the country.

In this report, Professor Libecap and his team provide insights into the problems of implementing marine protected areas. They uncover vague problem definition and goals for marine protected areas, lack of agreed criteria for their establishment, lack of cost-benefit analysis and lack of integration with national laws and indigenous rights. They observe that local, rights-based systems result in more positive incentives for resource users to manage the effects of fishing on fisheries and the marine environment.

On the issue of reallocation, the team finds that reallocating quota in shared fisheries to a less regulated recreational sector contradicts the objectives of the Deed of Settlement and the spirit of collaborative management of marine resources.

I commend this report as a major contribution to the discussions necessary to ensure marine policy supports our ongoing relationship with Tangaroa and ensures the Deed of Settlement endures.

Rangimarie Hunia
Chair – Te Ohu Kaimoana
March 2020

Project Overview

New Zealand Fishery Regulations

New Zealand is considered a leader in fisheries management under a property-rights system that is unusual worldwide in the security, durability, and definition of the rights held (Hale and Rude, 2017). Although rights-based management has been shown to bring remarkable benefits by changing incentives regarding exploitation (Grafton et al., 2000; Costello et al., 2008) in most settings elsewhere in the world, the property right is less well defined and secure (Grainger and Costello, 2014). New Zealand's fishery policies are based on the Fisheries Amendment Act 1986 that implemented the quota management system (QMS) for twenty-nine species (Newell et al., 2005; Day, 2004,) and the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992, which formally recognised Māori customary, non-commercial fishing rights and rights to manage their fisheries, and guaranteed Māori 10 percent of the quota for existing commercial fisheries placed in the QMS, 20 percent of any new fisheries brought subsequently into the QMS, and 50 percent of Sealord Products Limited.

In this regard, New Zealand is in the forefront of the protections and property rights granted to its indigenous population, Māori. The Deed of Settlement 1992 and related legislation not only provides formal property rights but recognises the customary fishing rights and management

practices of Māori due to their long-standing and cultural participation in the fishery (Day, 2004). Elsewhere in the world, indigenous populations do not have such property rights or the protections called for under the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) agreed to by 144 nations in 2007. In Latin America and Asia, indigenous populations typically are not recognised formally by governments as having property rights to the critical customary resources that they use and that have cultural significance. In many cases, exploitation rights are granted to others without the approval of indigenous populations, and these rights also deny the indigenous people's access to and the ability to benefit from them (United Nations Permanent Forum on Indigenous Issues, n.d.). In the United States and Canada, property rights to resources are held in trust by national governments and are not defined by or delegated to indigenous groups. Without property rights to essential resources and dependence on remote bureaucratic administrative agencies for use, income, and social services, vital traditions and customary practices have deteriorated. By any socio-economic measure, indigenous populations in the United States and Canada perform poorly compared with the rest of the population.

The property rights held by Māori under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 that make them unique, as well as the rights held by other fishers within the QMS, are at risk from:

1. Proposed expansion of marine protected areas (MPAs), beyond those under the Marine Reserves Act 1971, in order to provide ecosystem-based fishery management (EBFM) (Ministry for the Environment, 2016). These actions involve not only large MPAs and commercial fishing exclusion zones around the Kermadec Islands, Campbell Islands, parts of the Hauraki Gulf, and other areas under discussion as part of the South East Marine Protection Forum but also introduce a major change in New Zealand's approach to fisheries management and marine protection. These large spatial reserve areas are installed unilaterally, undermining property rights to existing and new fisheries as well as customary access and management by Māori. Such MPA expansions are potential takings and inconsistent with provisions of the Deed of Settlement 1992. Moreover, their implementation does not recognise the actions taken by Māori or other QMS quota holders to safeguard the marine environment.
2. Gradual, effective reduction of Māori quota within the southern bluefin tuna quota management system through reallocation to the unregulated sports fishing industry. As above, there are also negative impacts on other QMS quota holders as well as the QMS overall.

Marine Protected Areas Expansion

Proposed expansion of marine protected areas in New Zealand follows from international efforts to establish or expand MPAs in order to achieve EBFM. This action is despite the fact that arrangements are currently in place in New Zealand to account for ecosystem-based management (Hale and Rude, 2017). The proposed MPA extensions are spearheaded by non-government organisations, international agencies, consultants, and delegations from administrative agencies within signatory governments. International efforts include provisions of the United Nations Framework Convention on Climate Change whereby member nations committed to designate new marine protected areas by 2009; the 1992 United Nations Conference on Environment and Development (UNCED) and the Convention on Biological Diversity (CBD) that encouraged the use of protected areas or area-based closures; and the 2002 World Summit on Sustainable Development (WSSD), where MPAs were placed at the top of the agenda for implementation in order to achieve sustainability (Wells et al., 2008).

MPAs often involve vast areas of sea being set aside, effectively placing them off-limits to fishers and other resource users and for other applications. MPAs are put under centralised, bureaucratic monitoring and management by national and international agencies. The officials within these agencies are not elected, nor are they generally directly accountable to the citizens of the countries whose waters are affected. Typically, in administering their mandates, they are driven by biological objectives, without weighing up trade-offs or considering area-specific institutions or fishery management practices. Advocates and bureaucratic officials can work together because new regulatory mandates around establishing MPAs and EBFM benefit both the agencies and advocacy groups. They are not disinterested parties, and regulatory officials, often who have tenure, do not bear the direct costs of their actions. This setting creates an inherent bias towards implementation of EBFM and MPAs unless there is a strong, well-organised competitive interest group that opposes such actions (Becker, 1983). As described below, such groups are absent in most world fisheries where MPAs have been implemented or are under consideration. Because of their property rights, Māori are an exception who could both protect their rights under the Deed of Settlement 1992 and force better articulation and defence against proposals to expand MPAs.

Phrasing the creation or extension of MPAs as EBFM cloaks these regulatory impoundments as essential for

provision of public goods. While it is true that traditional fisheries management, focused on single species sustainability, may ignore some ecosystem considerations, it is not necessarily the case that fishers neglect such issues because they can be directly affected. Their incentives to consider broad habitat effects depend on the nature of the property rights they hold – their strength and durability. Because of their property rights under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992, Māori not only have incentives but the ability to address issues such as bycatch and gear impacts on habitat without unilateral declaration of the need for EBFM. Their cultural and community values along with the value of quota under the QMS depend on vibrant fish stocks and healthy ecosystems. These positive incentives also generally apply to other quota holders within the QMS. If local institutions are undercut and existing fishers displaced, how might incentives and practices change and thwart achievement of the ecosystem goal?

In other parts of the world where fishing rights are non-existent (open access) or weak or fishery access and management are plagued by corruption, there may be fewer direct incentives to protect stock and ecosystems. In those cases, any remedy would most directly lie in more precise definition and strength of the property right rather than in imposing broad, spatial MPAs that overlay and displace local users with bureaucratic and political administrators. Further, with an absence of strong national institutions, it seems unlikely that exogenously-defined MPAs will achieve their goals, given the need for effective monitoring and enforcement.

Unfortunately, there is little precision in the definition of EBFM or consensus on what the concept means, when it should be implemented, where it should be applied, or what it is to deliver. A survey of experts in fisheries science and management reveals a wide variety of opinions and lack of consensus on which actions may be part of ecosystem-based management (Trochta et al., 2018). These results are not surprising in a setting where advocates and bureaucratic officials are not required to use general, consensus-based templates to guide analysis, examine local practices and institutions, weigh baseline alternatives (such as refining existing fishing rights), or present verifiable measures of costs and benefits to evaluate outcomes within an agreed time frame. The open-endedness of MPA designation and EBFM to achieve undefined public goods provides entry for advocates whose actions impose costs on others with no clear accountability.

Without consensus on what EBFM entails, it is a high-sounding but empty and potentially dangerous concept that allows for broad discretion by advocates. What is the evidence that drives designation of MPAs in a particular location or of a particular size? Are they designated in response to deterioration in fishery and ecosystem quality? Are they preemptory and, if so, based on what evidence delivered by what parties? What are the levels of uncertainty associated with the evidence? Are local fishery and ecosystem management practices canvassed and considered? If so, is it feasible to work within prevailing institutions and practices if there is credible evidence that ecosystem values are deteriorating? Indeed, where such local arrangements exist, could the MPA and EBFM undermine existing local institutions and practices that offer important value? An overview of two MPA approaches reveals no apparent weighing of any of these questions (see Ministry for the Environment, n.d.; NOAA, n.d.).

Although most fisheries elsewhere in the world lack the property rights that exist in New Zealand, parallel insights are gained from the United States Endangered Species Act 1973 (ESA). This law impinges on the property rights of private landowners by prohibiting habitat destruction where any endangered species has been located. The law did not require alternative approaches to species protection nor did it consider the impact on the property rights of affected landowners as takings. Numerous detailed cases are available (Dolan, 1992; Stroup, 1995; Mann and Plummer, 1995; Seasholes, 1997; Ruhl, 1998; Lueck and Michael, 2003). The law actually weakens prospects for achieving the environmental goal because it shifts the incentives. Landowners take actions that they otherwise would not to degrade habitat so that they avoid losses of asset values. These distorted incentives contribute to the extremely poor performance of the law. Of approximately 1600 species listed, only around 33 have been successfully delisted. The entire process is politicised because advocates bear no costs whereas regulated parties bear all of the costs, and there are no bases for collaborative progress. Property rights allow for such negotiations because there a basis for trade. Conservation easements, for example, allow for voluntary, agreed-to adjustment in practices to achieve environmental goals while maintaining the integrity of property rights.

Within fisheries, there are also insights for New Zealand from case studies of recently expanded MPAs off the north-east coast of the United States where large areas have been placed under no access/no take for commercial fisheries. Analysis would include the arguments and evidence underlying the MPAs, the identity of advocates, bureaucratic agency involvement, and the impact on existing fishing management and fishing communities.

Unregulated Growth of Sports Fisheries

The unregulated growth of sports fisheries presents a direct threat to the property rights held by Māori under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 as well as the integrity of the QMS in general. The gradual, effective reallocation of Māori fishing rights to new fisheries, such as southern bluefin tuna, is inconsistent with the guarantees of the Deed of Settlement 1992. Moreover, the expansion of the commercial sports fishing sector reduces incomes and impacts on cultural values for Māori, and catch for other QMS quota holders. As sports-fishing fish mortality rises, the basis for quota as a property right is weakened as is the incentive for fishers to adhere to it (Libecap, 2014; Deacon et al., 2013).

Even though the United States fishers do not hold property rights as in New Zealand, many do have catch shares or adhere to other fishery management practices. These may be at risk, along with the livelihoods of commercial fishers, from growth of the sports-fishing sector. The Modern Fish Act, a fisheries management bill, passed by the United States Senate in 2018, grants broader access for recreational and sports fishers in United States fishery management waters. As such, it potentially weakens an already tenuous fishery sector (Bittenbender, 2018).

Project Objectives

1. Analyse the introduction and expansion of MPAs to meet EBFM goals and their impact on Māori property rights agreed on in the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992.
2. Analyse the effective reallocation of harvest of southern bluefin tuna to sports fishing outside the QMS as it affects the property rights held by Māori under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992.

Project Activities

Worldwide Expansion of Marine Protected Areas to Achieve Ecosystem-based Fishery Management

1. Review the current debate about EBFM around the world. Taking as a starting point the study by Trochta et al. (2018), we will look for other cases in which the EBFM is being considered. We also will examine the literature on EBFM to identify key terms, trends, data, outcomes, advocates, and local practices addressing ecosystem management.
2. Review empirical evidence regarding MPAs in other countries. Potential documents include those associated with fisheries in waters off Australia, Ecuador, Chile, and the United States. All these countries have more protected marine areas per square kilometre according to the registry of the International Union for Conservation of Nature (IUCN). We will review cases in the United States north-east, the region with the highest percentage of regional waters in some form of MPA (approximately 23 percent of United States MPAs). President Obama declared a fully protected area in the Atlantic Ocean of 4913 square miles off the New England coastline. One of the most affected sectors is the red crab fishery, which has been certified as sustainably managed by the independent Marine Stewardship Council (Eilperin, 2016).
3. Examine the evidence regarding establishment of MPAs worldwide. Are there conclusive indicators of ecosystem deterioration? What is the nature of the data? Who collected it, and how much uncertainty is associated with the evidence? What evidence exists regarding outcomes? Are MPAs successful?
4. Are MPAs worldwide established ex post or pre-emptively? If the latter, what is the basis for such declarations? Who are the advocates? What agencies – international and national – administer the MPAs? Are the agencies active in designating MPAs, and is there a regulatory mandate result? Are local institutions and practices considered in designating MPAs? Are local fishers and communities involved in the process of MPA selection and designation? What was the experience of fishers (e.g., in terms of catch and income) after MPAs were implemented?
5. Make an inventory and review cases of the taking of property rights and indigenous rights in fisheries and

other resources. We will start with reports from non-governmental organisations such as Conservation International (Painemilla, 2010) that explored cases around the world of indigenous communities, their rights, and their resource management. Other potential cases include the experience of indigenous communities in countries in Latin America (Chile, Peru, Bolivia, and Brazil).

New Zealand Expansion of Marine Protected Areas to Achieve Ecosystem-based Fishery Management

1. Examine how EBFM and expansion of MPAs interacts with existing law regarding fishery management, ecosystem preservation, and Māori property rights. Legislation includes the Marine Reserves Act 1971, the Resource Management Act 1991, and the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992.
2. Gather data on existing MPAs and those proposed for expansion to include clear, measurable objectives. What factors underlie designation: ecosystem damage or pre-emptory designation? Who are the advocates? What agencies will manage the MPAs? What are the criteria used for judging effectiveness? Who will determine effectiveness? What is the nature of accountability and review?
3. Evaluate the potential effects on Māori. Addressing this issue requires consideration of stock and fishing location projections, historical fishing patterns, cultural factors, ecosystem protections, and determination of economic and cultural values at stake along with legal requirements for secure property rights under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992. This research may involve interviews with key members of the Māori fishing sector.

Gradual Reallocation of Fishing Rights to Southern Bluefin Tuna from Māori and Others within the QMS to the Commercial Sports Fishing Sector

1. Review the United States Gulf Coast redfish fishery where commercial and sports fishing compete. In the United States, sports fishing for redfish is largely unregulated, and its share of the fishery is growing. Deacon et al. (2013) show how arbitrary share adjustments can lead to an unravelling of the entire quota management scheme.

Project Implementation

2. Research the Snapper 7 fishery, a case of a New Zealand recreational fishery where the government is increasing the share of the total allowable catch (TAC) for the recreational fishing sector. This case study has existing information and data that can be analysed for insights regarding the southern bluefin tuna fishery.

In implementing the proposed research, we considered various options. We chose to focus on the peer-reviewed literature and experiences elsewhere and direct the findings to the specifics of New Zealand. There were several reasons for this approach.

1. If we could show that the problems encountered in New Zealand were reflected broadly in the peer-reviewed literature, then there would be additional credibility for the concerns raised regarding the expansion of MPAs, related EBM within them, and the relatively unregulated expansion of the sports/recreational fishery in New Zealand as they affect Māori property rights granted under the Deed of Settlement 1992. The alternative option of focusing on the specific case of New Zealand and relating it to other countries' experiences as far as possible within the timing and budget of the grant would not bring in the perspectives and background of this broader, peer-reviewed literature. It would also potentially make the New Zealand case appear idiosyncratic rather than symptomatic of more general problems that should be addressed in New Zealand and elsewhere.
2. This approach utilised the comparative advantage of the University of California, Santa Barbara (UCSB) research team. UCSB is a leader in fishery research and regulation and the design and implementation of MPAs and EBM. Many of the key authors in the peer-reviewed literature are on the faculty there or known to them. Accordingly, it was possible for the UCSB research team to interact with those faculty members to get references to consider, people to contact, and key issues to address. This activity required a major allocation of time and resources that could not be devoted to more specific New Zealand issues. At the same time, it provided a broad perspective on the problems in New Zealand, showing them to be part of major worldwide issues that require revisiting and reform. One member of the UCSB research team spent three weeks in New Zealand this year gathering information and meeting key parties. Additional research using publicly available information was also carried out to document relevant characteristics of MPAs as established under the Marine Reserves Act 1971. It should be noted that this publicly available information may not provide a complete picture of data held by government agencies that would be relevant to this report.

