Forest & Bird Submission to South-East Marine Protection Forum Consultation

Submitter: Anton Van Helden
Organisation: Royal Forest & Bird Protection Society of New Zealand
Interest Group: Conservation
Postal Address: PO Box 631 Wellington 6140
Email: A.VanHelden@forestandbird.org.nz
Phone: 04 801 2210

Date: 20 December 2016

Introduction

Forest & Bird is New Zealand's largest independent national conservation organisation comprising over 70,000 members and supporters in 56 branches throughout New Zealand, including South Canterbury, Waitaki, Dunedin, South Otago, Southland and Central Otago Lakes. The main object of the Society is to take all reasonable steps within the power of the Society to preserve and protect New Zealand's remaining flora and fauna, and natural features of New Zealand, for the benefit of the public including future generations. Forest & Bird has been instrumental in achieving marine reserves and has been involved in most of the processes leading to the establishment of marine reserves.

Forest & Bird wishes to thank all members of the Forum for the hard and difficult work that has given rise to the proposed marine reserves.

This submission follows the format of the public submission form and comments on all the options presented, followed by Forest & Bird's general comments in response to part C of the submission form. Maps of recommended changes are included in the comments to the relevant sites, rather than as part D.

Part B Specific Sites

Site A Tuhawaiki to Pareora Type 2: Support

Forest & Bird supports this MPA as it formally protects an area important for shark pupping and elephant fish egg site. This site achieves a measure of protection from the existing voluntary trawl ban, so it should not be included in an assessment of the impacts on trawling.

Site B Waitaki Coastal Type 1: Support with Extension and Further Extension

Forest & Bird supports a marine reserve off the Waitaki River Mouth. This is the opportunity to protect biodiversity associated with the North Otago Quaternary gravels which potentially include rhodolith beds – a unique ecosystem found in North Otago.[1]

[1] Nelson et al 2012; Rhodolith Beds in Northern New Zealand: Characterisation of Associated Biodiversity and Vulnerability to Environmental Stressors, New Zealand Aquatic Environment and Biodiversity Report No. 99

The area is a hot spot for little blue penguins and Hector's dolphins and the biodiversity associated with the foraging ranges of these species. Hector's dolphins feed mostly in small groups and are generalist feeders, feeding both at the water surface and at the bottom. They eat a variety of fish including squid, red cod, flatfish and yellow-eyed mullet. Hector's dolphins and penguins are caught in set nets, and there are records for Hector's dolphins and yellow-eyed penguins being caught in nets off Waimate.

Hector's dolphins are caught in set nets, trawl nets, and get entangled in cray pot lines. The latest bycatch estimates from Government estimate that 107 - 172 Hector's dolphins were caught in set nets. Observer coverage in inshore trawl fisheries is low, e.g. for 2011 observed effort = 0.67%. A simple extrapolation using capture rate and total fishing effort suggests that the number of dolphins caught in trawl fisheries could be as high as the number caught in set nets.[2]

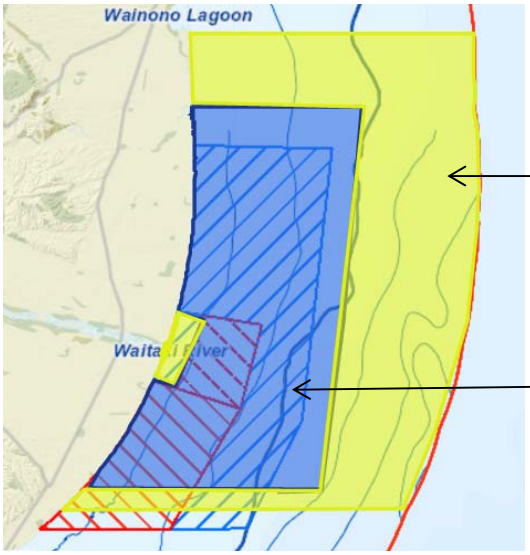
The presence of these top predators here indicates a special ecosystem that needs to be well represented in a marine reserve. River mouths contain unique biodiversity and fronts occurring between the river and sea water create special features and are productive zones. The ecosystems north of the Waitaki River are influenced by water from the Waitaki, the second largest river in the SEMPF region.

The proposed marine reserve only protects three habitat types and does not represent estuarine gravels, exposed shallow gravel, deep gravel or moderate shallow sand. Samples of these habitats need to be represented in a marine reserve in this portion of the SEMPF region due to the different ecosystems created by the influence of the Waitaki and origin of the substrate.

The reserve needs to be extended seawards to incorporate a greater range of habitats and northwards to represent known foraging areas of Hector's dolphins and penguins.

[2] *Aquatic Environment and Biodiversity Annual Review 2015*, compiled by the Fisheries Management Science Team, Ministry for Primary Industries

Recommended changes to Site B Waitaki Coastal Type 1 – (blue) and C Waitaki Offshore Type 2



Site C Waitaki Offshore Type 2: Oppose as Type 2, and recommend as Marine Reserve
As noted above the habitats and ecosystems contained within this Type 2 are not represented in the proposed network and therefore need to be represented in a marine reserve.

New Type 2 Waitaki Offshore shown on the above map in yellow
This Type 2 extension will help maintain the rich diversity used by Hector's dolphins and little blue penguins, and yellow-eyed penguins, as well as terns, gulls, shags, sooty shear waters and various albatross species. Continuation of trawling and set netting in this area poses risks to dolphins and penguins and reduces food sources and would not enable the maintenance and recovery of the ecological systems, natural species composition and trophic linkages.

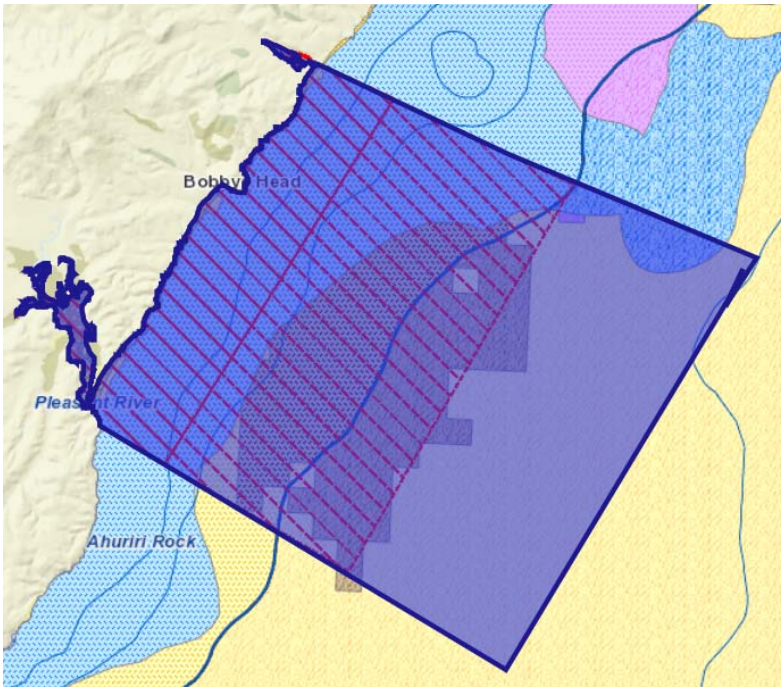
Forest & Bird recommend a new MPA as shown above in yellow within which the marine reserve is nested to buffer the reserve from edge effects. This MPA should prohibit all bottom and mid water trawling, set netting, marine farming, mineral exploration and extraction, and dredging.

Site D Pleasant River to Stony Creek Type 1: Support with Extension and Further Extension
Forest & Bird supports this option if it is extended to better represent reef habitats. Forest & Bird's strong preference would be for a marine reserve to be established at Shag Point due to its greater biodiversity values and ease of access for education, science and enjoyment.

Deep reef is poorly represented in the proposed network. Only 3% of deep reef habitat is protected within the SEMPF area, and nearly all (80%) of this is within the proposed Saunders Canyon Site F reserve, which is over 80m deep and within the bryozoan zone. There is very little deep reef protected within moderate depths, (2km2 out of 348.6km2 = just 0.6%) in the proposed network. The rocky faunal community associated with these moderately deep reefs is likely to have significantly different biodiversity than that represented in the Saunders Canyon site. The extension provides greater representation of the biodiversity associated with the further offshore habitats. The endemic Otago shag and yellow-eyed penguin, and flocks of spotted shags, red billed gulls, white fronted terns and sooty shearwater feed within this proposed area.

Hector's dolphins were previously in greater numbers along this coast and were recorded in 1988 and 1994-1996 surveys, but were not recorded in this area in Turek's 2010-2011 survey.[3] They are known to have significantly declined along this stretch of coast.

Forest & Bird Recommended Extension to Site D Pleasant River to Stony Creek Type 1



Site E Bryozoan Type 2: Support and recommend additional restriction on potting
This site is an important replicate for the Saunders reserve and will allow comparisons to be made between the outcomes achieved in the marine reserve with those attained in the Type 2 MPA. Potting (although it can be discrete), when repeated many times is likely to impact on the fragile benthic structures associated with the bryozoan beds. This will negatively impact the maintenance and recovery of these biogenic structures, and natural species compositions including trophic linkages.

This option better represents the full range of biodiversity associated with the bryozoan reefs which provide habitat for rich biodiversity including marine mammals and sea birds. To enable restoration of the bryozoan beds potting should also be banned.

Site F Saunders Canyon: Support with extension to shore to include Hooper's Inlet and link with Site I Harakeke
The Forum is tasked with representing the full range of habitats and ecosystems in marine reserves within the SEMPF area, including the outstanding, rare, distinctive or internationally or nationally important marine communities and ecosystems and natural features, (MPA Policy – paragraphs 30 and 92). Where there is a choice between several similar sites the site chosen should minimise adverse impacts on existing users and Treaty settlement obligations.

[3] J Turek, E Slooten*, S Dawson, W Rayment and D Turek, 2012. Distribution and abundance of Hector's dolphinsoff Otago, New Zealand, Department of Zoology, University of Otago, Dunedin

Submarine canyons are distinctive and important natural features and with distinctive marine communities, and an example must be protected as the Forum has noted. New Zealand has less than 20 submarine canyons located along the east coast of the South Island and a canyon system consisting of eight canyons in Cook Strait (Houtz *et al*. 1967; Probert *et al*. 1979; Lewis 1994; Lewis and Barnes 1999; Mountjoy *et al.* 2009, all cited in Peebles 2013).[4]

Submarine canyons connect the shelf to the continental slope and allow for the exchange of terrestrial sediment (mainly down-canyon) and water between shelf and offshore environments. Vertical mixing and upwelling events generate complex currents inside the canyons which advect most non-migratory zooplankton, displace plankton close to the surface across the canyon, and gather some migratory zooplankton species near the canyon head (Allen *et al*. 2001 in Peebles 2013). Larger organisms, such as marine mammals, fish, squid, and crustaceans, can be concentrated in the canyons as a result of increased particulate organic matter introduced into the canyon by these currents (Bosley *et al*. 2004 in Peebles 2013).

Biomass and benthic abundance in canyon environments tend to be higher than those of adjacent slope areas, suggesting that canyons can be productive environments and biomass hotspots. Trawling or mining can damage or completely remove these organisms, (Levin and Dayton 2009 cited in Peebles 2013).

Canyons are hotspots for whales and sea birds.

Saunders canyon is the largest area of submarine canyon ecosystem to occur in the SEMPF area. This greater area allows a greater complexity of topography and more hydrographic features to be represented. It is likely that these features generate more complex currents and upwellings, thereby enhancing both pelagic and benthic productivity as well as biodiversity.

Saunders canyon has the greatest depth range from 120m to 900m compared with Papanui 130-650m. Papanui canyon has a comparatively small area below 650m.

Though deeper assemblages have not been studied it is likely that there would be different communities associated with the deeper habitats, and changes in sediment composition.

The Saunders canyon is the only opportunity the Forum has to represent this deep water habitat and thus to represent the full range of biodiversity found in canyon habitats in the SEMPF area.

Studies (reported in Peebles 2013) of the epifaunal assemblages (benthic organisms that live attached to a surface) in the Otago canyons have found that community structure changes significantly with depth, with different assemblages between the three different depth criteria < 200 m, < 320 m, and < 380 m, studied. Canyon specific species are found at depths >380m. The shallower community was primarily composed of actiniarians, ascidians, asteroids, bryozoans and polychaetes, while decapods, demosponges and isopods were only found in the deeper community. The community in the deep canyon is primarily composed of gastropods, sponges, anomorans, and bryozoans with few crabs, bivalves, ascidians, asteroids, ophiuroids, and corals.

[4] Peebles Bryce A. 2013: Otago Submarine Canyons: Mapping and Macrobenthos. MSc Thesis University Otago

Peebles' study found differences in the infaunal communities (benthic organisms that live within the bottom sediments) between the Papanui and the Saunders canyons. Saunders canyon had more than twice the abundance of mesogastropods but less than 1% of the foraminiera tests found in Papanui canyon, although they were commonly found in Saunders canyon.

Proposal H for Papanui canyon does not represent the plateau scallop habitat between Papanui and Saunders canyons. Queen scallops are/were abundant on the outer shelf around 110-200m, and bryozoans dominated the bycatch. At least 30 of New Zealand's 45 known habitat forming bryozoans are endemic including those caught in the scallop fishery bycatch. This area contains distinctive biodiversity that needs to be adequately represented in a marine reserve big enough to ensure long term resilience.

Although there is no direct evidence that benthic habitat complexity has been reduced, Batson & Probert (2000), cited in Wood and Probert (2012),[5] considered it reasonable to assume that fishing off the Otago Coast has adversely affected the bryozoan grounds.