Outputs

3. Application is pending to access all marine reserve advice papers held by the Department of Conservation and to access marine reserve concurrence advice prepared by Fisheries New Zealand and its predecessor organisations (e.g., the Ministry of Fisheries) to complete this analysis. Summary information and conclusions drawn in the main report should be read subject to further information that may come to light from these internal government files, which may enable a more in-depth analysis of the specifics of the issues. Information publicly available is sufficient, however, to reveal that what is happening in New Zealand is happening elsewhere and there are important lessons to be learned.
4. With the background research provided here, we anticipate that it would be feasible to delve more deeply into the details of the proposed New Zealand expansion of MPAs, EBM, and the sports fishery and their impacts on the property rights held by Māori under the Deed of Settlement 1992 and the strength of the QMS more generally. A more in-depth analysis of the details within New Zealand would, however, require further resourcing.

The project has three outputs, compiled as one publication, as follows:

- i. EBM/MPA worldwide report – a worldwide report on ecosystem-based management and MPA establishment as applied to fisheries and impacts on rights allocated in the use of fisheries with a particular focus on indigenous rights;
- ii. EBM/MPA New Zealand report – a report examining EBM/MPA application in the New Zealand context, drawing from worldwide experiences;
- iii. Recreational sports fishing report – a report examining impacts of reallocation in selected United States fisheries and lessons for New Zealand with reference to examples in the southern bluefin tuna and Snapper 7 fisheries.

Key Contributors

Gary Libecap was commissioned to lead this analysis and will be the primary author of all reports. Dr Gary Libecap is Distinguished Professor of Corporate Environmental Management in the Bren School of Environmental Science & Management and Distinguished Professor of Economics at the University of California, Santa Barbara. He is also Research Associate at the National Bureau of Economic Research in Cambridge, MA, Senior Research Fellow at the Hoover Institution, Stanford University, and Senior Fellow at the Property and Environment Research Center, PERC, Bozeman, Montana. He was Pitt Professor of American History and Institutions, Cambridge University, Economics Faculty and Saint Catharine's College, 2010-11. He received his PhD from the University of Pennsylvania and his BA from the University of Montana. His research focuses on the role of property-rights institutions in addressing the open-access losses for natural resources such as fisheries and freshwater, as well as the role of water markets in encouraging efficient use and allocation.

Michael Arbuckle is providing New Zealand-based technical support to Dr Libecap. Mr Arbuckle holds an MSc (Hons) and has over thirty years' experience in fisheries governance, including being the General Manager at the Ministry of Fisheries between 2000 and 2005 where he was responsible for all fisheries management advice and led a significant expansion of the species encompassed within the QMS. He has recently returned from working for ten years as a senior fisheries advisor at the United Nations and World Bank, designing fisheries investments in Africa, the Middle East, Asia, and the Pacific. He is an Independent Director of Seafood Innovations Limited. He is a lead author of The Nature Conservancy's report *Learning from New Zealand's 30 Years of Experience Managing Fisheries Under the Quota Management System*.

Chester Lindley is the main researcher assisting with the project. Mr Lindley has recently completed a Master of Science degree in environmental science and management (coastal marine resource management) at the University of California, Santa Barbara. He has previously engaged in researching United States Census data and property-rights law to see how property rights in the United States were assigned from the colonial period to the close of the frontier and how these rights impacted on human migration and economic development. He is working for the California Fish and Game Commission, Sacramento.

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Output 1:

Marine Protected Areas and Ecosystem-based Management – A Critical Global Overview

Introduction

In the past twenty-five years, there has been growing international interest in the designation or expansion of areas of the world's seas as marine protected areas (MPAs). These are often associated with prescribed fishing practices and other exploitation restrictions such as ecosystem-based management (EBM). Both are advocated as being needed to safeguard global biological/ecological habitats and species thought to be at risk from excessive direct or indirect human utilisation. The Our Ocean conference in Malta, October 2017, outlined MPA target coverage of 10 percent of the world's ocean areas by 2020 with subsequent expansion to 30 percent (European Union, 2017; Wood et al., 2008).

This review of MPAs and EBM is drawn from a comprehensive summary of the literature, where many of the papers examined are summaries themselves or have extensive bibliographies. Many of the papers included were recommended by faculty at the Bren School of Environmental Science and Management at the University of California, Santa Barbara, who have been active in the designation of MPAs. Others were recommended by colleagues at the University of Washington and the University of California, San Diego, who are actively involved in evaluating fisheries management. More broadly, this review targeted literature based on search

terms around MPAs, EBM, no-take reserves, ecosystem-based fisheries management, indigenous peoples, and indigenous rights. The literature includes MPA, non-governmental organisations, and international and national agency websites, recent peer-reviewed academic papers from economic and ecological disciplines, and policy-related white papers or grey literature. The conclusions drawn are based on this review. The focus is on institutional arrangements regarding the access and exploitation of marine resources: their origins, including proponents and opponents and the political process underlying them; the distribution of costs and benefits; the incentives they create for resource use, including conservation; and the trade-offs they impose on humans.

Ecosystem-based management is a broadly defined management strategy to encompass aspects of the marine environment that may not be considered in traditional fisheries management practices, such as effort controls in single- or multiple-species fisheries. The notion is that these controls may be too narrow and that broader habitat protections will be missed by fishers without EBM. EBM ostensibly is motivated by the 'best understanding of the ecological interactions and processes necessary to sustain ecosystem composition, structure, and function' that would not occur under customary

fishery regulation (Christensen et al., 1996). EBM focuses on multiple objectives and is claimed to weigh the trade-offs between different management approaches (McLeod and Leslie 2009).

The review below, however, does not reveal trade-off analysis to be common using standard cost-benefit analysis and observational data. Moreover, the broad definition of EBM with little consensus on how to operationalise it leads to confusion about the way policies might achieve the principles of EBM or their impact on fishers (Ounanian et al., 2012; Trochta et al., 2018). The complexity and intensive planning required for EBM, along with the lack of practical tools available to managers and fishers, has led to relatively few actual instances of EBM being achieved through policy intervention (Convention on Biological Diversity, 2007). This is not to say that fishers and fishing communities do not already carry out the principles of EBM within existing management regimes, which is an issue addressed below.

Because MPAs, by their very nature, are executed as a command-and-control government regulation that defines ocean boundaries and outlines permitted uses within them, they are often promoted as a tool to achieve some of the loosely defined goals of EBM regimes. MPAs establish the spatial dimensions within which EBM management can be implemented by prohibiting or constraining specific resource-use activities thought, generally by fishery biologists and ecologists, to damage the ecosystem. Without these constraints, standard fishing practices, especially under open-access conditions, may inflict externalities, such as excessive bycatch of non-target species or harm to seabirds, seagoing mammals, corals, and the seabed. As noted below, however, the literature does not address the baselines for imposing EBM regulation, timelines for recovery of the ecosystem, trade-offs imposed, or why existing fishing and other resource-use practices and institutions cannot be adapted to achieve ecosystem goals.

No-take marine reserves, a particularly restrictive type of MPA, are claimed to be associated with EBM goals of increased density, biomass, and diversity across different trophic levels (Halpern, 2003). However, the extent to which these no-take reserves, and MPAs more generally, can address the broad goals of EBM is uncertain as MPAs typically only encompass a small fraction of any given ecosystem. Accordingly, it is unlikely that they will adequately address the broad impacts that EBM seeks to address on a much larger scale, and there is little empirical evidence that analyses the importance of MPAs in achieving EBM goals (Halpern et al., 2010). Moreover,

EBM goals are not stated in a clear and measurable manner so as to allow for validation or determination of other regulations or MPA adjustments, should the objectives not be met. There is little discussion in the literature on long-term uncertainties in achieving biological goals. This ambiguity in design and goals creates uncertainty for resource users who are or might be critically affected by EBM. Ecosystem conditions necessarily vary case by case, so that broad, one-size-fits-all EBM prescriptions may not be appropriate for both differing ecosystems and fishing practices that occur within in them (Halpern et al., 2010). Finally, except for a few cases, EBM regimes do not take advantage of the latest incentive-based management fishery tools that create vastly different incentives for marine protection than do standard limited entry and effort controls. Established in a collaborative manner with fishers who are part of incentive-based or rights-based systems described below, EBM can be much more realistic, effective, and welfare-enhancing with fewer distributional conflicts.

The overwhelming emphasis on MPAs and their application in EBM arises from government officials (international and national), members of non-government organisations, and related lobbyists (academic and non-academic consultants). Their efforts are aimed at modifying existing marine resource access and use, often as prescribed through multinational treaties drafted at international conference sites and signed by national government officials. They typically are not spearheaded by those most directly dependent on the marine resource: local fishers and residents of adjacent communities. The rare instances where local communities are involved in the planning and management process, cases such as Apo Island Reef Park in the Philippines and the SGaan Kinghlas-Bowie Seamount (SK-B) in Canada, are often referenced as major success stories of MPA implementation (Russ and Alcala 1999; Gaines et al., 2010; Haida Nation, 2018). Indeed, the EBM and MPA literatures do not address the importance of incorporating the opinions and practices of incumbent fishers and their communities; the trade-offs fishers and their communities face currently and under proposed regulations; how the interventions might affect standard or customary fishing practices; how the practices blend or do not blend within existing law regarding fisheries and related resources; and how the costs and benefits asserted to accrue by advocates would materialise and when (Halpern et al., 2013).

Indeed, because both MPAs and EBM involve new central-government regulation, they run counter to ongoing

Review Findings

fishery management trends. Although, most fishery regulation since World War Two has involved command-and-control restrictions on entry and inputs (seasons, vessel size, equipment), in light of their often-observed and documented failure to revive fishery economics and stocks, rights-based or incentive-based systems have been adopted. These involve enlisting actual fishers directly in management through the assignment of individual or group property rights. Fishers have the most information about and the greatest incentives to care for the marine resources on which their livelihoods and communities depend. Rights-based systems include setting annual total allowable catch amounts and the distribution of shares or quota as a property right to individuals or companies. Additionally, there are group rights to specific areas or territorial use rights for fisheries (TURFs). Where these rights are secure, long-term, and tradable, as described below, they have brought important gains over previous regulation.

The provision of global public goods through ecosystem protection is emphasised by advocates of MPAs and EBM. There is no specificity as to what global public goods are provided by action at the country level, whether the MPA/EBM is large enough to impact global variables, or whether or not such action is welfare-enhancing for its citizens. Such outcomes are assumed to be the case. Nevertheless, adoption, management, and durability of MPA/EBM depend on how they affect country constituents and on the actions of internal political coalitions.

Because most MPA/EBM proposals are vague and do not include measurable outcomes, timelines, or policy adjustments, they potentially provide for maximum regulatory agency discretion. Because they are so broad and vague, the proposals do not facilitate constituent assessments of how policies might play out, what their private costs might be, and what ensuing benefits might accrue. Affected parties must form expectations based on limited information and high levels of uncertainty. These conditions, in turn, reduce any realistic constituent benefit/cost calculation. Although the proposals are driven by global objectives formed by advocates, their implementation relies on actual national budget allocations and political durability, which depend on constituent support. If it is not in the interest of those with the most stake in the ocean resources to back MPAs and EBM, they will not do so.

MPA Definition

There is no uniform definition of MPAs. Marine protected areas involve a variety of different management interventions, sizes, locations, existing ecosystem conditions, and include no-take or limited-use areas. Definitions are presented with a broad brush. One definition states that an MPA is a 'clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values' (Dudley, 2008 quoted in Spalding and Hale, 2016; Bander et al., 2015). Another definition includes natural marine areas, with permitting and non-permitting use, tidal and subtidal coastal areas, to achieve goals of biodiversity conservation, economic resources and species protection (UNEP-WCMC and IUCN, 2016). The vagueness and variation in MPA definition and goals make critical analysis of the objectives of MPAs and impacts on national constituent groups, where actual policy must take place, extremely difficult. It also hinders the design of alternative approaches, if warranted, to achieve reasonable biological goals. There are few thresholds or templates for reassessment.

EBM Definition

As with MPAs, EBM is broadly defined to include management strategies for sustaining ecosystems (Christensen et al., 1996; Pikitch et al., 2004). It often is associated with MPAs because these are spatial areas where regulatory controls can be implemented and monitored. For example, the National Marine Sanctuaries in the United States, that cover over 375,000 square kilometres of ocean, are designed to protect ecosystems within them (Lindholm and Pravia, 2010). Commercial and recreational fishing within them must occur within the framework prescribed and monitored by the National Marine Fishery Service. Even so, for EBM there is no general agreement on management strategies, types of ecosystems that might benefit, timelines, or performance criteria (Trochta et al., 2018). As with MPAs, this vagueness leads to a variety of interpretations and objectives in prescribing restrictions on resource use that will affect users and their communities, who bear far more precise costs. The ambiguity of definition invites extensive regulatory discretion and associated uncertainty for users.

Durability of MPAs

Although MPAs and EBM are called for by members of broad international organisations, such as United Nations agencies, and worldwide non-governmental organisations to provide

global public goods, they must be designed and implemented at the country level, affecting country citizens, budgets, and use of natural resources. The lack of precision in MPA and EBM definitions in local policy discussions leads to distrust and conflict, which have potential economic and political costs. Advocates have general policy objectives that they promote, but they typically do not bear direct private costs of the restrictions imposed by MPAs and EBM. By contrast, those who will bear the private costs of implementation of MPAs and EBM, with unclear benefits, will have very different objectives and incentives in mind. This does not bode well for long-term political durability of MPAs or of the economic and social returns from national marine resources affected. Ongoing disagreements over MPAs and their potential distributional effects in United States state waters, as well as north-eastern United States federal waters, addressed below, illustrate the costs of discord between fishers and members of regulatory agencies.

Criteria for Establishment of MPAs

Similarly, there are no generally understood criteria for the establishment of MPAs. Some may be pre-emptive, inserted into areas of partially pristine ecosystem conditions, such as the Great Barrier Reef Marine Park (Day, 2002; Great Barrier Reef Marine Park Authority, 2014). Others are opportunistically created by advocates in areas of little current human exploitation or constituent involvement or reaction, such as the Marianas Trench Marine National Monument (NOAA, n.d.b). Because of limited information about such areas and the desire to lock them from human exploitation, the economic returns and potential public goods associated with the use of valuable resources within them will be denied to current and future generations. Although MPAs typically are established to protect ecosystems for future generations, the lack of specificity in criteria definition makes it difficult to evaluate the effects of any MPA on later human populations (Pendleton et al., 2018). Positive predicted outcomes are not based on rigorous trade-off analysis. Additional MPAs, such as Apo and Sumilon Islands in the Philippines, may be more remedial, having been established as responses to potential or existing degradation, such as dwindling fish stocks and overall decline in catch per unit effort (Aliño et al., 2002).

Objectives for MPAs

In general, there are few measurable targets for assessing success in achieving MPA goals. The absence of specific,

identifiable goals, timelines, and sources of uncertainty or risk, not only make it hard to judge performance, but also add policy uncertainty if the MPA appears to fail. What actions might be taken for management options should the initiative require modification? How flexible are MPA/EBM policies and how do adjustments impact existing and potential users? There are many sources of uncertainty in biological outcomes and not all are controllable within an MPA, particularly for global factors such as rising water temperatures or increased salinity. In other cases, if the MPA appears to successfully meet biological objectives, can constraints on use be relaxed or adjusted? If so, when and how? Detail on such potential outcomes is required for clearer assessment of the trade-offs born nationally with MPA establishment.

MPA Links to EBM

MPAs that are very remote and in areas of no major existing human activities (fishing, tourism, mining) may involve fewer cost-benefit conflicts. Such remote MPAs appear to be larger and are classified as large-scale marine protected areas (LSMPA), being 150,000 square kilometres or more. There are sixteen LSMPAs that make up Big Ocean, a collective support network to design and manage LSMPA (Lewis et al., 2017). Inshore or close-offshore MPAs, however, are more likely to conflict with existing human use, particularly since worldwide MPAs cover 10.2 percent of coastal and marine areas under national jurisdiction (UNEP-WCMC and IUCN, 2016). Some MPAs prohibit all fishing or other human extractive activities with no-take zones. Globally, 1.6 percent of MPAs are fully protected from any form of use (Lubchenco and Grorud-Colvert, 2015), whereas remaining areas involve some degree of multiple use, particularly by fishers and/or tourism. These MPAs generally regulate human activities through centralised EBM.