Bryozoan species are known to take 30-60 years to form habitat forming colonies, and scallop fishing is likely to occur more frequently than would allow bryozoan populations to recover. The time needed for recovery from large scale impacts are unknown for the Otago shelf but are known to vary from one to 50 years in Foveaux Strait.

Shears and Thomas recommend that MPAs should be large enough to cover the majority of species adult movement distances and should extend along the depth gradient from intertidal to deeper offshore waters, preferably to the 12nm limit.[6]

Recommended Changes: Extend Boundaries inshore to include Hooper's Inlet and link with Option I Harakeke Point

Hooper's Inlet Values

Soft sediment environments provide habitat for many bioengineering species and emergent organisms that provide settlement sites and refugia for predators and prey, e.g. rays, birds, fish and crabs. Shore birds rely on the fauna in intertidal soft sediment habitats in harbours, estuaries and beaches for food. The June 2016 Birds New Zealand Coastal Wader Count recorded 8 species, including 168 Bar-tailed godwit, 148 Banded dotterels (threat ranking Nationally Vulnerable), and Pied stilt and South Island Pied oystercatcher, both ranked Declining.[7]

Hooper's Inlet is known to have abundant populations of Stalk eyed mud crabs, and is an important settlement area and nursery for 3 species of flatfish. Roper and Jillett 1981 recorded high densities of juvenile *Rhombosolea plebia, R. tapirine* and *Peltorhamphus latus.*[8]

[5] Wood, A.C.L., Probert P.K. 2013. Bryzoan dominated benthos of Otago Shelf, New Zealand: Its associated fauna, environmental setting and anthropogenic threats. Journal of the Royal Society of New Zealand

[6] Shears Nick and Thomas Hannah in Austral Ark: The State of Wildlife in Australia and New Zealand, eds. A. Stow, N. Maclean and G. I. Holwell. Published by Cambridge University Press, 2014.

[7] June 2016 Birds New Zealand Coastal Wader Count (http://www.osnz.org.nz/sites/osnz.org.nz/files/regional-newsletters/Otago%201607.pdf)

[8] D. S. ROPER and J. B. JILLETT Seasonal occurrence and distribution of flatfish (Pisces: Pleuronectiformes) in inlets and shallow water along the Otago coast. 1981 New Zealand Journal of Marine & Freshwater Research, 1981, 15(1): 1-13

Hooper's Inlet is used by Otago University for research.

Allan's Beach Reserve is adjacent to part of Hooper's Inlet. The saltmarsh and swamp behind Allan's Beach on the eastern side of Hooper's Inlet is listed as a regionally significant wetland in the Otago Regional Water Plan, and listed as an Area of Significant Conservation Value in the Dunedin City District Plan. It is described as an estuary with mudflat, saltmarsh and reed and a succulent herb swamp of national and local significance.

Protecting Hooper's Inlet in a marine reserve would represent 2.7km2 of inter and subtidal mudflat, 0.8km2 estuarine sandy beach and 0.2 km2 shallow subtidal estuarine sand flat. These habitats are poorly represented in the proposed reserves.

Table One: Percentage of estuary habitats represented

Estuarine Habitats	**Proposed Reserves km^2**	**% of SEMPF habitat**	**Hooper's Inlet km^2**	**% of SEMPF habitat**
Estuarine	0.7	8%		
Estuarine sandy beach	0.3	2%	0.8	5%
Estuarine mud flat	1.5	3.5%	2.7	6.3
Estuarine sand flat	0	0	0.2	1%
Totals	2.5	3%	3.7	4%

Incorporating Hooper's Inlet into a large shore to 12nm reserve would provide for some connectivity of ecosystems between the soft sediments of the inlet, rocky shelfs, sandy bottom, bryozoan and canyon ecosystems thereby ensuring greater resilience, ecosystem functioning and protect the full range of biodiversity longitudinally.

Represent longitudinal variation across the Continental Shelf Sand and gravel
The Forum is tasked with representing a sample of each habitat or ecosystem type in a marine reserve, consistent with the MPA Policy. The design guidelines include representing latitudinal and longitudinal variation, as many processes create across the shelf differences in habitats and ecosystems.

Wood and Probert report that species assemblages occur across the Otago shelf in association with sediment composition and origin.[9]

Sediments off the Otago Peninsula are supplied mainly by the Clutha and Taieri Rivers. Relicit terrigenous gravel with varying proportions of sand and mud occurs from 30-80m with predominantly sand from 30-120m and biogenic sand gravel from 50-120m. The biogenic component comprises molluscan and bryozoan fragments, with bryozoan generated sediments dominating the gravel fraction at 80-90m off the peninsula.

[9] Wood, A.C.L., Probert P.K. 2013. Bryzoan dominated benthos of Otago Shelf, New Zealand: Its associated fauna, environmental setting and anthropogenic threats. Journal of the Royal Society of New Zealand

The quartz gravel was supplied by the Clutha and forms an almost continuous band along the mid shelf from near Clutha to just north of the peninsula. Species assemblages change latitudinally across this gradient. According to Wood and Probert (2012) the inshore assemblage less than 30m depth is characterized by low species richness with conspicuous gastropods, between 40-90m the epifauna includes a mixture of species from shallower and deeper water with a distinct infaunal assemblage associated with the gravel and silt-clay sediments. Between 45-130m water depth there is a distinctive mid-shelf epifauna on gravelly sediments dominated by bryozoans. Different species of bryozoa occur at different depths seaward of 70m.

The Saunders canyon reserve does not represent the diversity of habitats across this longitudinal gradient.

Benthic primary production decreases with water depth. Trawling modifies these habitats and decreases diversity (Thrush 2012). Sandy environments provide habitats for suspension feeding bivalves, which provide habitat for juvenile fish and invertebrates.

According to Sea Sketch the Saunders Reserve only represents a small proportion of the deep coarse gravels. These coarse gravels, living and dead mollusc shells and bryozoans, and the chitinous-tube dwelling worm, Phyllochaetopterus socialis all provide suitable, stable substrata for colonization, even where sediments are sandier. Phyllochaetopterus socialis is particularly abundant on patches of fine sediment and may facilitate bryozoan colonization of sediments on Otago shelf. There are at present no studies of biologically mediated settlement/recovery on Otago shelf, but in Foveaux Strait, the stabilization of sediments by molluscs is thought to enable other fauna, including habitat-forming bryozoans, to colonize and eventually form epifaunal reefs. [10]

These habitats provide foraging for sea lions and yellow-eyed penguins and are important in the protection of biodiversity associated with these species.

The consultation document refers to the area being a significant set net fishery, however Forest & Bird is not able to determine how significant. There is no data on the value of this fishery or the number of fishers involved. Forest & Bird has not been able to source any recent data however a 2007 report by Aranovus Research gives the number of vessels and fishers for set netting for the whole of the east coast South Island for 2005-6[11]. There were 62 set net fishers of which 6 fishers caught 60% of the regions total and set netting made-up 75-100% of their total catch. The set net fisheries catch value was $2,741,124.

Forest & Bird recommends that the Forum extend the Saunders Marine Reserve proposal to represent the longitudinal gradient of habitats from the shore to 12nm and provide adequate representation of sea lion and yellow-eyed penguin foraging habitats, as shown on the map below.

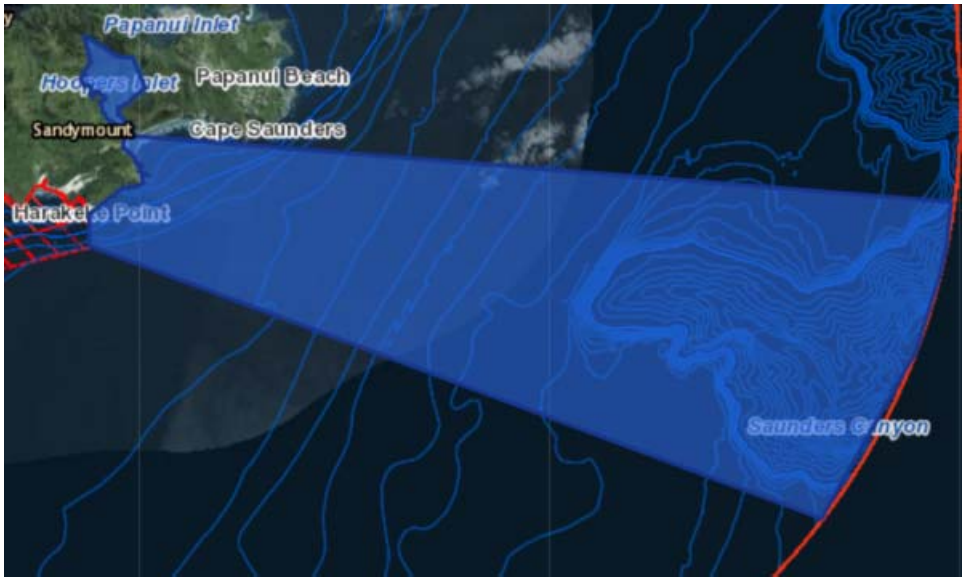
[10] Wood and Probert 2013

[10] Shears Nick and Thomas Hannah in Austral Ark: The State of Wildlife in Australia and New Zealand, eds. A. Stow, N. Maclean and G. I. Holwell. Published by Cambridge University Press. 2014.

[11] Aravovus Research, 2007: A Socioeconomic Impact Assessment of Fishers re Options to Mitigate Threats to Hector's and Maui's Dolphins, http://www.fish.govt.nz/NR/rdonlyres/12869309-5028-40D3-A372-FC42A241D20E/0/AranovusSocioEconomicImpactAssessment.pdf

Link an extended Saunders Canyon Reserve with Harakeke Site (Site I)
Extending a Saunders canyon reserve to the proposed Harakeke Site I reserve enables the full protection of two substantive headlands and their associated faster currents and high productivity areas, and represents additional sea lion and yellow-eyed penguin foraging areas. The Harakeke site includes a popular dive drop off site with prolific sea life and high visibility.

Site F Saunders Canyon: Map of Recommended Changes
Below is a map of possible boundaries to link Saunders canyon with Harakeke and Hooper's Inlet. Forest & Bird observes that this boundary is not an ideal shape, but has been drawn to exclude Cape Saunders in recognition of the cultural significance of this site.



Site G Bryozoan: Oppose
This site does not represent the extent of the biodiversity associated with the unique bryozoan beds, and foraging habitat for sea lions and yellow-eyed penguins. It provides for set netting which can extract large quantities of fish and is relatively unselective. Allowing for set netting will not achieve the protection standard in the MPA Policy.

Site H Papanui Canyon Type 1: Oppose
This site does not represent the diversity of habitats and ecosystems that are represented in the Saunders Canyon proposal, for the reasons outlined above.

Site I Harakeke Point to White Island Type 1: Support with Tow Rock extension and link to Site F as described above
This site represents a range of habitats that are not represented elsewhere in the proposed network and as noted in the Consultation Document, would be a flagship reserve and provide the greatest opportunity for the greatest number of visitors for education, research and enjoyment. It needs to be designed according to best principles.

The Tow Rock extension increases the diversity of habitats and incorporates an area in high current known to have high biodiversity. Even with Tow Rock extension the reserve needs to expanded seawards to provide for edge effects. The Tow Rock extension is only 1km offshore and there is no buffering to prevent edge effects. The overall resilience of this reserve would be improved if the

boundaries were extended out to at least 2km offshore to protect against edge effects and better provide for all life stages and maintain natural species composition and trophic linkages.

Site J White Island to Waldronville Type 2: Support
This site provides an opportunity for research to better understand the impact of differing management on marine biodiversity. It may also increase the resilience of the Green Island and Harakeke sites.

Site K Green Island Type 1: Support
This site has high biodiversity within a small area which is more sheltered than similar habitats in the Harakeke site. It is relatively easily accessible by small craft and offers potential for research and education as well as public enjoyment.

Site L Akatore Estuary Type 2: Support, with further consideration needed re reserve status
Regenerating forest and a large coastal wetland adjoin this estuary enhancing the integrity of this option. Once the Forum has completed a gap analysis this estuary should be reconsidered.

Site M Akatore Coastal Type 1
The proposed reserve fails to include sufficient buffering and connectivity between the rocky reefs and sand ecosystems, and offshore habitats. As presented it does not meet the protected area guidelines as it has a high boundary to area ratio, and complex boundaries.

Many reef associated species move off reefs to feed on soft sediment organisms. Sandy buffers of at least 1km have been shown to provide greater protection for rocky reef organisms from the edge effects of fishing. Crayfish at Cape Rodney-Okakari Point Marine Reserve at Leigh frequently move beyond the offshore boundary which is only 800m from shore, as they move into deeper patch reef and sand for reproduction and foraging.

The proposal has a long edge effect which is likely to reduce its long term viability and effectiveness.

Forest & Bird notes that the Forum decided not to extend this area to the proposed N – Akatore Offshore MPA due to the trawl fishery and recreational values.

The MPA Policy is about representing the full range of habitats with the SEMPF region, and when there are several alternatives the Policy directs that the area chosen be the one that has least impact on existing users and Treaty Settlement Obligations.