Cost-Benefit Analyses

Cost-benefit analyses of MPAs and related EBM to assess trade-offs, particularly as they include precluded or restricted human activities, such as fishing or mining, are very rare in the literature. Where cost-benefit analysis occurs, it typically uses model-based simulations and not observational data. For example, in southern California, a bio-economic model was used to assess how regulated fishing pressure might increase profits with a strategically designed MPA network (Rassweiler et al., 2012). On the other hand, Fiji's locally managed marine area network appears to have provided economic gains to

villages through improved fish catches and tourism employment (Brander et al., 2015). This is an unusual example, both in terms of the involvement of locals in design and implementation and in outcomes. Trade-off analysis could be far more prevalent because numerous MPAs have been in operation for sufficient time to provide data and to allow for cost-benefit studies.

To effectively assess trade-offs facing citizens when countries consider implementation of MPAs, the following parameters must be included in cost-benefit analysis: relevant interest rates for discounting future costs and benefits; expected price changes for the affected natural resources; risk and uncertainty both for biological outcomes and for economic impacts; and identification of the country citizens most likely to be affected. This is not the same as cost-effectiveness analysis that sometimes is presented to justify MPAs (Halpern et al., 2013). Such analysis is aimed at minimising the costs of proposals that have already been decided. In contrast, cost-benefit analysis is aimed at determining whether or not a policy should be adopted, relative to other national economic, political, and social objectives.

Integration with National Laws and Indigenous Rights

MPA proposals are generally presented in isolation from national policies and legal obligations. Nevertheless, they involve costs and potential benefits and, therefore, must be weighed in light of other national objectives and responsibilities. For example, fishing communities, and especially those with indigenous populations, often perform poorly relative to the national socio-economic criteria. Indigenous populations also have treaty guarantees that may be compromised. If MPAs inflict added costs, then these outcomes would be inconsistent with other policies.

Indeed, MPA and EBM discussions rarely acknowledge the incentives of indigenous and other local peoples who depend on fisheries for their livelihoods and may incorporate the surrounding ecological and terrestrial systems into norms and customs that protect the ecosystem in a manner that is quite different from open access (Guénette et al., 2000). In a literature review by Ban and Frid (2018), less than 0.5 percent of MPA papers include involvement of indigenous peoples in design. Nevertheless, the practices of indigenous and other local parties can be an alternative to MPAs, achieving more ecosystem goals at lower cost. They are locally based and understood, whereas MPAs and EBM typically are top-down initiatives.

Compensation

Compensation to resource users affected by MPA no-take or highly restricted access regulations is extremely rare. Even if compensation or alternative economic opportunities were proposed by MPA advocates, they may not materialise. This was the case with the Galapagos Marine Reserve where fishers were promised compensation in the form of licences and help in transitioning to new tourism industries that would grow from the creation of large no-take zones. However, this compensation promise was diluted by a dramatic increase in the number of fishers after no-take zone implementation, and fishers felt 'cheated' as compensation took longer than expected, which led to an overarching distrust between fishers and regulators advocating for no-take reserves (Castrejón and Charles, 2013). If parties are made worse off, they may resist MPA/EBM management and these conditions raise the costs of implementation, management, and enforcement of MPAs. As discussed below, such higher costs question the political durability of MPAs, which is especially important given that they are designated to provide long-term future benefits (Weigel et al., 2014).

The Great Barrier Reef MPA rezoning in Australia that took place in 2004 is an unusual case of direct compensation to fishers. During the effort to rezone the Great Barrier Reef and to dramatically increase the area deemed no-take, the Australian government agreed to compensate commercial fishermen who were adversely affected by the new zoning (Olsson et al., 2008). The cost to fishermen from the closures was originally estimated at around AUS\$14 million a year (McCook et al., 2010). Assistance included the costs of transitioning out of the industry, compensation to those who lost jobs, paying for financial/legal advice, and helping the communities impacted by the loss of fishing (Macintosh et al., 2010). Between July 2004 and October 2008, 1783 applications for assistance were approved, with a total cost of AUS\$205 million (Macintosh et al., 2010). While this financial commitment to assisting commercial fishermen is considerable, it is estimated in total that the income from tourism to the Great Barrier Reef is around thirty-six times greater than commercial fishing, and that ratio was increasing during this time (McCook et al., 2010). It is important to underscore, as this study shows, that the tourism benefits did not necessarily accrue to fishers or their communities. Distributional effects must be addressed in any cost-benefit analysis.

Absence of Trade-off Analysis

The absence of economic trade-off analysis, such as cost-benefit analysis, is often justified through arguments that ecosystem values are extremely difficult to assess without extensive data (Garces et al., 2013; Rosales, 2018) and that, in principle, they should not be assessed in economic terms because they involve non-human values. In contrast to these claims, there are long-standing, established methods for valuing non-traded resources in economics, including contingent valuation, travel-cost analysis, hedonic studies, and benefit transfer. The failure to conduct such studies, implicitly assigns an infinite value to the biological goal as a global public good, which is unlikely to be the case at the local or national level. Defining, maintaining, and enforcing MPAs and EBM is costly and requires real resources. Although international non-governmental organisations and intergovernmental organisations may provide start-up funding, most governments must rely on country allocations over the long term, particularly given the ambitious objectives of expanding MPAs to cover up to 30 percent of the ocean surface. Budget allocations occur through the political process involving politicians, agency officials, and lobby groups. There are many competitors for funds. High-cost, unpopular or controversial activities consume political capital because trade-offs have to be negotiated and incorporated into policy. MPAs and EBM that impose disproportionate costs on key constituents are unlikely to be durable, undermining the biological goal.

The MPA literature generally does not incorporate the findings of the collective-action literature in the social sciences, which reveals that policies are long lasting when costs and benefits are distributed proportionately among parties. If not the case, those who bear more costs than benefits are made worse off and will resist, and those who bear more benefits than costs will promote. This setting results in conflict that raises the costs of any environmental policy. MPAs are presented as providing global public goods, so the notion of disproportionate cost is not addressed because all parties are presumed to benefit. Although there may be generalised public-goods benefits, more narrow policy benefits and costs are far more apparent and particular to specific national constituent groups. Differential distributional outcomes critically mould support for public-goods provision and for policy resilience.

The issue of disproportionate potential costs/benefits distributions in MPAs/EBM arise because advocates generally are members of international non-governmental

organisations or intergovernmental agencies, along with national politicians and regulatory agency officials. Rarely are these initiatives inaugurated by existing users. Given the gains that are often described with MPAs, the question arises as to why local users resist. They do so because the benefits are uncertain, generalised, and long term, whereas imposed costs are far more immediate and clear. Advocates seek to implement their values, generally framed as global public goods, but do not bear direct costs. In contrast, parties whose fishing or other resource-use practices are curtailed bear direct costs. At the country level, interest-group politics moulds outcomes. Fishers can be at a disadvantage as they often are poorer, with less education, and are spread across multiple locations and fisheries, which are factors that raise the costs of mobilising lobby groups. By contrast, members of non-governmental groups, consultants, and elected and unelected government officials have higher incomes and higher levels of education and are adept in the policy arena.

Baseline Assumptions

The baseline alternative for MPAs and EBM is not defined. When open access and the race to fish dominates, then short time horizons prevail with excess labour and capital devoted to the fishery, low profitability, depleted target stocks, high levels of bycatch, and little ecosystem preservation. MPA/EBM discussions typically point to these conditions as the source of human degradation of biological systems and justification for MPAs. But open access or traditional regulatory practices are being replaced by local, rights-based systems that result in different incentives for resource use. As noted above, MPAs and EBM generally move in the opposite direction. Alternatives to achieve agreed ecological goals using rights-based systems can be timely, less contentious, and more effective.

Discussion of Key Issues

Movement towards and Advocates of Global MPAs and EBM

Advocates assert that MPAs and EBM are essential for current and future generations and the overall health of the earth's ecosystem. These initiatives aim to provide broad global public goods, and the lobby efforts behind them are coordinated by major international organisations. Representative of this is the call for action at the 2017 United Nations Ocean Conference:

We, the Heads of State and Government and high-level representatives, meeting in New York from 5 to 9 June 2017 at the United Nations Conference to Support the Implementation of Sustainable Development Goal 14 of the 2030 Agenda, with the full participation of civil society, and other relevant stakeholders, affirm our strong commitment to conserve and sustainably use our oceans, seas and marine resources for sustainable development. We are mobilised by a strong conviction that our ocean is critical to our shared future and common humanity in all its diversity. As leaders and representatives of our Governments, we are determined to act decisively and urgently, convinced that our collective action will make a meaningful difference to our people, to our planet, and to our prosperity (United Nations, 2017).

The related call for ecosystem-based management or an ecosystem approach to fisheries (EAF) is provided by the Convention on Biological Diversity (CBD). As early as the Second Conference of Parties in 1995 CBD members affirmed, 'the ecosystem approach should be the primary framework of action to be taken under the Convention' when addressing the sustainable use of biological resources and addressing biodiversity and socioeconomic and cultural factors (Convention on Biological Diversity, 1995). More specifically for marine EBM, CBD advocated at the Strategic Plan for Biodiversity, Conference of Parties 10, 18–19 October 2010: 'By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits' (UNEP, 2010; NOAA, n.d.a.).

International efforts that underlie country MPA designations, generally within country exclusive economic

zones (EEZs), include provisions of the United Nations Framework Convention on Climate Change, whereby member nations committed to designate new marine protected areas by 2009; the 1992 UN Conference on Environment and Development (UNCED) and the Convention on Biological Diversity (CBD) that encouraged the use of protected areas or area-based closures; and the 2002 World Summit on Sustainable Development (WSSD), where MPAs were placed at the top of the agenda for implementation in order to achieve sustainability. Among non-governmental organisations, prominent advocates for MPA designation and expansion are the Pew Charitable Trusts and Oceans Initiatives and Conservation International (Fathom, 2016). Other supportive non-governmental organisations include Birdlife International; Blue Marine Foundation; CORDIO East Africa; Global Ocean Trust; International Union for Conservation of Nature: IUCN; Commission on Protected Areas, Marine Conservation Institute; Marine Affairs Research and Education: MARE; Oceana; Ocean Unite; Oceano Azul Foundation; Rare; The High Seas Alliance; The Nature Conservancy: TNC; Waitt Foundation and Waitt Institute; Wildlife Conservation Society: WCS; and World Wide Fund for Nature: WWF.

For the most part, these non-governmental organisations are well funded and organised, and the various United Nations and other international conferences provide opportunities for advocates to meet to identify areas they believe are of critical need, to present action proposals, and to launch country-level efforts for implementation. For example, the United Nations Convention on the Law of the Sea, Subcommittee on Oceans and Coastal Areas and the 2002 World Summit on Sustainable Development led to the creation of UN-Oceans in 2003 to coordinate international actions towards ecosystem sustainability (United Nations Sustainable Development Goals, n.d.).

As noted above, MPAs can involve vast areas of sea being set aside, effectively placing them off limits to entry by fishers and other resource users. Other MPAs allow for multiple uses, including fisheries, recreation, and tourism. Where fishing is allowed, it is often to be regulated in a variety of ways to achieve ecosystem goals through EBM. Some 14,688 marine protected areas have been designated in the world's oceans and coastal marine areas under national jurisdiction (UNEP-WCMC and IUCN, 2016). MPAs vary widely in size, location, and nature. They range from many small MPAs <1 square kilometre throughout the Philippines to the 1,500,000 square kilometre marine monument north-west of Hawaii (Alcala, 1988; Obama, 2016). There are many MPA summaries and databases. One

summary is by Wells et al. (2008), and another is the Atlas of Marine Protection (<http://www.mpatlas.org/>) prepared by the Marine Conservation Institute in Seattle that claims to be the most comprehensive.

Absence of Verifiable Objectives and National Application: Interest-group Politics and Agency Incentives

As described above, neither MPAs nor EBM are defined in uniform, clear ways as to what the concepts mean, when and where they should be implemented, and what they are to deliver (Trochta et al., 2018). The biological objectives for MPAs and EBM are not presented in measurable, verifiable ways. These would include timelines, complexity and interaction within relevant ecosystems, exogenous (uncontrolled) factors, and uncertainty. Such factors allow for determination of goal attainment, the actions that must be taken, and the costs that must be incurred. Both concepts are couched in broad terms for public-goods provision with little specificity for implementation, evaluation, and assessment. The details for achieving them are left to country politicians, agency officials, consultants, and national members of international non-governmental organisations.

After international proclamations are made, member delegates return to their home countries to outline what they believe to be the underlying obligations for implementation. National application requires adapting generalised global public-goods objectives to specific cases, and as this occurs, the potential effects on country constituent groups become far more precise. Latitude for implementation exists with local politicians and administrative agency officials. These parties decide how to respond with input from interested lobby groups, including country representatives at the international forums, members of supportive transnational non-governmental organisations, and consultants. These are also the people with the most direct knowledge of the global effort. In political and administrative deliberations, other constituent groups also mobilise, such as those from industry and community groups that may be affected. Because these groups typically were not part of the initial international MPA/EBM effort, they assemble later in the policy development process, which potentially places them at a disadvantage compared with advocates.

Constituent response depends on the way policy specifics unfold. Only then can those likely to be directly affected assess how their welfare may be impacted. Given that national policies are cloaked in globally-beneficial

terms, those who perceive direct costs can be portrayed as responding to narrow private interests. Advocates – supportive politicians, agency officials, non-governmental organisation members, and consultants – who do not bear direct costs (that is, their livelihoods generally are not at stake) and have their values advanced can be portrayed as furthering broad social objectives.

Absence of Cost-Benefit Analysis

The global objectives of MPAs/EBM do not call for critical evaluation of trade-offs nor of multiple ways of advancing towards a goal. Further, they do not recognise that in some specific MPA/EBM settings broad ecosystem goals may not be achievable or advance human welfare. As noted earlier, the broad sustainability objectives underlying MPAs are not defined with sufficient specificity to invite trade-off evaluation.

Actual implementation, however, takes place at the country level where real resources will have to be committed over the long term, due to the nature of the biological goals outlined. This means that durable, supportive political coalitions have to be formed to support country-level policies. Significant economic and social costs, especially to organised constituencies, undermine such political durability. The practical importance of trade-off analysis and policy flexibility, including major modification or abandonment at the country level, is not recognised in MPA documents, including websites from non-governmental organisations, international and national agencies, the academic literature or policy white papers reviewed here.

Country budgets and resources are constrained. MPAs and EBM require definition of areas; species and ecosystems to be included; parties and activities to be excluded or limited; enforcement; and ongoing management. The literature review by Halpern et al. (2010) that links MPAs and EBM in achieving ecosystem protection emphasises that MPAs must be well defined and enforced, especially where fishing pressure is the greatest. These are the same areas, however, where enforcement costs are likely to be highest, so agreement on objectives and compliance with the MPA and related EBM will be critical otherwise resistance will be widespread, compromising the biological objective – an issue not addressed generally in the literature.

National resource requirements depend not only on the complexity of the ecosystem problem, but on constituent support and buy-in to the process. This process of achieving consensus and compromise can take a very long time depending on the magnitude of MPAs/EBM proposed, the

degree to which they conflict with established resource-use practices, existing legal institutions, and information on the costs as they unfold. Those parties who will bear costs due to proposed access and use constraints must perceive that these restrictions are reasonable, compensable, or aligned with benefits that are alleged to accrue to them. These parties include fishers and fishing communities or, potentially, mining and other extractive users and their communities whose activities are to be prohibited or constrained. The literature on support for collective action is uniform in the empirical finding that costs and benefits must be proportionately distributed (Ostrom, 1990; Cox et al., 2010; Libecap, 2014). If that is not the case, then those who bear disproportionate costs have incentive to defect or, in the case of MPAs or EBM, to violate policies, raising enforcement costs and undermining ecological goal achievement.