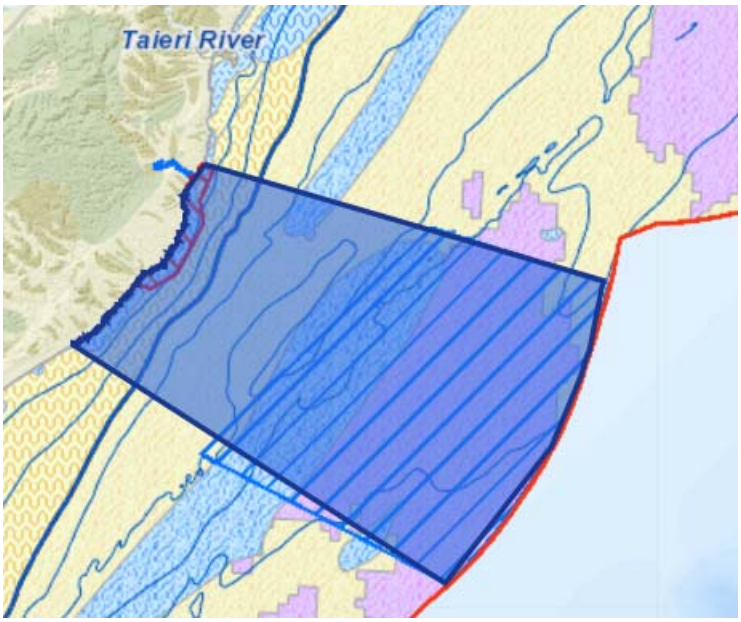
The Fishing Intensity maps indicate that this area is less intensively trawled or fished by set net than similar areas further south.

Jones *et al*. recorded areas of foul papa rock and crayfish spots between Quoin Point and Nugget Point, with reef patches and reef pinnacles, noted to be good for crayfish off shore between 40m

deep stretching across the slope to 12 nm.[12] It is likely that this habitat will support different faunal assemblages that may not be represented elsewhere in the network.

As noted in the consultation document the offshore Type 2 MPA contains substantial areas of deep gravel habitat which have different sea floor terrains and oceanographic conditions than other deep gravel locations off the Otago Peninsula and is likely to contain different biodiversity values that therefore need to be represented in a marine reserve in order to create a representative network.

Forest & Bird recommends that Site M Akatore Coastal be extended to encompass Site N Akatore offshore



Site N Akatore Offshore Type 2: Oppose Recommend Marine Reserve
The habitats contained in this MPA are not represented in reserves as described above.

Site O Long Point: Support with extension to 12nm and Tahakopa Estuary
This site offers the best opportunity in the SEMPF region to fully protect an estuary and beach ecosystem that is nearly surrounded by native bush and conservation land so best meeting a design guideline of considering adjacent land uses. Areas adjacent to protected intact terrestrial ecosystems are likely to have greater biological integrity.

Including the whole estuary within Long Point Reserve would enable connectivity between the estuary and offshore environments. Flat fish are known to settle and spend juvenile stages in estuaries before migrating offshore as adults. The proposed Tahakopa reserve does not meet the design guidelines as it does not protect the whole Tahakopa ecosystem and associated habitats. It

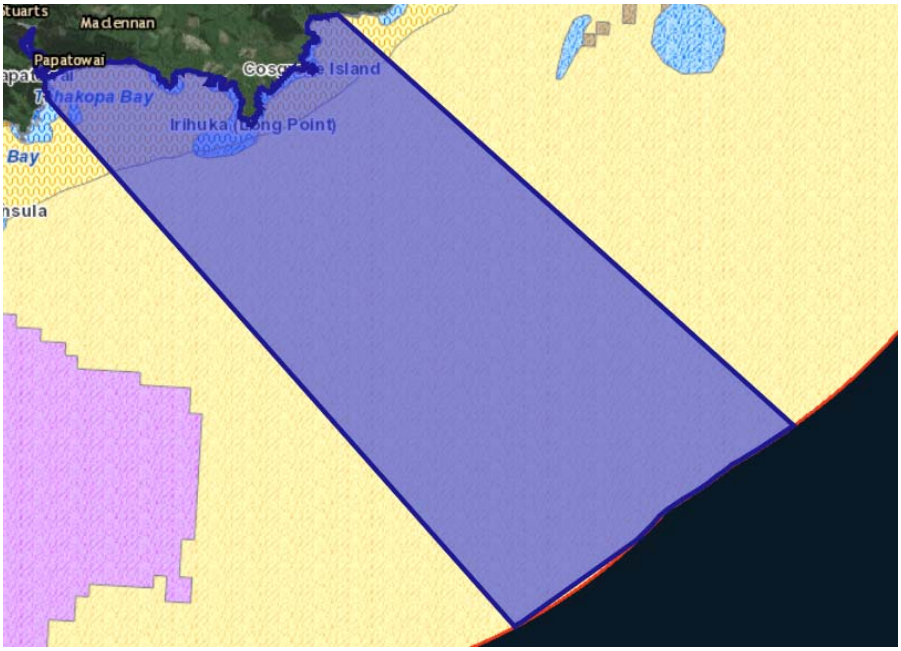
[12] E.G. Jones, M.A. Morrison, N. Davey, B.W. Hartill, C. Sutton 2016: Biogenic habitats on New Zealand's continental shelf. Part I: Local Ecological Knowledge New Zealand Aquatic Environment and Biodiversity Report No. 174 ISSN 1179-6480 (online) ISBN 978-1-77665-394-2

only represents 0.23% of estuarine mudflats within the SEMPF area, and does not include the estuarine, or estuarine sandy beach and estuarine sandy flat habitats.

Long Point is one of the most significant yellow-eyed penguin sites and it is likely they will forage out to 12nm making use of the biodiversity associated with these habitats, as do other albatross species and sooty shearwaters. Longitudinal representation of habitats from shallow shore to deep water is needed in a marine reserve in the southern portion of the SEMPF area. Reserve status out to 12nm means that species that move offshore are protected, so improving the viability and resilience of the network. Larvae of many species are likely to be carried north and assist in replenishing populations beyond the reserve. This would provide for better recovery and long term health of the ecosystems, including the full range of currently exploited species, improve their size and fecundity, and protect trophic linkages within the reserve.

Jones *et al* report the presence of corally tubeworms associated with shell hash south of Nugget Point.[13] This unique habitat does not appear to be well represented in the Long Point Reserve.

Recommended extensions to site O Long Point Type 1



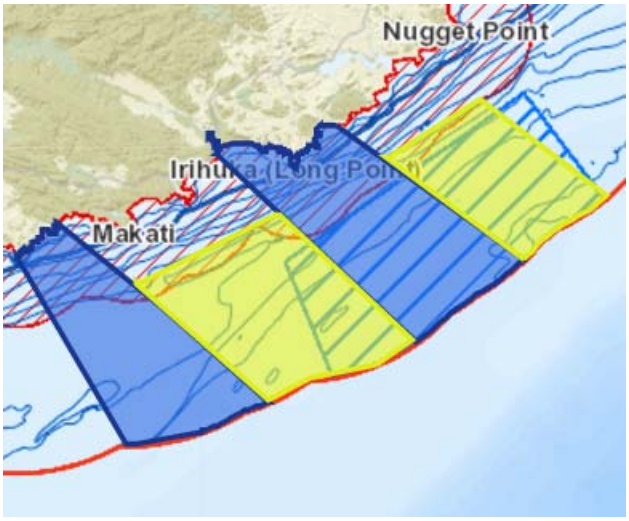
Site P Long Point Type 2: Support with extra restrictions and realign to accommodate Forest & Bird's proposed extensions to Long Point Site O

Forest & Bird generally supports the proposed MPA and recommends that the fisheries restrictions be expanded to include all activities likely to impact on the sea floor – including mineral and gas

[13] E.G. Jones, M.A. Morrison, N. Davey, B.W. Hartill, C. Sutton 2016: Biogenic habitats on New Zealand's continental shelf. Part I: Local Ecological Knowledge New Zealand Aquatic Environment and Biodiversity Report No. 174 ISSN 1179-6480 (online) ISBN 978-1-77665-394-2

exploration, mining and marine farming, and that any MPA must link with the 4nm set net restricted area.