Additionally, local fishers and community members are often the parties with the most information about the ecosystem and how it might respond to different policy recommendations. If those parties are disaffected, then they will be less likely to share that information, hindering policy objectives. In contrast, those who gain disproportionate benefits have incentives to seek more action. These conflicting groups make policies controversial, even those framed as public-goods provision, and raise political conflict within countries. This, in turn raises costs to politicians. Achieving consensus on MPAs and EBM can reasonably involve compensation to parties harmed on net or substantial alteration of policy proposals. Advocates driven by global public-goods objectives can be insensitive to the details of the costs imposed. Even if there are alternative benefits from MPAs, such as greater tourism or recreational opportunities, these benefits may accrue to other constituencies and communities. There will be within-country distributional outcomes, and how these are addressed will affect collective support for adherence to international agreements and their implementation within countries.

In general, rigorous social science approaches are not included in MPA analyses, where biological considerations, not social ones, dominate. Because MPAs are placed within unquestioned global public-goods provision, there are few actual assessments of impacts on fishers and other resource users, even for MPAs that have been in existence for sufficient time to allow for such analysis. Beneficial projections are made for both the ecosystem and humans. These, however, are model-based simulations that are not based on actual observations, and they do not include critical economic criteria. For example, consider Halpern et al. (2013)

who argue that in three case studies in central California, Indonesia, and Southeast Asia, social equity, economic return, and conservation are all feasible. They do not perform cost-benefit analysis, but rather cost-effectiveness whereby the predetermined conservation goal is to be achieved at least cost. Cost-benefit analysis in contrast would determine if or how the initiative would be implemented or adjusted. The trade-offs outlined in the paper are between equity sharing of simulated benefits and conservation objectives.

It can be argued that ecosystems do not lend themselves to trade-off evaluation. Their values are broader and non-monetised. This is a legitimate criticism, but the values of ecosystem services have long been assessed through a variety of techniques in economics, ranging from contingent valuation, travel-time cost, hedonic studies, and benefit transfer (Dixon, 2012). As a clever alternative, Kotchen and Burger (2007) measure the costs of a major conservation set-aside involving the Arctic National Wildlife Reserve in Alaska. Costs typically are more directly measured, and Kotchen and Burger sought to calculate a cost value as a benchmark that any ecosystem valuation would have to meet for a benefit-cost ratio equal to one. Their analysis provides an unexpectedly large present value opportunity cost estimate of US\$1,141 per adult citizen of the United States for not producing from this terrestrial set-aside. Because no exploitation was underway, there were no adjustment costs that would also have to be addressed.

Achieving a stream of expected costs and benefits from an MPA that meets standard acceptance criteria requires definition of time frames for achieving the biological objective; time frames for constraining human activities; identification of alternative options; determination of relevant discount rates; assessment of the opportunity and transaction costs inflicted on particular parties as well as the benefits achieved by others; and determination of the programmatic costs over time (that will not be independent of constituent-group reactions). These cost-benefit criteria are virtually absent from the MPA/EBM assessment literature. If they were included, then not all MPAs/EBM could be achievable, calling for reassessment, redesign, or abandonment. This is very useful information because it avoids political and social conflict over unattainable policy goals and focuses attention on those initiatives that provide for ecological gains and improved human welfare.

As with Halpern et al. (2013), most analysis of the MPA impacts on user groups relies on simulations of ecosystem responses and the related predicted effects on fishing harvests and profitability. They typically are optimistic in predicted

impacts on users. Dalton's (2010) simulations suggest that MPAs increase profitability, especially through strategic placement of smaller MPAs to promote recruitment and growth of fish stocks, for fishers outside MPA boundaries. Another study by Adams et al. (2010), however, recognises that opportunity costs that are unevenly spread can impact users, their support for nature preserves, and the potential for success.

Gallacher et al. (2016) perform an MPA literature review and then apply the general findings to a case: the Lyme Bay, England, marine protected area. This is an unusual example, where actual observational data are gathered for determining economic impacts, as opposed to using simulations. The authors point out that most discussion in the literature focuses on biophysical criteria for establishing MPAs and not on economic or social factors. In the Lyme Bay fishery, the authors found that mobile and mixed-gear fishers, such as scallop fishers, bore the brunt of policy costs and were forced to leave the fishery as their income declined. Recreational fishers, on the other hand, who had access to adjacent areas were not harmed.

In an unusual and useful cost-benefit analysis in the peer-reviewed literature, Pascal et al. (2018) examine the ecosystem benefits of five small community MPAs in Vanuatu in the Pacific and one large government MPA at Saint Martin in the West Indies. The focus is on tourism benefits resulting from improvements in the natural environment related to fish biomass, scenic beauty, protection against coastal erosion, bequest and existence values, social capital, and greenhouse gas sequestration. These benefits are difficult to calculate, and the authors use simulations, surveys, and benefit-transfer methods. They also analyse surveys and catch-per-unit-of-effort data for small-scale fisheries at both locations. The number of observations is small. The benefits are compared to the costs of administering MPAs. Opportunity costs to fishers from MPA restrictions are examined, but their size is not clear. The authors could not detect changes in fish size or variability of harvest. A twenty-five-year time span and 10 percent discount rate are used in the analysis. They also determine that the value of benefits varies between tourism and small-scale fishing. In the end, the authors find that benefits exceed costs, giving a benefits/costs ratio greater than one, and that corresponding rates of return in MPAs at both sites justify the investments in them. The authors caution that these results do not suggest that increasing MPA sizes would result in even greater benefits.

Another uncommon study of the direct effects on fishers from MPAs that initially were predicted to improve profitability

is by Guenther (2010). She uses observation data and examines the spiny lobster fishery in the Santa Barbara Channel. Marine managers created MPAs as part of the Channel Islands State Marine Reserve (CISMR) network that spatially limited or prohibited fishing of lobster. One objective of the CISMR was to enhance predator abundance (spiny lobster) to control the rapid increase in prey species (sea urchins) and prevent trophic cascades that threatened kelp beds in the ecosystem as a whole (Ugoretz, 2002). Despite supportive simulations as part of the set-up of the reserves, using panel datasets of five years before and five years after the CISMR designation, Guenther found that kelp cover and sea urchin abundance were far more affected by reef characteristics and tide patterns than by fishing effort. She also estimated a 28 percent loss in individual daily catch associated with denial of access to fishing grounds. Two-thirds of the loss was due to forcing fishers to search for and learn about new areas for fishing.

These possible negative effects are best anticipated by fishers whose livelihoods are directly affected by MPA and EBM policies placed on them. This probably explains why efforts to expand MPAs in central California to include 10–20 percent of coastline up to five kilometres from shore have been very contentious, with conflict between marine conservationists and fishermen (Dalton, 2010). The establishment and maintenance of MPAs requires more than simulations, and it needs gradual measurement of results and flexibility in MPA design, including rejection. Trade-off analysis for MPAs is described in Lester et al. (2013).

Unclear Baselines for Comparison of MPA/EBM Proposals

As described earlier, the MPA literature rarely identifies the baseline setting of concern. Is the proposed MPA in an area of open-access fisheries where timelines are short and there is a race to fish? Alternatively, is it an area with government limited-entry fishery controls on inputs and seasons whereby incentives for ecosystem protection, including bycatch controls, are unclear? Finally, is it within areas with annual allowable catches and shares or quota within them or TURFs? Are all of these areas within the waters of countries that adhere to the rule of law, have enforcement capabilities both for internal compliance and against illegal entry from outside parties, and have mechanisms to elicit the concerns of various internal interests and respond to them?

The counterfactual baseline for MPAs is critical because it determines what options might be considered for achieving the ecological goal and what is feasible. If the alternative is open

access, the question arises as to why open access exists. Open access has long been understood to bring important losses (Gordon, 1954; Scott, 1955; Hardin, 1968). An alternative solution for both improvements in fishery outcomes and ecosystem protection could be the assignment of property rights through catch shares (Christy, 1973). Traditional government limited-entry controls and restrictions on inputs fail to fully align incentives and to reduce the losses of the race to fish (Grafton et al., 2000). Moreover, there is no basis for bargaining among fishers in an open-access setting. They cannot easily contract among themselves to halt damaging fishing practices. Except for unusual cases (Acheson et al., 2015), there are no owners or enforcement frameworks for such private contracts. Open access and weak government regulation are likely to coincide with ecosystem damage. A remedy is to reform fishery regulation towards incentive-based or rights-based systems and then incorporate ecosystem concerns in the design. This remedy could be far less controversial and provide broader human and ecosystem benefits than MPAs/EBM.

Indeed, property rights have been assigned through the definition of total allowable annual catch (TAC) and the assignment of shares within them. Where these catch shares or quotas are durable and tradable, they fundamentally change incentives in human exploitation, which is a critical condition not recognised in the MPA literature (Essington et al., 2012). Rights-based systems provide both long-term incentives in harvest and ecosystem protection because the stock depends on the ecosystem. Assessments of catch-share systems generally are positive in terms of improvements in profitability, reduced variance in harvest, and, in some studies, ecosystem protection (Grafton et al., 2000; Costello et al., 2008; Bonzon et al., 2010; Essington et al., 2012; Afflerbach et al., 2014; Thunberg et al., 2015; Birkenbach et al., 2017). Criticism of rights-based systems is generally driven by distributional concerns (Bromley, 2009).

Rights-based systems not only change incentives, but they allow for bargaining within groups. They identify who the quota or catch shareholders are and provide the basis for negotiated arrangements to change fishing behaviour. Such negotiations are not possible in open access or within traditional effort regulation. There can be unlimited numbers of parties and none has legal standing to engage in group negotiations to protect the ecosystem. Catch-share systems, by contrast, are well placed to take on a number of responsibilities to achieve ecosystem goals, including bycatch controls and restrictions on spatial access.

Holland (2018) outlines how rights-based systems were used to achieve biological objectives in the Bering Sea and Aleutian pollock fisheries and Pacific whiting fisheries in Alaska, all under quota systems. These industry-led cooperative arrangements reduce bycatch of non-target species. Caps are set on bycatch, quotas assigned are tradable, and unused bycatch credit can be carried forward. There also are risk pools of bycatch quota among members to reduce the hazard of target fishery closure. None of these actions would be feasible in the absence of a catch-share system of some type. As another example, the British Columbia groundfish trawl fishery, which has been managed with individual transferable quotas since 1997, reduces incidental harm to deep-water corals and sponges through some area closures and transferable bycatch quota. Notably, the actual catch of corals and sponges has remained far below the total quotas set since the programme was implemented and also well below average levels prior to the agreement.

Another property-right regime is spatial, assigning use rights to a group as TURFs or territorial property rights (Christy, 1982; Cancino et al., 2007). Afflerbach et al. (2014) compiled twenty-seven TURF reserves worldwide, suggesting that strong customary tenure systems result in distinct qualities of governance, management, and enforcement, as opposed to government-mandated TURFs. TURFs make up about 10 percent of worldwide catch-share systems (Holland, 2018). Holland argues that such spatial collective rights arrangements can address both open access and ecosystem values. They can be effective where there are many fishers and assigning individual property rights is costly or less effective than having group rights and harvest practices. Costello and Kaffine (2017) provide a model whereby TURFs lower the costs of defining, managing, and enforcing marine conservation. The group internalises the benefits and self-enforces private spatial-biodiversity controls.

Because catch-share and TURF systems can be so fundamentally different from open access or government effort regulations, they can be alternatives to MPAs. They can provide clear incentives for stock and ecosystem conservation at lower cost than imposed MPAs. The latter disrupt existing resource uses, raising the costs of implementing and enforcing MPAs (Costello and Kaffine, 2017). Multispecies fisheries, such as the Pacific groundfish fishery, can be included within quota or catch-share systems to broaden the impact of quota outcomes (Warlick et al., 2018). The literature finds that catch shares/quota are more successful with durable, secure, and tradable property rights. MPAs/EBM, however, potentially

weaken property rights by imposing constraints on access and fishing activities.

As Holland (2018) argues, fishers can, through cooperation, often address external impacts more effectively and efficiently than can regulators if they are incentivised to do so. By capitalising on private information, they can devise restrictions on their own fishing that mitigate these issues more cost-effectively than by methods devised externally by agency officials (Little et al., 2016). Fishers organised around customary practices, formal catch shares, quotas, or TURFS can tailor contracts and incentives to the specific situation. Collaborating fishers can monitor each other more effectively and cheaply than can the regulator. They can adjust rules more quickly and in an incentive-compatible manner. They can discipline noncompliance relying on local pressure and norms, and they can invest in research to develop new technologies that reduce bycatch and habitat impacts.

As emphasised by Holland (2018), there is a general lack of involvement of fishers and other resource users in the initial stages of considering MPAs/EBM, especially where there is the possibility that the initiatives may not be implemented. The general pattern, instead, is for advocates to designate an MPA and then force those directly affected to respond. The absence of incentive-based, collaborative agreements is likely to be a major obstacle to achieving any reasonable response to ecosystem concerns (Dehens and Fanning, 2018).

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Output 2:

An Analysis of Ecosystem-based Management and Marine Protected Areas in New Zealand with Application to the Proposed Kermadec Ocean Sanctuary

Abstract

A review of New Zealand's experience with marine protected areas (MPAs) and ecosystem-based management (EBM) focuses on five factors: a) existence of clear and measurable ecological goals; b) incorporating both natural and social sciences in decision making and assessments; c) performance of rigorous trade-off analysis; d) involvement of Māori and other resource users; and e) incorporation of New Zealand's existing incentive-based management. Insights are drawn for assessing the proposed large-scale Kermadec Ocean Sanctuary that would be one of the world's largest MPAs with permanent restrictions on human access and use. The review concludes that emphasis has been on the mechanism rather than on measurable outcomes. Neither past nor proposed MPAs have had precise goals that address ecological interactions, uncertainties, timelines, or contingent adjustments. Claimed benefits, accordingly, are difficult to assess. Costs and their distribution are given insufficient attention to be able to determine their magnitude and the trade-offs encountered. The initiatives are driven by natural-science concerns without rigorous social science analysis. The absence of socio-economic investigation potentially undermines the achievement of environmental goals. Moreover, MPA efforts generally do not encourage the involvement of Māori or others whose

knowledge and cultural values are critical in management of the ocean resource. The institutional framework of the quota management system (QMS) that has made New Zealand a world leader in fishery management has not been incorporated. Indeed, the large-scale Kermadec reserve could undermine the QMS and change user incentives across New Zealand's exclusive economic zone, resulting in greater resource depletion rather than protection. Finally, the Kermadec initiative may violate the provisions and spirit of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 and other Māori treaty rights.

Introduction

As a result of international agreements between parties to the Convention on Biological Diversity (CBD), there has been a growing pressure on country politicians and agencies to set aside between 10 percent and 30 percent of the world's oceans as marine protected areas (MPAs) and manage marine resources through ecosystem-based management (EBM) (CBD, 1996; CBD, 2004; CBD, 2010). While there are many databases documenting global MPAs, the *MPA Atlas* currently lists 14,688 individual MPAs. MPAs range in size from less than 1 square kilometre to 1,500,000 square kilometres and cover 10.2 percent of coastal and marine areas under national jurisdiction (Alcala, 1988; Barnett et al., 2016; Juffe-Bignoli et al., 2016). These protected areas can vary from strict nature preserves with very limited or no human use to protected areas where some highly regulated access to natural resources is permitted (Dudley, 2008). Ecosystem-based management is a broadly defined conservation strategy within MPAs that is motivated by the 'best understanding of the ecological interactions and processes necessary to sustain ecosystem composition, structure, and function' (Christensen et al., 1996, 665).

MPAs and EBM are largely spearheaded by environmental non-governmental organisations (NGOs) and are increasingly promoted as ocean regulation tools (Sissenwine and Murawski 2004; World Wide Fund 2005; Halpern et al., 2010; Rand, 2017). Importantly, these efforts often are not initiated by national citizens who live and depend on the ocean resource and its long-term viability. Rather, they are presented as proving global public goods that may not be understood or valued by local users, whose actions are viewed by proponents as counter to the broad objective. Hence, MPAs and EBM involve centralised restrictions on entry and use, generally without user-group involvement. As such, the initiatives run counter to and do not take advantage of modern incentive-based fishery and ecological management arrangements that have documented successes (Costello et al., 2008; Branch, 2009; Walden et al., 2012; Birkenbach et al., 2017). Accordingly, there can be intense opposition, creating an adversarial setting. Depending on the political organisation and influence of user groups, opposition can corrode long-term citizen support for MPAs that is critical for securing ecological benefits. The work of 2009 Nobel Prize winner Elinor Ostrom (1990) has shown how critical it is to directly involve local agents in effective conservation of open-access natural resources. Documented resistance to large-scale MPAs is a paradoxical result for initiatives ostensibly designed to provide beneficial public goods, and it signals the need for more attention to be given to

the trade-offs imposed and who bears them in MPA planning and implementation.

There is an overriding emphasis on the need to meet international treaty obligations for ocean habitat protection with little precision about what that means or how it will be achieved and sustained over an undefined period of time. MPA/EBM proposals emphasise ecological benefits with little socio-economic analyses of potential costs or trade-offs imposed on particular segments of the population. Such information is valuable because it directs MPA planning in ways that elicit the current and long-lasting support of important user groups and help in the selection of MPAs/EBM that are most viable. Instead, users are often portrayed as sources of ecological problems who must be constrained via imposition of controls, rather than as collaborators to achieve agreed objectives. Costs borne by such parties do not receive careful attention.

Social science is as important as natural science in achieving biological goals. A variety of issues can arise that rarely are addressed in planning. For example, what would happen politically within a country should the net costs of the initiatives rise? These include discovery of new very valuable fisheries or mineral deposits, while vaguely stated ecological benefits fail to materialise. What contingent adjustments would be considered should the MPA be found to be too small (or larger than required) or EBM is determined to be not restrictive enough (or more restrictive than necessary)? Budget allocations for scientific study, enforcement, management, and, potentially, compensation to injured parties are made at the country level. MPA/EBM efforts make little or no reference to the literature on the determinants and durability of country political commitments and budget appropriations in light of shifts in national costs and benefits.¹

¹ For an example of the top-down push to establish and expand MPAs without consideration of local users and their incentives to cooperate and long-term national political factors, consider this recent statement by the CEO of WWF-NZ: <https://thespinoff.co.nz/society/24-09-2018/why-nz-has-to-stop-telling-whoppers-about-our-care-for-the-ocean/>

Further and importantly, achievement of the ecological goal is not independent of user reaction. The mechanism alone (MPA/EBM) does not insure success. Opposition raises enforcement and monitoring costs, and because enforcement will never be complete, protected habitat and species can be compromised. If user groups are sufficiently influential in the political process, international treaty provisions can be reneged or seriously weakened. Social science research in international collective action for global public goods reveals that, ultimately, countries take positions that are in their best interests should costs rise and be significant relative to the national benefits received (Barrett, 2007; Libecap, 2014).

New Zealand is a useful case study about the way MPA/EBM regimes have materialised through time and the potential trade-offs encountered. New Zealand is considered a pioneer of marine reserves, with the country's first reserve established in 1977 (Ballantine, 2014). As early as 1992, fisheries legislation called for an 'ecosystem based approach' to ensure sustainability (Wheeler et al., 1992). Although ostensibly created to provide national and global public goods, MPAs/EBM have been controversial, underscoring the importance of more consideration of socio-economic factors and national legal obligations. Research on the establishment of early reserves found support or opposition varied significantly according to how costs were imposed on communities (Wolfenden et al., 1994). Disagreements over whether, where, and how additional MPAs and EBM restrictions should be established continue (Bess and Rallapudi, 2007; Hale and Rude, 2017).

New Zealand is also useful because of its national application of incentive-based management through the quota management system (QMS) and the partnership between government and Māori in fisheries management decisions (Stokes, 1992). The QMS was instituted in 1986 and has grown from managing 26 species to 98 species and 642 individual stocks as of 2017 (Hale and Rude, 2017). Māori fisheries rights that were neglected for 140 years after the signing of the Treaty of Waitangi were formally incorporated into the QMS system in 1992. Māori received a 50 percent share in New Zealand's largest fishing company as well as 10 percent of pre-settlement quota and 20 percent of quota for any species brought into the QMS going forward (Treaty of Waitangi (Fisheries Claims) Settlement Act 1992). The expansion of the QMS has made New Zealand a global leader in incentive-based management and has given formal property rights to Māori that bind their interests in the sustainable use of fisheries – recognising practices that have long been part of their cultural resource-use ways. The QMS would provide

a valuable institutional framework for additional habitat protection, should that be agreed on. It has not been central, however, to the MPA/EBM effort. In MPA planning, treaty obligations to Māori appear to be presented as secondary to the objectives of international agreements. There seemingly is little or no attempt to draw on the expertise of Māori and their enduring ties to a viable ocean resource or recognition of their legal rights to current and future New Zealand fisheries.

Methods

The analysis of MPAs/EBM in general is drawn from a comprehensive summary of the literature as listed in the references. The literature review is guided by common search terms, including ecosystem-based management, ecosystem approach to marine and fisheries management, marine protected areas, and marine reserves. Leading researchers in the area were also contacted to identify key studies.² The review of New Zealand MPA/EBM is organised around five categories: a) clarity of the ecological objectives with measurable benchmarks; b) integration of natural science and social science concepts and literatures; c) involvement of existing fishers and indigenous peoples in MPA planning, implementation, and management; d) extent of trade-off analysis and follow-up socio-economic impact assessment; and e) extent to which incentive-based fisheries management is incorporated in achieving ecological objectives.

To gain more in-depth understanding of how MPAs and EBM perform along these five categories, researchers spent three weeks in New Zealand interviewing stakeholders from Māori fishing groups, iwi, commercial fishing companies and industry groups, environmental non-governmental organisations, and research institutes. These interviews were semi-structured and guided in-depth research into New Zealand's experience with the global efforts for EBM and MPAs.

Analysis of New Zealand's Experience with EBM and MPAs

New Zealand's Unique Institutional Context

New Zealand does not have law specifically designed to establish marine protected areas as might, for example, be defined under International Union for Conservation of Nature (IUCN) guidelines³. Rather, protection of marine areas in New Zealand has arisen through measures implemented under legislation established for a range of different management purposes as follows:

- i. Forty-four marine reserves in New Zealand were created under the authority of the Marine Reserves Act 1971 although some are enacted through special legislation (e.g., Subantarctic Islands Marine Reserves Act 2014). The Marine Reserves Act 1971 provides for the establishment of marine reserves for the specific and relatively narrow purpose 'of preserving, as marine reserves for the scientific study of marine life, areas of New Zealand that contain underwater scenery, natural features, or marine life, of such distinctive quality, or so typical, or beautiful, or unique, that their continued preservation is in the national interest'. The Department of Conservation is the principal implementing agency. All marine reserves are no take with the exception of Long Island – Kokomohua Marine Reserve, which allows traditional serpentine and nephrite harvesting.
- ii. Eight marine mammal sanctuaries were established under the Marine Mammal Protection Act, 1978. Six of these place specific restrictions on fishing, primarily on location, trawling, and mesh size of set nets. In addition, general restrictions on trawling and set netting are also applied within most coastal areas around New Zealand.
- iii. Ad hoc legislation applies in a number of cases and includes one marine park, the Mimiwhangata Marine Park (prohibiting commercial fishing but allowing recreational fishing) and the Sugar Loaf Islands Marine Protected Area Act 1991.

³ The IUCN defined a protected area in its 2008 guidelines in this way: 'A protected area is a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.' The New Zealand Department of Conservation defines an MPA as 'An area of the marine environment especially dedicated to, or achieving, through adequate protection, the maintenance and/or recovery of biological diversity at the habitat and ecosystem level in a healthy functioning state.'

² Among those contacted were Luke Brander (University of Amsterdam), Chris Costello and Ben Halpern (UCSB), Lynne Zeitlin Hale (The Nature Conservancy), Dan Holland (University of Washington), and Dale Squires (UCSD).

- iv. A wide range of fisheries regulations established under the Fisheries Act 1996 for the purpose of providing 'for the utilisation of fisheries resources while ensuring sustainability' protect areas from fishing effects. These include, but are not limited to, a series of mātaihai reserves, established for management of traditional Māori fishing grounds, an extensive network of benthic protection areas, which prohibit fishing activity 100 metres from the sea floor, and seamount zones prohibiting all trawling around a range of these features. In addition, marine reserves, such as the Fiordland, Hikurangi, and the Subantarctic Islands marine reserves, have supporting legislative provisions coordinating the establishment of other types of management controls (such as fishing gear controls established under the Fisheries Act 1996).
- v. Certain wildlife is protected under the Wildlife Act 1953 either specifically by species or within defined area delineated sanctuaries.
- vi. A number of cable and pipeline protection zones, established under the Submarine Cables and Pipelines Protection Act 1996, prohibit fishing and anchoring as well as access in some cases.
- vii. Finally, various coastal areas are protected under the provisions of coastal plans established under the Resource Management Act 1991 for the purpose of promoting 'the sustainable management of natural and physical resources'.

This interconnected set of measures protecting marine habitats and life that exist today has its genesis in the resource management reforms implemented during and immediately following the Fourth Labour Government free-market reforms of the 1980s. Prior to this, the management of what is now considered to be New Zealand's (government or Crown owned) conservation estate on land was administered by several large agencies for multipurpose use. The 1987 reforms abolished many of these agencies and divided state-owned land into land managed for commercial purposes, which were either sold or managed within state-owned entities, and conservation estate administered by a new single-purpose department, the Department of Conservation (Boston and Holland, 1987). A new Ministry for the Environment was established to take on responsibility for government environmental policy development. The many statutes regulating land use were ultimately consolidated into the Resource Management

Act 1991, administered by local and unitary authorities, with a dedicated purpose as noted.

At the same time, the management of fisheries was placed under quota management in 1986. The quota management system, however, only partially privatised rights to fisheries by allocating individual tradeable catch quotas and retaining management of the marine sector of New Zealand within the authority of government under dedicated fisheries law. Initially, this new regime was implemented as an amendment to the planning-based Fisheries Act 1983, but it was later reformed into the Fisheries Act 1996 with a dedicated purpose of focusing on sustainable use. Importantly, this new legal framework was designed and implemented to meet settlement agreements on customary rights to fisheries reached with Māori, and a variety of mechanisms were put in place to manage interactions between fisheries law and other statutes. These mechanisms included, for example, provisions under the Resource Management Act 1991, which empowered local government to control land use (including use of the seabed), that exempted effects of fisheries harvesting from local body control. Likewise, the Resource Management Act 1992 and the Marine Reserves Act 1971 required explicit consideration of adverse effects on fisheries, and in the case of marine reserves, the Minister of Fisheries was required to agree to any such reserve before it could be put into effect.

For the above reasons, the New Zealand historical experience in marine management and establishment of areas protecting marine resources does not fit easily into MPA definitions, and the specific arrangements that might qualify as an MPA are often debated. Arguably, at one extreme, the QMS itself, encompassing all marine areas of New Zealand, could be defined as an MPA given that it is established under law to meet sustainability, including biodiversity maintenance and habitat protection. Recently, however, the New Zealand government has taken the position that a dedicated law is required to expand New Zealand's legal framework for MPA establishment given the narrow scope of the Marine Reserves Act 1971 (Ministry for the Environment, 2016b). This new legal framework is advocated on the basis that the current legal systems are not effective for managing New Zealand's marine environment. The Kermadec Ocean Sanctuary, proposed to encompass some 620,000 square kilometres of ocean space, although being promoted under dedicated law separate from the more general MPA legislation, is so far the most significant of these new MPA initiatives.

This analysis does not take sides in the debate about what constitutes an MPA but simply focuses on evaluating the process followed in establishing marine protected areas that are identified by the Department of Conservation in their 2018 Annual Report as New Zealand's current network of MPAs (which are limited to those established under the Marine Reserves Act 1971 and the Marine Mammals Protection Act 1978) and the more recent experience with the Kermadec Ocean Sanctuary process.

Lack of Measurable Ecological Criteria and Benchmarks

The literature exploring New Zealand's implementation of EBM and MPAs reveals an emphasis on the mechanisms themselves and an absence of measurable goals. Around forty-four MPAs were established in New Zealand under the Marine Reserves Act 1971. The Act's primary objective is to preserve special areas with distinctive features in their natural states for scientific study. The Act and subsequent planning documents do not identify metrics for monitoring and measurement of what is the natural state; whether or not an area remains within it; whether exogenous factors, such as ocean warming/salinisation, play a critical role; and what contingent adjustments might be made should the 'natural state' not be achieved by some unspecified time.

Despite a lack of clear, guiding, and generally agreed metrics for achieving or sustaining a natural state, there is evidence of monitoring in the reserves through to 2013, but this ceased in large part when government funding for such activities was reduced. At Cape Rodney-Okakari Point Marine Reserve (Goat Island), surveys have been conducted on fish and lobster abundance inside and outside the reserve. The reports on fish (Haggitt, 2011) and rock lobster (Haggitt and Freeman, 2014) point to increased size and abundance of species inside the reserve relative to the fished areas outside the reserve. Subsequent to 2013, monitoring activity has been limited mainly to the few reserves associated with university-based research.

Without determinate goals or benchmarks, and regular ongoing monitoring, it is difficult to assess whether reserves are providing wider benefits for management of the broader ocean resource. Is, for example, the goal to have larger lobsters in reserves while fishing and other activities are prohibited from these areas? Species depletion may rise along MPA boundaries and overall stock levels may not change as fishers compete for the reduced areas allowed for fishing. Other questions include how large should some fish stocks be?

How does that impact predator/prey relationships and species richness? What is the likely impact on enforcement costs and political durability as protected species proliferate inside reserves but decline outside them?

MPAs in Australia and New Zealand saw lobsters increase in size and abundance inside reserves, but this was accompanied by decreases in urchins and abalone (Babcock et al., 1999). In California's Channel Islands, lobsters also increased in size inside reserves, but fishers experienced an estimated 28 percent loss in individual daily catches associated with loss of fishing grounds (Guenther et al., 2015). The costs of fisher search and adjustment, the time involved, and the present value of lost earnings during the process were not part of MPA planning or implementation analysis. Reimer and Haynie (2018) examined closures to protect Steller sea lions along Alaska's west coast and found significant economic costs on the groundfish fishery, some of which could be mitigated by shifts to new species and areas. Again, even in this programme evaluation, there was no assessment of the costs of search and adjustment.

Although the marine reserve system to date has been relatively limited, proposals for the dramatic increase of MPAs in New Zealand, such as the proposed Kermadec Ocean Sanctuary, change natural and socio-economic dynamics. The lack of measurable, transparent conservation objectives has made evaluation of past reserves a more subjective, rather than rigorous, scientific exercise. This condition has been tolerated within the country, but that may no longer be the case as the size and costs of MPAs/EBM rise. If user and broader political support for the reserves is to be secured and held for perpetuity, as plans describe, far more attention will be required for clearer benefit or outcome measures, timelines, tools for implementation, and possible contingent adjustments, along with greater assessment of current and future cost/benefit trade-offs to users and their communities.

Moreover, the more recent experience with marine protected area establishment in New Zealand in the case of the Kermadecs shows little consideration of coordination with existing fishery management. New Zealand is not unique in this case. Sanchirico et al. (2006) and Trochta et al. (2018) both explore the complexities and lack of agreement around how to operationalise EBM. In New Zealand, opinions on EBM range from calls for an overhaul of the QMS (Environmental Defence Society, 2016) to suggestions for a stepwise approach to incorporate the ecosystem in management schemes (Hilborn, 2004). Criticisms of the QMS or other incentive-based systems fail to outline the baseline alternative. Is it

first-best conservation, and if so, what would that be and how would it be achieved? If second-best, how would EBM improve on existing QMS practices or how might QMS be modified to achieve collaborative goals? Yet, national discussions for implementation of EBM to meet international agendas do not seriously consider a bottom-up approach of collaboration with the QMS and building on its considerable successes. Without recognition of the value of existing practices, property rights, and treaty obligations associated with the QMS, fishers have little reason to endorse vaguely described EBM that may be unnecessary and costly and bring little overall additional habitat benefit.