Forest & Bird recommends splitting the MPA to buffer both sides of ourproposed extension, and adjoin Forest & Bird's proposed Te Rere Reserve as shown below.



Site Q Tahakopa Estuary Type 1: Support with extension to connect with Long Point
Forest & Bird supports a marine reserve over the entire estuary and linking this with Long Point. As it stands this proposal does not meet the MPA design guidelines. It only protects one side of half the estuary, and does not include the full range of habitats within the estuary, or include the estuary mouth, which are zones of higher productivity. The proposed reserve does not maximise the opportunity for connecting this protected area with the marine reserve thereby representing more habitats within one reserve.

Site R Tautuku Estuary: Type 2 Support with extension to mouth
This is one of the least modified estuaries in the Catlins, surrounded largely by native forest, most of which is protected. The proposal does not meet the MPA design guidelines and fails to represent the full ecosystem and habitats. Any protection here needs to be extended to include the complete estuary.

Site S Haldane Type 2: Support, consider change of status
This Estuary provides the opportunity to represent habitats that are not well represented and has the greatest diversity of habitats of the estuaries proposed for protection.

Site T Kelp: Support
This is an innovative idea. Kelp is a keystone species for coastal ecosystems in the SEMPF region and drives many ecological processes.

Shag Point
Forest & Bird understands this site has been withdrawn from consideration due to the significance of the site for Kai Tahu and is likely to be opposed by both commercial and recreational fishers.

Forest & Bird respects the significance of Shag Point to Kai Tahu's Statutory Acknowledgement in the Ngai Tahu Claims Settlement Act 1988 but wishes to suggest that further consultations between the Treaty Partners take place to investigate the possibility of protection for this site.

Shag Point has a number of unique features which cannot be represented elsewhere. These include soft sandstone intertidal platforms which bear fossils from a shallow marine environment. The eroded spherical Katiki concretions are common along this platform creating unique rock pool habitats. The broken reef along Katiki beach contains extensive rock pools at low tide. Shag Point has considerable biodiversity values due to the range of substrate, geomorphological features which form many cracks, crevices and channels, fringing reefs, offshore reefs and sandy gravel beaches, and many different wave exposures. The area is rich in seaweed species including red seaweed meadows. The biodiversity of this area supports a range of shore bird species including Yellow-eyed penguins.

This area is one of Otago's unique features and offers the most accessible site for research, education and general public enjoyment for rock pooling, snorkelling and scuba diving. New Zealand's first reserve at Leigh has for the wider Auckland area, for education, tourism, and the local economy.

Shag Point was a popular choice for a marine reserve in 1989 when 500 questionnaires were sent out seeking options for reserves. Of the 134 replies 89% wanted reserves. Shag Point was selected along with Sandfly and the Nuggets for further consideration. Of the 455 submissions received by the Department of Conservation 68% were from recreational fishers and 8% from commercial fishers. Shag Point was favoured by 47% of submissions with 37% opposed.

Tokata The Nuggets

Forest & Bird is very disappointed that Tokata and the northern bay /mouth of the Clutha is not being considered by the Forum for a marine reserve. Forest & Bird respects the significance of Tokata to Kai Tahu and its Statutory Acknowledgement in the Ngai Tahu Claims Settlement Act 1988. The Society wishes to suggest that further consultations between the Treaty Partners take place to investigate the possibility of protection for this site.

Tokata has habitats that cannot be represented elsewhere in the network and is the most publicly accessible site in the South, providing for more and easier opportunities for research, education, tourism and public enjoyment. Long Point has considerable merit as a marine reserve, however it does not represent the range of biodiversity, ecosystems and habitats found at Tokata.

Tokata is distinct with very diverse habitats associated with horizontal sedimentary strata, as well as cliffs, sea caves and stacks. It contains both exposed and sheltered sites and is representative of nearshore ecosystems on the north side and habitats more typical of oceanic ecosystems on the south side.

Tokatā is influenced by New Zealand's largest (by water volume) river, the Clutha. This carries a significant sediment load which meets with the fast flowing, nutrient rich Southland Current waters. This meeting enables prolific marine life to flourish. Tokatā creates a physical barrier in the path of the Southland Current and forces water to disperse offshore. This creates a drag-effect and

mixing of Clutha-influenced waters occurs in the form of a gyre or eddy in Molyneaux Bay. This area is known as a spawning site for species such as ahuru, sole, *Pelotretis flavilatus* and sprat.

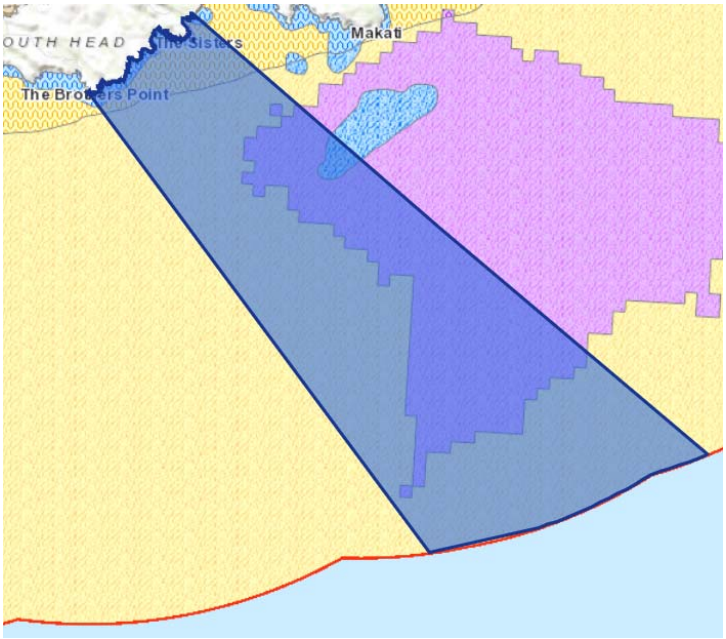
The turbulent mixing of waters as they stream off the end of the Nuggets is nutrient rich and the site of concentrated feeding by large predators. The most visible of these are the massive flocks of sooty shearwaters, accompanied by seals, dolphins and several species of albatross.