Existing EBM discussions neglect ongoing management by government and fishers. In general, EBM is used to manage targeted species, reduce by-catch and minimise impacts on habitat (Hilborn, 2011). Much of these are already achieved in New Zealand. In an analysis of how thirty-three countries perform in terms of EBM principles and implementation, New Zealand was ranked third (Pitcher et al., 2009). Under the QMS, 84 percent of assessed stocks in 2018 were above management target levels (Ministry for Primary Industries, 2018). Fishers have also led efforts to reduce damage to sensitive ecosystems by setting aside roughly 30 percent of New Zealand's exclusive economic zone as benthic protection areas, where bottom trawling and dredging are prohibited to protect benthic habitat (Helson et al., 2010). Additionally, fishers and government have spent NZ\$48 million on the innovative Precision Seafood Harvesting technology that selectively targets fish to reduce undersize catch and bycatch. The technology is projected to deliver NZ\$44 million in economic benefits by 2025 (Guy and McKelvie, 2016).

The QMS and related fishery management also provide a framework for adaptive management. As quota holders with a long-term stake in the ocean resource, fishers can jointly incorporate new scientific data and respond with various management tools as is emphasised in successful EBM (McLeod et al., 2005). Fishers can do this because the quota system provides them with standing for collaboration not possible under open access, excessive entry, or traditional centralised fishery management. Under these systems, decisions are made by the regulator who may have different information and incentives, which raises monitoring and enforcement costs and reduces opportunities for success (Costello and Kaffine, 2017).

For example, the pāua (abalone) fishery has responded at a fine resolution to localised stock depletion and developed internal regulations to meet spatial differences in species. Pāua is unique as a sedentary and patchy species that requires

certain densities to successfully spawn and is prone to localised serial depletion (Neubauer, 2017; Karpov et al., 2000). These circumstances are recognised by fishers, and the Paua Industry Council established a data-logger system that individual pāua divers wear to give industry and managers fine-scale, catch-per-unit effort data (Neubauer, 2017). This innovative, voluntary approach to fisheries data collection, promoted by the Paua Industry Council, has led to a spreading of harvest effort; deliberate increases in minimum harvest length, based on age of maturity of local populations; and voluntary catch reductions in areas that show signs of depletion (Jeremy Cooper, CEO Paua Industry Council, personal communication, August 2018). These adaptive and holistic initiatives under the QMS are clearly part of any EBM.

Objectives Are Driven by Natural Science with Limited Rigorous Social Science Analysis

Globally, proposals for marine reserves focus predominantly on natural science objectives (Thorpe et al., 2011). Social science, however, is as critical as natural science in achieving long-term ecological goals, especially if significant trade-offs are encountered. The neglect of socio-economic factors and the social science literature associated with them can ultimately undermine national efforts to promote enduring habitat and species protection (Christie, 2004).

In New Zealand, the primary purpose of the Marine Reserves Act is to hold areas in their natural state by excluding human interaction. The proposal for the Kermadec Ocean Sanctuary has an unambiguous objective to 'preserve the Kermadec region in its natural state now and in the future', and it outlines how fishing and other extractive activities will therefore be excluded from the area in perpetuity (Ministry for the Environment, 2016a). In regulatory impact statements, the government calls for monitoring of fish abundance, biodiversity, and habitat, with data to be made publicly available (Department of Conservation, 2011). Current and potential future impacts on resource users, their communities, and New Zealand citizens in general are not addressed in any detailed manner. There are no calls to monitor socio-economic indicators post-implementation as fish migration patterns change or as other exogenous factors change the importance of reserved areas to local populations. The ocean is heterogeneous and adjustment options vary and may be costly to implement. Prioritising natural science objectives and pristine environments that are only vaguely defined relegates human interests as secondary concerns.

This approach has serious implications for constituents who bear the costs of these proposals, the long-term political durability of support for the reserves, and the allocation of budgets for enforcement, monitoring, and management. Further, there is considerable empirical evidence from the work of Ostrom (1990) and others documenting the important role of local involvement in the conservation of natural resources. Without more attention to socio-economic issues, New Zealand could achieve apparent biological successes in some areas without clear benefits to important national stakeholders. This is observed in Southeast Asia (Christie, 2004) and in the lobster fishery around the Channel Islands in California (Guenther et al., 2015). An adversarial relationship between MPA advocates and the local population has been documented in many of the sanctuary efforts in Australia (Fitzsimons and Wescott, 2016) and the United States (Suman et al., 1999; Salz and Loomis, 2004; Hilborn, 2007; Stewart, 2009).

Finally, there has been little or no emphasis on MPA programme evaluation. Programme evaluation is a critical element of evidence-based policy making for natural resource and environmental management (Ferraro, 2009). Such evaluation assesses the degree to which changes in an outcome variable, such as species or habitat sustainability or growth, can be attributed solely to the MPA/EBM policy. It is essential for eliminating explanations for the outcomes that are unrelated to the policy or for signalling needed contingent adjustments. Most of the programme evaluation literature is devoted to establishing whether a programme causally affects an outcome variable. Programme evaluation also can explore the nature of the causal relationship (Imai et al., 2011). Understanding how a programme influences an outcome variable can assist people to design policies that achieve the intended objectives, adjust the mechanisms that do not, better balance costs and benefits, and elicit long-term constituent support (Ferraro and Hanauer, 2014).

Trade-off Analysis, Such As Cost-Benefit Analysis, Is Not Performed, and Impact Statements Lack Detailed Calculation of Likely Costs or Benefits

Standard cost-benefit analysis (CBA) of existing and proposed MPAs or EBM policies in New Zealand, surprisingly, is absent. Benefits claimed to arise from expanding marine protection, such as in the case of the Tāwharanui reserve, are based on broad assertions rather than measurement. These include generalised non-use gains from greater protection of the marine environment, tourism, education, other non-extractive recreation, and potential spillover for fishers

(Department of Conservation, 2011). Additionally, in the impact analysis there is no recognition that any positive outcomes may accrue to different parties and communities – fishers are not necessarily trained in hospitality or tourism and long-term social/community dynamics of the two industries are quite different. There appears to be no sociological analysis of how communities might adapt to imposed shifts from fishing to tourism/recreation. Moreover, New Zealand citizens who bear no direct costs of the reserves will evaluate broad public-good benefits quite differently from those who do bear such costs. These consequences create distributional conflicts and political divisiveness within the citizenry, again potentially undermining the conservation goal.

In terms of cost, there is a similar lack of serious measurement, projection, or mitigation. For example, with the Tāwharanui reserve, proponents noted that there would be displacement of commercial and recreational fishers with little attention to the impacts on these parties and their communities. The reserve impact statement and other similar ones (Ministry for Primary Industries, 2015) rely on general claims of value to diffuse groups from additional protection. Search and adjustment costs receive little consideration, and regulators assume fishers can access fish in other locations at little loss, ignoring the heterogeneity of the ocean resource (Ministry for Primary Industries, 2015), or shift smoothly to tourism and recreation.

A post-hoc analysis of one, small (8.54 square kilometre) New Zealand marine reserve, Taputeranga, provides evidence that the costs can be significant. Rojas-Nazar et al. (2015) calculated the organisation and implementation costs to include NZ\$508,000 for pre-establishment consultation and NZ\$353,000 for post-establishment information dissemination, surveys, and equipment purchase. The authors point out that these are probably minimum estimates as much of the labour was voluntarily supplied by environmental non-governmental organisations, including the Royal Forest and Bird Protection Society of New Zealand and the South Coast Marine Reserve Coalition Trust. Management costs per area unit for this small reserve were similar to larger reserves – a finding that differed from previous projections (Balmford et al., 2004; McCrea-Strub et al., 2011). Estimates of annual management costs for the Taputeranga reserve range from NZ\$43,200 to NZ\$112,500. Additionally, after creation of the reserve, lobster fishers had higher search and travel costs than anticipated, with a total estimated annual displacement cost of NZ\$22,160 per vessel (Rojas-Nazar et al., 2015).

Monitoring of the Taputeranga reserve after establishment found little evidence that there had been benefits to adult marine species within it or that spillovers outside reserve boundaries had occurred, with the exception of two species (Diaz-Guisado, 2014). Spillover-benefit claims are commonly made in reserve proposals, but the Taputeranga case and the Channel Islands case in the United States reveal that such projections may be optimistic and not forthcoming. More rigorous analysis of the factors underlying successful spillovers as well as the costs of search and adjustment by resource users are required prior to reserve establishment. Otherwise, planning and advocacy occur based on unproven and often subjective claims of generalised environmental and human benefits that can be achieved at low cost. If this turns out not to be the case, then overall reserve benefits and cost assertions are called into question. Negative reaction occurs when actual benefits and costs are revealed, harming prospects for existing and proposed reserves.

These results for a small reserve suggest caution for the proposed 620,000 square kilometre Kermadec Ocean Sanctuary, where costs and impacts on users may be much higher than the proposals suggest. Further, if there is widespread opposition, monitoring and enforcement costs could be higher still. In planning stages, careful trade-off analysis needs to be conducted using well-established cost-benefit analysis techniques (Hotelling, 1947; Clawson, 1959; Davis, 1963; Sorg and Loomis, 1984; OECD, 2006). This will make reserve proposals more realistic and point to areas where adjustments in reserve design and potential compensation are likely to be required. This process reduces uncertainty, makes the reserve process more legitimate, and encourages longer-term political commitment to the conservation objective.

National Calls for Expanding MPAs and EBM Generally Exclude Māori and Fishers' Perspectives

New Zealand follows a global trend of implementing MPAs and EBM in a centralised manner that does little to incorporate the perspectives and knowledge of indigenous peoples and other local fishers or the incentives relevant to them. In a global review of MPA literature, only 0.5 percent of papers dealing with MPAs included indigenous people (Ban and Frid, 2018). In New Zealand, there are distinct protocols that separate the government's process for reserves from ones implemented by Māori. Māori fishing interests are diverse across iwi (tribes) and hapū (clans/sub-tribes), and this heterogeneity influences Māori policies, as one would expect from locally supported approaches to conservation. Bess and Rallapudi

(2007) discuss disputes arising from Māori holding commercial, recreational, and customary rights to fish in the implementation of taiāpure and mātaītai reserves/closures. Addressing different perspectives and expected costs and benefits is essential for a successful, collaborative approach to solving open-access resource problems (Ostrom, 1990; Ayres et al., 2018). These localised efforts to create taiāpure and mātaītai reserves and restrict access are quite distinct from government-led reserves, where there is less accommodation of diverse interests.

Reserve proposals in New Zealand have often neglected Māori positions in the planning process or rejected their stated preferences in implementation. For example, during the design of the Poor Knights Islands Marine Reserve, efforts were made to include local fishers and Māori. Local iwi strongly supported this approach, and the reserve plans restricted commercial and recreational fishing similarly. In the final adoption, however, the government reserve overlooked Māori goals and instead promoted recreational fishing (Guénette et al., 2000). More recently, with the Kermadec Ocean Sanctuary proposal, the government only consulted with two local iwi, even though other Māori hold fishery property rights in the area that would be closed (Ministry for the Environment, 2016a). Te Ohu Kaimoana, the Trust established through the Māori Fisheries Act 2004 to represent Māori fishing interests, criticised the government's push for MPA expansion without consulting Māori who own quota that would potentially be severely restricted with the loss of fishing grounds (Tuuta and Tuuta, 2018). These unilateral reserve actions taken by the New Zealand government are counter to the partnership between Māori and government that is articulated in the Treaty of Waitangi and reinforced in High Court decisions during the settlement process (Stokes, 1992).

The failure to genuinely include the positions of Māori and other fishers in reserve decisions undermines successful local collective action to support the conservation effort. The social science literature outlines conditions that facilitate cooperation among stakeholders for the provision of local and international public goods in natural resource management (Ostrom, 1990; Cox et al., 2010; Libecap, 2014; Ayres et al., 2018). MPAs are most likely to be successful over the long term if local users and their communities are directly engaged in the design and execution of reserves. This involvement insures that anticipated costs and benefits and their distributions are articulated and that rights are clearly recognised (Weigel et al., 2014). New Zealand, however, has a very mixed record in creating opportunities for such collective choice in natural resource management (Yandle, 2003). Even when government

reserve legislation attempts to include indigenous peoples, actual co-management relationships fail to materialise due to the variety of Māori interests, a lack of trust in the process, and a lack of adjustment in positions taken by other interest groups (Taiepa et al., 1997). As they unfold, government reserve proposals become too uniform and too inflexible to accommodate the kinds of contingent adjustments required as new information emerges. Insights for flexible design and implementation are far more likely to be held by local users with a history of dependence on the ocean resource than by external reserve advocates, consultants, and government officials who have more remote and indirect knowledge.

EBM and MPAs Do Not Integrate the Incentive-based Fisheries Management Strategies Utilised in New Zealand

Proposals for MPAs and EBM fail to incorporate the incentives for habitat management and institutional structure created by the QMS. This is a critical missed opportunity because New Zealand is recognised as a world leader in incentive-based fishery organisation, and globally there is a considerable record of success for such arrangements. Catch-share programmes such as the QMS have eliminated the race to fish (Copes, 1986; Squires et al., 1998; Dewees, 1998; Birkenbach et al., 2017), improved fleet efficiency (Boyd and Dewees, 1992; Eero et al., 2005; Felthoven et al., 2009; Walden et al., 2012; Brinson and Thunberg, 2016), improved profitability (Dewees, 1998; Grafton et al., 2000; Campbell et al., 2000; Newell et al., 2005; Arnason, 2008; Costello et al., 2008; Bonzon et al., 2010; Essington et al., 2012; Waldo and Paulrud, 2013; Afflerbach et al., 2014; Thunberg et al., 2015; Birkenbach et al., 2017), and promoted ecosystem stewardship (Dewees, 1998; Squires et al., 1998; Campbell et al., 2000; Branch, 2009; Yagi et al., 2012).

A key advantage of catch-share programmes is that they provide stakeholders with an extended tie to the marine resource, depending on the characteristics of the rights granted. New Zealand has permanent fishing rights in the QMS, making them among the most secure and valuable in the world. Their value, however, depends on the vibrancy of fish stocks and the habitat that supports them. This is very different from an open-access setting where short-term considerations dominate. It is also different from centralised fishery management that is similar to MPA/EBM proposals, in which fishers have no internalisable stake in the regulatory process. Fishers are regulated entities not partners with standing to directly capture the gains from management and to bargain among themselves to adjust fishing and ecosystem-

preservation practices that could increase those gains. These opportunities are possible under the QMS. Fishers benefit as rights holders from improved fish stocks and supportive ecosystems, whereas under centralised management, these benefits may or may not accrue to them, changing incentives to participate in collective resource management. These conditions underscore why catch-share systems have been so successful and why they could play a central role in additional marine conservation.

Moreover, the centralised, regulatory approach taken in proposing MPAs and calling for EBM undermines the QMS and the benefits it has provided. It has long been understood that the security provided in a property-rights system is a vital component for ensuring incentives are instilled in a rights-based system (Ostrom and Schlager, 1996). Exogenously imposed restrictions on access and use, previously available under the QMS, weaken confidence in the security of the rights granted and shorten time horizons, altering user motives for conservation. Further, placing MPAs/EBM on QMS stakeholders without their cooperation generates a sense of lack of legitimacy and fairness. This motivates resource users to create inventive ways to evade the restrictions, which compromises conservation objectives and raises monitoring and enforcement costs (Seabright, 1993; Wilson, 1995; Yandle and Dewees, 2003).

QMS critics claim that wider ecosystem impacts of fishing are ignored by quota holders (Slooten et al., 2017; Melnychuk et al., 2016; Whittaker et al., 2017), but these critics fail to provide a clear baseline for comparison. Is the baseline comparison with open access? With traditional fishery regulation? Or with proposed vague MPA/EBM regimes? Without more precision about how proposed EBM reforms would be implemented and maintained, relative to a clear baseline in a cost-effective manner, it is difficult to evaluate their merit. Moreover, critics fail to recognise the potential for use of the QMS as an institutional framework for further ecosystem protection, should that be an agreed objective.

Catch-share programmes elsewhere have provided an incentive-based arrangement for habitat protection. For instance, in British Columbia's groundfish fishery, which has been managed with catch shares since 1997, non-governmental organisations and fishers collaborated to create tradable quotas for sensitive benthic habitats such as sponges and corals (Wallace et al., 2015). After implementation, habitat damage declined to the lowest levels of harm in the seventeen-year data set (Wallace et al., 2015). Reimer and Haynie (2018) describe the way in which the Alaska groundfish

fleet cooperative, within an annual total allowable catch, collaborated in the protection of Steller sea lions. Holland (2018) argues that fishers are best suited to address external impacts on non-target species and the broader ecosystem if they are incentivised to do so. Habitat quota programmes have been modelled to be more effective and efficient at protecting sessile non-target species than general MPAs (Holland and Schnier, 2006).

Within this overview of New Zealand's experience with MPAs and EBM, it is worthwhile examining a far more extensive MPA, the proposed Kermadec Ocean Sanctuary, to see how it is likely to perform.

Kermadec Ocean Sanctuary Case Study

The projected Kermadec Ocean Sanctuary illustrates the problems associated with the MPA and EBM process in New Zealand and that the proposal could have far more serious consequences because of its size and broader implications. The proposal, for what would be one of the world's largest MPAs (620,000 square kilometres or 15 percent of New Zealand's exclusive economic zone), signifies a major shift in New Zealand policy from relatively small reserves for scientific research to a large-scale marine protected area for general global conservation objectives. Analysing this proposal and the repercussions in detail highlights the challenges it poses to Māori rights, culture, and livelihoods, as well as to the overall New Zealand QMS. It also shows a lack of information about additional conservation and socio-economic goals the sanctuary would causally achieve.

In planning documents for the sanctuary, the government does not provide evidence of threats to the area or any measurable conservation or socio-economic goals. In the impact statement, the government outlines global threats to marine environments from overfishing and climate change, while at the same time emphasising the unspoiled nature of the Kermadec area and the few immediate and direct threats to the region (Ministry for the Environment, 2016a). The emphasis is on preserving this vast area as an unexploited ocean reserve. There are, however, no indicators or targets for species richness, biodiversity, fish abundance, habitat quality, or other ecological factors to be protected. Also, it does not specify what the causal mechanisms might be beyond a no-use designation. What other factors might affect the species and habitat in the region over time in light of dynamic ocean and climatic conditions? The planning documents provide a list of selected species and ecological features of the Kermadec area, but there is no indication that these are at risk or are

depleted or whether the only goal is to retain their current state. The Kermadec initiative appears to set aside a very large area of the ocean resource in its present state by fiat with no clear outline of conservation goals, careful assessment of benefits and costs and who might bear them, timelines, or programme evaluation. Nor does it outline contingent adjustments that would be considered should conditions deteriorate for exogenous, unanticipated reasons or if QMS fish stock migration patterns were to move into the region. If the initiative was small, then these issues might be of little consequence, but it is not, and potential longer-term costs could undercut national efforts to conserve truly threatened areas of the marine environment.

The sanctuary proposal is driven by international non-governmental organisations and government officials wanting to be recognised as leaders in the MPA movement. The planning document lists major advocacy parties, including Pew, World Wide Fund for Nature, and the Royal Forest and Bird Protection Society, and notes the desire for New Zealand to be viewed as 'at the forefront of global protection initiatives' (Ministry for the Environment, 2016a, 5).

Although the government impact statement describes general costs and benefits of the proposed sanctuary, it does not provide a rigorous cost-benefit analysis, which is justified given the magnitude of the initiative. It lacks the fundamental components of cost-benefit analysis that could describe the possible socio-economic effects and the trade-offs that might be imposed. For example, there is no discussion of uncertainty in achieving ecological benefits or factors that might affect it; no clear timeline for cost assessment on the commercial fishery nor analysis of the opportunity costs and greater search costs arising from denying access to so large an area; and no use of discount rates for assessing costs and benefits over time. The impact statement outlines current fishing interests in the region and estimates total economic value to be NZ\$164,672 (Ministry of the Environment, 2016a, 8). This is framed as a small fraction of the value of all fisheries in New Zealand, suggesting that harvests could occur elsewhere by the same quota holders. Such an assertion ignores the heterogeneity of the ocean, future shifts in fish stocks, and the costs of search and learning that are borne by quota holders. These negative outcomes were neglected in the United States Channel Islands reserve proposals, but significant, uncompensated costs were imposed on fishers as the reserves were put into place.

The Kermadec impact statement acknowledges opportunity costs associated with locking up an area in perpetuity but makes no attempt to calculate these because

'it is difficult to quantify this opportunity cost' (Ministry of the Environment, 2016a, 8). Difficulty, of course, is no justification for a lack of analysis. A failure to measure opportunity costs implicitly assumes they are minimal, which they may not be. As noted earlier, there is established social science research in cost-benefit analysis to estimate trade-offs imposed by policy and the distributional impacts on the parties that actually incur the costs or receive the benefits. These distributional effects critically affect the success of resource management regimes (Ostrom, 1990). None of this analysis is evident in the report. Vaguely described, globally broad benefits are asserted without dimension or identification of causal mechanisms, and costs are effectively dismissed. Compensation is directly ruled out. It is worth noting that in a similarly large expansion of marine reserves in Australia's Great Barrier Reef Marine Park, fishers were expected to incur serious losses in access in favour of broad ecosystem and tourism benefits and were compensated through the buyback of licences and funding of transitional programmes (McCook et al., 2010; Macintosh et al., 2010).

Such an incomplete causality and cost assessment by proponents of the Kermadec Sanctuary and reliance on unspecified, diffused benefits generates mistrust and weakens the cooperation needed with resource users that research reveals is essential for successful conservation. It creates social divisiveness and sets the stage for political revision within the country at a later date should costs rise and commensurate benefits not be apparent. Moreover, as argued above, the arbitrary set aside of a large portion of New Zealand's exclusive economic zone with potential fishery opportunities challenges the strength of the property rights granted under the QMS that have made New Zealand a world leader in fishery management.

Māori fishing rights are briefly addressed, but the reserve's impact on them is given little attention in the sanctuary proposal (Ministry for the Environment, 2016a, 8–9). As mentioned earlier, the vast majority of MPA literature, including that associated with large-scale MPAs, does not include indigenous people in planning efforts (Ban and Frid, 2018), which alienates these groups and fails to take advantage of their localised knowledge of the resource and how to manage it (Leenhardt et al., 2013). The Kermadec impact statement acknowledges that there is a risk that the imposed sanctuary would be perceived as undermining the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 (Ministry for the Environment, 2016a, 9). Indeed, Te Ohu Kaimoana has taken the government to court over the

initiative, and one of the two iwi consulted on the proposal withdrew support (Bootham, 2016).

The quota held by Māori around the Kermadec Islands would be compromised by the access and use restrictions included in the reserve without financial compensation. Such compensation would not only include estimated value of lost access, but any reduction in overall quota values arising from the imposition of the sanctuary. The magnitude of the set aside and its precedent creates uncertainty for QMS property rights in general, undermining their role in promoting sound fishery management throughout New Zealand waters and internationally, given the highly migratory status of many fish stocks around the Kermadec Islands. This broad effect also is neglected in the proposal. Finally, the absence of extensive consultation, cooperation, and collaboration with Māori in the sanctuary proposal neglects Māori cultural attachments to the resource and understandings of how to preserve it. Considerable research into Māori perspectives of kaitiakitanga, often translated as guardianship, points out the deeply held values around sustainable, wise use (Kawharu, 2000; Roberts et al., 1995) that are essential for resource conservation. Such local knowledge and attachment is not part of the background of MPA advocates.

Conclusions

The proposed large-scale Kermadec Ocean Sanctuary, with its greater implications for fishery and marine management, signals a fundamental shift from the previous, relatively modest establishment of MPAs with related EBM in New Zealand. The approach taken may jeopardise past conservation and social gains associated with New Zealand's ocean policies and those promoted with the sanctuary. Assessing how this large-scale MPA has been proposed and implemented at the national level suggests caution is needed as New Zealand moves forward to meet general ecological concerns. This review focuses on five areas of concern: a) existence of clear and measurable ecological goals; b) incorporation of both natural and social sciences in decision making and assessments; c) performance of rigorous trade-off analysis; d) involvement of Māori and other resource users; and e) incorporation of New Zealand's existing incentive-based management into proposals for MPAs and EBM.

In general, New Zealand's MPAs/EBM have neglected social science methods and analysis to appropriately propose and assess socio-economic impacts and how they in turn could affect achievement of conservation objectives. With limited, small-scale reserves, these effects may be of little consequence, but with large-scale ones, such as the Kermadec Ocean Sanctuary, the impacts are likely to be far more significant and important for marine policy.

Proposals for MPAs and EBM focus on broad environmental objectives that are motivated by international agreements, non-governmental organisations, and national political officials who seek to have New Zealand be a leader in ocean conservation. The initiative planning and implementation documents generally do not describe costs or benefits with any precision, identify sources and effects of uncertainty in achieving ecological goals or the related costs of doing so, or determine timelines or discount rates. Additionally, advocates do not personally bear the socio-economic costs of their actions. There is little attention to programme evaluation in planning or implementation, and underlying causal mechanisms between establishment of the sanctuary and claimed outcomes remain unclear.

Neglect of trade-offs does not mean that they do not exist, and national negative political reaction is likely should benefits be perceived as limited and costs high (Libecap, 2014). Moreover, the parties that do bear direct costs are unlikely to cooperate in achieving ecological objectives that are often framed as broad global public goods. Failure to generate cooperation with Māori, who have cultural ties to resources,

and with other QMS holders who have a stake in the ocean resource could compromise success.

These problems are not unique to New Zealand as there is an understanding that clearly defined goals, causality linkages, and testing of assumptions are critical for MPA success worldwide (Agardy et al., 2003). Current monitoring of New Zealand's reserves emphasises increases in abundance and size of some species (Haggitt, 2011; Haggitt and Freeman, 2014), but it does not address the impacts on prey species that have occurred in other places or impacts on fishers who may not have seen the benefits from spillovers that proponents had asserted (Christie, 2004; Guenther et al., 2015). In planning for new and larger reserves, the ecological and social goals should be clearly stated in a testable fashion so the inherent trade-offs can be evaluated rigorously along with the overall programmatic performance.

This review reveals a lack of involvement of Māori and fishers in the MPA and EBM process. New Zealand's broad application of rights-based systems has helped the country become one of the world's leaders in avoiding overexploitation of fish stocks (Beddington et al., 2007; Worm et al., 2009). Rights to fish were a fundamental part of compensating Māori for over a century of violations of the Treaty of Waitangi. The brief attention to these rights in the proposal for the Kermadec Ocean Sanctuary raises a number of concerns. First, it appears to violate the objectives of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992. Second, actions taken by the government that erode the security of fishing rights could have ripple effects in the broader fisheries management regime, undermining existing incentives for marine stewardship and eventually creating the exact environmental and social problems that MPAs and EBM are designed to avoid. Third, Māori and other resource users need to be involved in collaborating on solutions, rather than being cast as adversaries, to draw on their unique, local, long-standing understanding of the resource and how to protect it. This was a key insight in Elinor Ostrom's 2009 Nobel Memorial Prize in Economic Sciences that has been missed in the effort to set aside large resource areas. MPA/EBM efforts are motivated by natural science concerns, but without careful social science evaluation and the collaboration of the people whose knowledge and support are critical across time and across shifting political cycles, the ecological objectives are unlikely to be obtained.

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Output 3:

Reallocation to Open-access Recreational Fishing: An Examination of the Impact on New Zealand's Quota Management System

Abstract

When commercial and sports fisheries access the same stock but are differentially regulated, fish populations can be imperilled and the viability of the most constrained regulatory system compromised. Worldwide, sports/recreational fishing is expanding, often targeting fish stocks exploited by commercial fleets. Moreover, for a variety of reasons, sports fishing is less constrained than commercial harvests and is controlled as regulated open access. In developed countries, citizens' access to fishing areas is viewed as a right, and limited regulations focus on effort controls. These controls, however, lack the incentive effects of rights-based management used in many commercial fisheries. Measurement and monitoring are limited. Overall, the growth of the sports fishery results in greater entry and negative effects on the stock. This, in turn, undermines the basis for rights-based management and its documented successes. In New Zealand, greater allocation of harvest to sports fishing potentially lowers values in the quota management system (QMS) and weakens the property rights granted to Māori in the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992.

Introduction

Recreational fishing, both from for-hire charter vessels and by individual sports anglers, is an important and growing activity worldwide. It accounts for perhaps 12 percent of global fish harvest (Abbott, 2015, 1). This growth coincides with rising per capita incomes, reduced transportation cost to the most lucrative locations, and ease of entry by individual citizens. In most countries, access to marine resources by recreational fishers is viewed as a right of citizenship, and there is little effort to constrain entry. There are strong political and practical pressures to accommodate recreational fisheries when so many citizens are potential participants. Recreational fishing provides leisure and sources of protein, and it supports local fishing communities. Nonetheless, the associated increased fishing effort can deplete fish stocks and undermine long-term sustainability. In the United States, for example, an estimated 9.6 million recreational fishers engaged in 16 million trips annually, and in the early 2000s, they contributed 23 percent of landings among marine fish populations that were overfished or experiencing overfishing (Abbott et al., 2018, 8948).

In developed countries, recreational fishing is loosely managed through regulated open access with a variety of effort controls, including adjustable fishing seasons, bag limits,

and size restrictions. Entry typically is open to all citizens. These regulations encourage a race to fish early in the season when stocks may be concentrated and before congestion sets in or managers reduce season length or adjust bag limits or acceptable fish sizes. Due to the diverse nature of sports/recreational fisheries in terms of fisher numbers, ports, vessel types, and harvest practices, measurement and monitoring of the impact on stock mortality (landings and discards) is limited, certainly relative to commercial fisheries (Abbott, 2015, 3).

This setting contributes to overharvest and stock declines: the race to fish encourages excess investment in vessels, equipment, and labour, which raises costs; and a derby fishery limits the ability of fishers to spread their fishing spatially or temporally in a manner that would generate the most value. As harvest pressures rise, seasons are narrowed and congestion increases. In the United States Gulf of Mexico red snapper sports fishery, for example, the June 2014 season was lowered to nine days (Abbott et al., 2018, 8949). Based on survey data, Abbott et al. (2018, 8951–8952) estimate that some type of second-best management system with tradable vessel days, the assignment of a fixed number of annual fish tags, or angler management cooperatives (Abbott, 2015, 13–15) would generate important welfare and stock gains over regulated open access. Depending on the system adopted, discard rates could fall by 40 percent, enhancing the stock and lowering fishing costs, and the benefits to the recreational fishery could be US\$1.2 billion in the United States alone, and US\$30 billion worldwide, (Abbott et al., 2018, 8952).

These estimates of the gains to the recreational/sports fishery from improved management are certainly an underestimate of the overall welfare benefits. Whenever a sports fishery accesses the same stock as a commercial fishery, there is overharvest in the former and associated fish stock depletion and ecosystem deterioration that undermine value in the latter. This dynamic intensifies the race to fish in both fisheries, generating additional losses in resource rents. Where the commercial fishery is governed by a total allowable catch with associated catch shares or quotas, over entry and excessive harvest in the sports fishery reduces the value of individual quotas and property rights in the commercial fishery. Losses in quota value reflect deterioration in current and future fish stocks as well as uncertainty for individual quota owners who can no longer predict that their changes in fishing practices will result in them capturing a larger flow of resource rents.

These inter-sectoral competitive losses are potentially significant. Indeed, the patterns of higher cost, reduced profits, and stock depletion in the recreational fishery have been encountered historically in commercial fisheries (Grafton et al., 2000). In those fisheries where rights-based quotas have been implemented, there have been dramatic gains. Considerable research has documented the environmental benefits of quota systems with their ability to eliminate the race to fish (Birkenbach et al., 2017), reduce the likelihood of stock collapses (Costello et al., 2008), and generally promote environmental stewardship (Branch, 2009; Yagi et al., 2012). Research has also demonstrated that rights-based fisheries management has increased fleet efficiency and profitability (Arnason, 2008; Felthoven et al., 2009; Walden et al., 2012; Essington et al., 2012; Thunberg et al., 2015; Brinson and Thunberg, 2016; Birkenbach et al., 2017).