When the Nuggets were last proposed for a marine reserve the overwhelming number of submissions received supported the proposal with 47% in favour and 26% opposed. Submissions from the residents of Balclutha, Kaka Point and Tirohanga were evenly spilt 47% for and against.

Recommendation for additional reserve at Te Rere, Catlins

The proposals do not represent any deep gravel habitats, or deep reef habitat within a high current area (according to Sea Sketch NIWA tidal current model) in the southern latitudes of the SEMPF region. A marine reserve as shown below (231.6km2) would represent 6 coastal habitat types; deep sand, gravel and reef, exposed shallow sand and reef and a small area of exposed intertidal reef. Biodiversity here includes foraging area for yellow-eyed penguins at breeding colonies at Te Rere Forest & Bird Reserve and Shades Beach Conservation Area, sooty shearwater, spotted shags, Stewart Island shags, terns, gulls and various albatross species. The sedimentary rock strata ranges from vertical to horizontal, creating an extensive reef system with rock pools, providing a range of differing microhabitats including sheltered indented crevices and bays. Good public access is available to Dummy's Beach.

Forest & Bird Recommendation for Te Rere Type 1



Part C Creating a Network
Forest & Bird supports the following sites (with our recommended changes) being included in the network.

A Tuhawaiki to Pareora (Type 2)
B Waitaki Coastal (Type 1) as recommended by F&B
C Waitaki (Type 2) – as recommended by F&B
D Pleasant River to Stony Creek (Type 1)- as recommended by F&B
E Bryozoan Bed (Type 2) – option 1
F Saunders Canyon (Type 1) – option 1- as recommended by F&B
~~G Bryozoan Bed (Type 2) – option 2~~
~~H Papanui Canyon (Type 1) – option 2~~
I Harakeke Point to White Island (Type 1)- as recommended by F&B
J White Island to Waldronville (Type 2)
K Green Island (Type 1)
L Akatore Estuary (Type 2)
M Akatore Coastal (Type 1) as recommended by F&B
~~N Akatore Offshore (Type 2~~)
O Long Point (Type 1) as recommended by F&B
P Long Point Offshore (Type 2) as recommended by F&B
Q Tahakopa Estuary (Type 1) as recommended by F&B
R Tautuku Estuary (Type 2) as recommended by F&B
S Haldane Estuary (Type 2)
T Kelp Forest (Type – other)

Other Recommended Additions
Te Rere

Reserves for habitats and ecosystems not represented;

- Sea grass habitat – possible Blueskin Bay
- Sheltered habitats northwest of Otago Harbour
- Biogenic Habitat Inshore of the Hay Paddock
- Estuaries

Part C General Comments

The Forum's proposals will only protect 5.3% of the region's sea protected in reserves even if the maximum of all proposals are recommended, this is just a fraction of what is required to restore and adequately manage the health of our seas, nor does not align with the consensus of international scientific advice.

Estuaries
The proposals fail to adequately represent the full range of estuarine habitats in the SEMPF region. Only three of the nine habitats shown in Sea Sketch are represented amounting to around 3% of estuarine habitats on the South-East coast.

Pleasant River Estuary is the only complete estuary proposed for protection in a marine reserve. Tahakopa fails to include the estuary mouth and only represents one out of four estuarine habitats found within the Tahakopa Estuary.

The Forum does not appear to have considered the Estuary Environment Classification (EEC) which provides an objective means of identifying representative types of estuaries in terms of ecological and habitat potential (Estuary types, NIWA website[14])

This classifies estuaries according to the following types of which Otago has types A, B, C, E and F. To ensure the full representation of Otago estuary habitats an example of each type needs to be protected in a marine reserve and replicated in a MPA.
A - coastal lakes
B - tidal river mouths
C - tidal river lagoons
D - coastal embayments
E - tidal lagoons or barrier enclosed lagoons
F - barrier enclosed lagoons or drowned valleys
G - fjords or sounds
H - drowned valleys, rias or fjords

Recommendation
The Forum revisits the estuary proposals giving consideration to the Estuary Classification to ensure the full range of habitats are represented in a marine reserve and replicated within a MPA.

Unrepresented Habitats and Ecosystems

Sheltered shallow sand Heyward Point to Blueskin Bay

Blueskin Bay is a well known nursery and rearing grounds for flat fish and sprat and has been found to have more larvae present than in the midshelf waters off Otago Peninsula.[15] This site is the only opportunity for the Forum to represent the range of sheltered habitats in the South-East bioregion. It is recognised that dredge spoil is likely to impact on the area, nevertheless Forest & Bird recommends that the Forum investigate an opportunity for a marine reserve here. It may also provide an option to protect seagrass habitat which is a nationally significant ecosystem.

Seagrass habitat: Blueskin Bay, Otago Harbour Papanui Inlet, Moeraki
Seagrass habitats are mapped in Otago Harbour and Papanui Inlet – neither of these areas have been identified as potential marine reserves. Other sites should be investigated such as Blueskin Bay and Moeraki to determine if it is possible to protect this internationally significant habitat.

[14] (Estuary types, NIWA website[14]) https://www.niwa.co.nz/coasts-and-oceans/nz-coast/learn-about-coastal-environments/estuary-types

[15] Parsons, Morag 1999: An investigation into the spatial and temporal distribution patterns of ichthyoplankton off the Otago coast, southern-eastern New Zealand. Otago University MSc thesis

Failure to do this means that the Forum has not considered how to represent a sample of this habitat in a marine reserve as is required by the MPA Policy.

It is likely that there should be a good opportunity to protect sea grass habitat in Blueskin Bay. Berkenbusch & Rowden (2007) examined the generality of macro fauna assemblage patterns in relation to the presence of seagrass *Zostera capricorni [muelleri]* and burrowing ghost shrimp *Callianassa filholi* across three tidal inlets in Otago, at Otago Harbour, Blueskin Bay and Papanui Inlet.[16] They recorded a total of 54–64 infaunal taxa in this region of which 41 taxa were present. Multivariate analysis showed that assemblages were distinctly different between inlets.

Biogenic Habitat Inshore of the Hay Paddock

The proposed network does not represent the unique biogenic habitats and associated biodiversity inshore of the Hay Paddock, where abundant sponges, coralline algae and bryozoans provide habitat for blue cod, leather jacket, orange wrasse, southern pigfish, brittle stars and sea cucumbers, as described in the Science Summary – Habitat-Forming Bryozoans in South-Eastern New Zealand. Jones et al report sea tulip beds offshore from Oamaru – known as the Oamaru Kaeo beds, where sea tulips are attached to pebbles and rock – these are also found in Dunedin Harbour and Blueskin Bay. [17]

Adequacy of representation

The Forum must ensure protection of all the identified habitat types. It is very important to protect the full range of ecosystems and habitats in the region. The Type 1 & 2 MPAs must be developed to ensure that the South-East region's coastal ecosystems and habitats, are "sustainably productive", "and that their treasured biodiversity, integrity and special nature" is protected.