The key drivers in quota systems are change in incentives and time frames and the ability of quota owners to contract among themselves to improve conditions. The motives to race to fish and to invest in excessive capital and labour are changed, and profits rise. Fishers can harvest over longer periods, knowing that entry is limited, and invest in higher-valued product (Grafton et al., 2000). These improvements are incorporated in rising quota values (Newell, Sanchirico, and Kerr, 2005) that are captured by quota owners as property rights. Inter-sectoral fishing competition for the same stock under different management regimes, however, can reduce quota prices and the value of the property rights associated with them.

Despite the evidence of fishery gains from rights-based systems, sports fishers have resisted them due to feared constraints on access and harvest. As noted above, sports and recreational fishers are not only numerous but heterogeneous, with multiple techniques, locations, and boat and equipment types, including small, individual vessels and larger for-hire boats. Compared to many commercial fisheries where numbers are smaller and vessels larger and more homogeneous, sports/recreational fisheries are more diverse, which makes collective action and forging a clear management position far more problematic. Moreover, because of limited regulation and open access, there is less information regarding the way sports fishing contributes to overall stock declines, compared to commercial harvests, and how benefits from stricter controls would accrue to individual fishers.

Sports and Commercial Fishing Competition in New Zealand

New Zealand is considered an international leader in rights-based fisheries management, with one of the most widely applied quota systems in the world (Lock and Leslie, 2007). The quota management system (QMS), guided by the Fisheries Act 1996, currently manages 642 fish stocks consisting of 98 species (Ministry for Primary Industries, 2018). The QMS ostensibly regulates commercial, recreational, and customary (Māori) fishing as three distinct sectors, with a total allowable catch (TAC) for each stock split among these user groups. Under this system, New Zealand has been uniquely able to act pre-emptively and avoid overexploitation of fish stocks (Worm et al., 2009). Currently, nearly 80 percent of stocks in New Zealand are managed at or above their target level (Ministry for Primary Industries, 2018).

A growing recreational fishing sector, however, could threaten the stability of the rights-based system in place in New Zealand, and it is particularly problematic for Māori quota holders. During the Deed of Settlement 1992, Māori were granted \$150 million to purchase half of Sealord, New Zealand's largest fishing company, and quota within the QMS (Treaty of Waitangi (Fisheries Claims) Settlement Act 1992; Hale and Rude, 2017). Māori received 10 percent of all quota in the QMS as of 1989 plus 20 percent for new species brought into the system after 1992. As of 2016, these holdings were valued at more than NZ\$1.4 billion (Stuff, 2016). At the same time, the recreational fishery in New Zealand has expanded, and in many cases it accesses the same stocks covered by the QMS. New entry and fishing pressure in the recreational sector lowers fish stocks and potentially undercuts quota values and the performance of the QMS. Quota holders have less certainty about fish abundance and the benefits of their rights-based harvest practices; as more returns are captured by recreational fishers, quota holders may experience catch reductions and shifts in the time of harvest. The outcomes, as noted above, are lower quota prices and values of the property rights associated with them. Depending on the size of the inter-sectoral competition, the successful QMS could be placed at risk if the value of participation is lowered. This effect, in turn, directly affects Māori and the provisions that they were granted under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992.

Methods

This paper assesses how the recreational sector has fared in New Zealand and how it potentially impacts the property rights held by quota holders, including Māori who are covered by provisions in the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992. To accomplish this, an in-depth literature review was conducted, focusing broadly on fishing sectors and allocation in New Zealand, and more specifically on two important stocks as case studies: Snapper 7 (SNA7) and southern bluefin tuna (STN1). These two stocks have seen increases in recreational participation, and Māori and the wider industry have been concerned over dilution of their property rights. These case studies also cover distinct types of recreational/sports fishing, with bluefin tuna being offshore large-game fishing and snapper being New Zealand's most popular inshore fishery.

Literature reviewed focuses on government documents explaining allocation and scientific analysis of these fisheries. The analysis in this paper also benefits from assessing relevant natural and social science peer-reviewed literature covering fishing in New Zealand and the fundamental components of rights-based fishery management.

To gain a more in-depth understanding of how fishing allocation effectively has shifted in response to recreational fishing demands, researchers spent three weeks in New Zealand interviewing stakeholders from Māori fishing groups, iwi, commercial fishing companies and industry groups, environmental non-governmental organisations, and research institutes. These interviews were semi-structured and guided in-depth research into New Zealand's experience with shared fisheries. The interviews focused on the concerns of stakeholder groups, as well as the government's response to addressing multi-sector fisheries. Interviews supplemented the literature reviews and provided insight into topics that have largely not been addressed in scientific literature or government documents and highlighted issues raised in the two case studies.

Examination of Shared Fisheries in a Rights-based System and Potential Impacts on Māori Property Rights

The gradual reallocation of access to fish stocks to recreational/sports fishers challenges the essential incentives for the quota management system. Elinor Ostrom's seminal work (1990) on managing common-pool resources stressed the need to clearly define who can use resources and also the importance of sufficient monitoring of these users' behaviour. Empirical analysis strongly supports her claims that these two principles are important for sustainable management (Cox et al., 2010).

New Zealand's recreational fishing, using small individual vessels or larger charter boats, is essentially managed as open access, with entry allowed for all citizens without fishing licences or formalised reporting of catch. Regulators rely on effort restrictions, including area restrictions or closures, and daily bag and size limits along with surveys to estimate catch (Wynee-Jones et al., 2014; Fisheries New Zealand, 2019). There are seven marine fishing areas with generally similar rules.

Effort controls and regulated open access lack economic or ecological incentives for stakeholders to behave consistently with management goals (Hilborn et al., 2005), and this explains why rights-based systems in commercial fisheries have had success. There is no reason to expect that incentives and outcomes for effort controls would be different in the growing recreational sector. With so many possible entrants in many different ways and voluntary catch reporting, monitoring and measurement of total harvest and information about the impact on the stock are very incomplete. Given the number of participants, the effects could be large and increasing. For example, the survey process that managers rely on to monitor the recreational sector estimated a 2.8-fold increase in snapper harvest from 1996 to 2000 but projected that the number of households with recreational fishers increased from 13.9 percent to 51.4 percent over the same time period (Kearney et al., 2012). In light of these disparities between estimates of entry and catch, it seems likely that the harvest growth was significantly underestimated.

In New Zealand, the recreational sector has become a significant factor in many important fisheries across the seven regions regulated by the government. The large number of current and possible participants creates a formidable political constituency that few politicians or regulators can ignore. As a result, the sector has received effective increases in fish stocks, at the expense of the commercial fishery (Hale

and Rude, 2017). If, however, harvest in the sports fishery is greater than regulators believe, as is likely, then total harvest across both sectors could rise, imperilling stocks. Reductions in available total allowable catch for quota holders and declining stocks potentially reduce QMS values. The recreational sector has resisted either licensing that could limit entry or formal inclusion into the QMS. This opposition is understandable from the point of view of individual sports fishers because access historically has been free and open (Borch, 2010; Council of Outdoor Recreational Associations of New Zealand, 2017). The situation, however, is not sustainable over the long term. It would not be sustainable for fish stocks or values to vessel owners or their customers even if the commercial fishery was totally banned from specific areas. The current arrangement lacks needed incentives and information for maintaining values and fish populations across time.

Alternative, second-best controls, noted above, could provide some harvest restrictions and shifts in incentives beyond current, limited open-access effort controls that have failed in other settings.

Explored below are two New Zealand case studies that illustrate the growing problems from inter-sectoral rivalry for the same fish stocks. Comparisons are drawn from the United States' quota system for the Gulf of Mexico red snapper fishery. The two case studies, Snapper 7 and Southern Bluefin Tuna 1, are of particular concern because of the implications for Māori QMS stakeholders.

Snapper 7 (SNA7)

Snapper is the most valuable inshore species in New Zealand. Between 2010 and 2015, the average value of commercially landed snapper was \$61 million (Williams et al., 2017). Values of the fishery vary by method of estimation. Using a marginal willingness-to-pay approach, the snapper fishery is estimated to be \$15.8 million annually, while an average willingness-to-pay approach estimates the fishery to be worth \$85.1 million (The South Australian Center for Economic Studies, 1999). In either case, the fishery is attractive and of growing interest to both recreational and commercial fishers.

Snapper 7 is a good example of how conflicts over allocation of shared fisheries have played out. This stock covers the top and west coast of the South Island of New Zealand, and it includes Nelson and the Marlborough Sounds, which is the largest seafood region in New Zealand (Pavlovich and Akoorie, 2010). Like many of the snapper stocks in New Zealand, SNA7 has experienced considerable variation in health and landings. A recorded low in landings occurred in the 2001–2002 season at 141 tonnes. Since 2009, the fishery has recovered as the stock has rebounded (Ministry for Primary Industries, 2017; Langely, 2018). Allocation to the commercial sector has remained stable at 200 tonnes annually from 1997 to 2014. Of concern to QMS quota holders is how much of the stock will be effectively assigned to the less-regulated recreational sector, affecting quota values (Deweese, 1998, 5135).

In 2016, the Ministry for Primary Industries increased the recreational allocation from 90 tonnes the year before (of which they estimated only 83 tonnes were caught) to 250 tonnes for the coming year (Ministry for Primary Industries, 2016). This near tripling of the allotted catch to the recreational sector was based on a proportional increase in harvest, relative to biomass. The ministry predicted that if biomass of a stock increased threefold, then recreational catch could triple as well (MPI, 2016, 5). Under the new allocation, the previous 70/30 split between the commercial and recreational sectors shifted to 50/50 for SNA7. The Southern Inshore Fisheries Management Company, an established Commercial Stakeholder Organisation, challenged the science underlying the increase in authorised recreational catch (Southern Inshore Fisheries, 2016, 22). Other stakeholders have joined in the criticism. Without reliable data on biomass, sports-sector harvests, and stock effects, the greater allocation could impact fish populations. Subsequent major reductions in allocation to the recreational industry are politically difficult, suggesting that existing regulation would not adequately respond to new stock conditions.

Māori fishing rights, formally recognised in 1992, are affected by the allocation shift from the commercial sector to recreational fishers. It dilutes Māori access to improved fish populations, and if weak regulation of the recreational sector leads to overfishing of the shared stock, Māori quota values are at risk. This policy-induced result can be viewed as a violation of the Deed of Settlement 1992. The Ministry for Primary Industries called for input from Māori stakeholders (MPI, 2016, 3), but the reallocation was unilateral. It is difficult to see how Māori as commercial quota holders would benefit from a major increase in distribution to the recreational sector.

Southern Bluefin Tuna (STN 1)

New Zealand is a member of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) that allocates harvest among member states. New Zealand regulators manage their national allocation of tuna as a single stock, STN1. This stock, like others, is split among commercial, recreational, and customary Māori sectors. STN1 were brought into the QMS after the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992, which granted Māori 20 percent of the initial quota. From 2018 to 2020, due to better forecasts of southern bluefin tuna stocks globally, New Zealand was allocated more tuna from the CCSBT (Commission for the Conservation of Southern Bluefin Tuna, n.d.). Eighty-eight tonnes of additional bluefin tuna were split by the New Zealand Minister of Fisheries: 76 tonnes to the commercial fishery and 12 tonnes to the recreational fishery, which increased the latter's share of the overall bluefin tuna fishery total allowable catch (Nash, 2018). This action, however, reduced the portion going to Māori, continuing a trend from the 1990s (Tuuta, 2018).

As with Snapper 7, Māori gradually lose access to quota that was guaranteed under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992. Moreover, as discussed earlier, the recreational fishery has fewer effective controls, threatening tuna stocks that the QMS and other quota systems are designed to protect. Indeed, recreational fishers celebrated the 'year of the tuna' in 2017, when the new allocations were announced, with reports of large numbers of sports fishers targeting bluefin around Waihou Bay and Gisborne every weekend (*The Adventurer*, 2017). With ease of entry and limited monitoring or measurement, it is possible for the recreational sector to quickly overshoot its allocation. The rapid expansion of the sports bluefin tuna fishery was not matched by the infrastructure to support it, resulting in waste. This would probably not occur under Māori stewardship where there is a tradition of wise use and respect for a prized fish caught (Peter van Kampen, personal communication, 2018).⁴

Gulf of Mexico Red Snapper

The inter-sectoral conflicts that arise in New Zealand when different segments are regulated in dissimilar ways are not unique. The Gulf of Mexico red snapper fishery in the United States has experienced many of the same issues that illustrate the problems facing Māori and other QMS quota owners. As with shared fisheries in New Zealand, recreational fishers in the Gulf of Mexico take a significant portion of the total catch of red snapper (Coleman et al., 2004). In response to derby-style fishing, falling fish populations, and reduced profits, an annual total allowable catch limit was implemented in the snapper fishery that split harvest roughly equally between the commercial and recreational sectors, with the recreational sector further divided into for-hire charter boats and private anglers. In 2007, an individual fishing quota system was implemented for the commercial fishery (Weninger, 2008; Agar et al., 2014).

Under these arrangements, regulators in federal waters have limited the total number of fish to be harvested annually, restricted the number of fishing licences issued for commercial and recreational for-hire vessels (but not individual anglers), reduced the number of fish retained per trip, added minimum fish-size limits, restricted gear types, and set fishing seasons. Although stock assessments indicate that red snapper abundance has risen since 2007, greater catch-per-unit of effort and more entry in the recreational fishery has led to shorter sports-fishing seasons. Even so, that sector has exceeded its annual quota. Moreover, Gulf States have opened state waters to recreational red snapper harvest for extended periods when federal waters were closed.

Overall, the Gulf of Mexico management system has had mixed success since 2007. In the first five years, profitability and resource stewardship metrics showed significant gains in the fishery, but disputes over distribution of those gains remained (Agar et al., 2014).

Because of the close parallels with New Zealand, the experience in the fishery is useful. As in New Zealand, the recreational sector, particularly the individual angler subsector, has fewer constraints. It has exceeded its allocation; experienced shorter allowed fishing seasons; and been embroiled in lawsuits with the commercial sector, between state and federal regulators, and between the two recreational classes of anglers (Environmental Defense Fund, 2017; Pew, 2016). In neither the Gulf of Mexico red snapper fisheries nor the SNA7 and STN1 cases are recreational fishers incorporated into the quota systems in a significant way. Because of increased entry and overharvest in the Gulf of Mexico, individual anglers have faced tighter season limits (at one point just three days

⁴ Peter van Kampen is a graduate policy analyst at Te Ohu Kaimoana, the Māori Fisheries Trust, who works on fishing issues relating to highly migratory species such as bluefin tuna.

in federal waters), a continued race to fish, and problems with state and angler compliance with federal regulations. At the same time, overfishing by the recreational sector weakens the quota system put in place for the commercial fishery. As commercial fishers reduce catch to build stock and increase profits, they observe rising harvests by competing sports fishers.

Conclusions

New Zealand's quota management system is heralded internationally as one of the most progressive and comprehensive fisheries management regimes. This approach relies on incentivising rights holders to incorporate long-term sustainability into fishing decisions since rights holders will be able to capitalise on fish stocks into the future. A growing recreational sector that is managed as regulated open access does not internalise these same incentives. Successful management regimes, from both an economic and ecological standpoint, require institutionalised systems that create such incentives for stakeholders across sectors to behave in a manner that promotes conservation goals (Hilborn et al., 2005). Reallocating quota towards a recreational sector without addressing the underlying problems of limited regulation and data reporting could undermine the success that the QMS has experienced in protecting fish stocks.

The gradual allocation of fishing access to less regulated sports and recreational fishers who share the same fish stocks with quota holders, including Māori, weaken property rights and quota values. It contradicts the objectives of the Deed of Settlement 1992 and the spirit of collaborative management of marine resources. A variety of options can be considered to better incorporate recreational anglers into fishery management (Abbott, 2015). Key is a shift away from regulated open access that encourages increased fishing pressure and losses in the economic wellbeing of fisheries and ecological conservation goals.

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