Despite the considerable work done by the Forum, it would have been useful if the Forum and supporting agencies could have combined the local knowledge, fisheries information, modelling, ecologically significant areas, and other features and used MARXAN or Zonation to provide a suite of objective modelled scenarios to support informed decision-making. This could still be completed and be used to help refine the next iteration of the SEMPF proposals the Forum will present to the Government following the input received from this consultation process, and it would provide a comparison of the proposals against the Forum's MPA objectives.

Appendix one presents a gap analysis of habitats available and percentage of representation. Table two below summarises these. The best represented habitats include; deep water sand, exposed intertidal reef, moderate shallow reef, exposed sandy beach and moderate shallow gravel. Under represented habitats 5-10% include deep mud, exposed shallow sand. Seven habitats have less than 5% of their area represented; significantly these include areas likely to have rich biodiversity particularly for fish species, such as moderate intertidal reefs, deep reef and shallow sand. Deep mud is not represented in the network with the smallest options and none of the sheltered habitats are represented in either of the proposed networks.

[16]Berkenbusch and Rowden, 1998. Interactions between seagrasses and burrowing ghost shrimps and their influence on infaunal assemblages, Journal of Experimental Marine Biology and Ecology 341, http://research.nhm.org/pdfs/27723/27723.pdf

[17] Jones et al 2016 Biogenic habitats on New Zealand's continental shelf. Part 1: Local Knowledge

Table Two: Representation of Habitats in Proposals with smallest options and largest options

Habitat	% SEMPF Area smallest options	Habitat	% SEMPF Area largest options
Deep Gravel	0.56	Deep Gravel	1.5
Deep Mud	0	Deep Mud	7.7
Deep Reef	0.5	Deep Reef	2.9
Deep Sand	3	Deep Sand	3.7
Deep Water Sand	28	Deep Water Sand	83
Exposed Intertidal Reef	22	Exposed Intertidal Reef	22
Exposed Sandy Beach	16	Exposed Sandy Beach	16
Exposed Shallow Gravel	3	Exposed Shallow Gravel	3
Exposed Shallow Reef	10.4	Exposed Shallow Reef	10.4
Exposed Shallow Sand	6.13	Exposed Shallow Sand	6.2
Moderate Gravel Beach	12.5	Moderate Gravel Beach	12.5
Moderate Intertidal Reef	4.2	Moderate Intertidal Reef	4.2
Moderate Sandy Beach	3.6	Moderate Sandy Beach	3.6
Moderate Shallow Gravel	12	Moderate Shallow Gravel	12
Moderate Shallow Mud	10	Moderate Shallow Mud	18.2
Moderate Shallow Reef	13	Moderate Shallow Reef	23
Moderate Shallow Sand	0.04	Moderate Shallow Sand	0.04
Sheltered Intertidal Reef	0	Sheltered Intertidal Reef	0
Sheltered Sandy Beach	0	Sheltered Sandy Beach	0
Sheltered Shallow Reef	0	Sheltered Shallow Reef	0
Sheltered Shallow Sand	0	Sheltered Shallow Sand	0

In September, the International Union for the Conservation of Nature (IUCN) World Parks Congress called for 30% of each marine habitat to be protected in a network of highly protected MPAs and other effective area-based conservation measures with the ultimate aim of creating a fully sustainable ocean, at least 30% of which does not allow extractive activities subject to the rights of indigenous people and local communities. The Congress called for 30% of marine space to be protected in 'no take' reserves by 2030.[18]

NZ has a 10% target set out in New Zealand's Biodiversity Strategy, which is at the bottom end of global targets that are now recommend between 10% and 30% protection. The IUCN resolution received the backing of 129 member states and government agencies and was based on scientific recommendations and a review of 144 studies, and the outcome of the 2014 World Parks Congress.[19]

[18] Motion 53 passed at IUCN World Conservation Congress September 2016 https://portals.iucn.org/congress/motion/053

[19] Sciberras et al: Evaluating the biological effectiveness of fully and partially protected marine areas. Environmental Evidence 2013 2:4 and O'Leary, B. C., Winther-Janson, M., Bainbridge, J. M., Aitken, J., Hawkins, J. P. and Roberts, C. M. (2016), Effective Coverage Targets for Ocean Protection. CONSERVATION LETTERS. doi:10.1111/conl.12247 https://portals.iucn.org/congress/motion/053

In Australia the Great Barrier Reef Representative Areas program set a minimum threshold of 20% of each bioregion to be protected within no take zones, but exceeded that and in 2004, the proportion of the GBRMP protected by no take zones was increased from <5% to more than 33% . The Great Barrier Reef now protects representative and replicated examples of each of the broad habitat types, with an average size of 700km2. California marine protected areas network includes 9.4% of state waters protected in no take areas, and 6% partially protected.[20]

So far New Zealand has committed to achieving 10% protection, consistent with the Convention on Biological Diversity Aichi Targets, yet at 5.3% the Forum's proposal falls well short of even this. The IUCN has recognised at least since 2014 that the 10% Aichi targets, that they take to mean 10% of each habitat type within a bioregion to be in no-take protection, is still not adequate to achieve sustainability, long term ocean health and biodiversity protection.

Forest & Bird urges the Forum to consider options for expanding the representation of habitats in marine reserves beyond the minimum of 10%, and set more aspirational targets in line with the 30% goal suggested by the IUCN World Parks Congress (both 2014 and 2016).

Impact on Fisheries

We all have a stake in our marine environment. It's not just about fisheries. Substantial benefits have been recognised through setting aside fully protected marine reserves. Healthy and abundant oceans provide for stronger coastal economies. As momentum grows to bring the health of our oceans in line with sustainability principles, we must continue to be vigilant about the numerous demands and pressures placed upon the oceans' natural resources.

Forest & Bird is mindful that the MPA Policy requires that the adverse impacts on existing users should be minimised and under the Marine Reserves Act the Minister is required to assess the impact of the reserve on commercial fishing and to be satisfied that the reserve will not "*interfere unduly*" with commercial fishing.

The key case on whether a marine reserve will unduly interfere with commercial fishing is CRAY3 Industry Association Inc. Vs Minister of Fisheries and others CP 317/99. In this case, the High Court and the Court of Appeal agreed that removal of an area where up to 10% of the catch for the QMA was caught was not undue interference.

Dr Bill Ballantine considered displacement of fishing effort and advised that fisheries are highly dynamic and that it is more or less impossible to accurately predict displacement, or take account of potential benefits. He noted that displacement occurs for a variety of non-ecological reasons including market forces, fashion, fuel costs, tax and subsidy arrangements, as well as those associated with the natural environmental variability in fish abundance.[21]

[20] Shears Nick and Thomas Hannah in Austral Ark: The State of Wildlife in Australia and New Zealand, eds. A. Stow, N. Maclean and G. I. Holwell. Published by Cambridge University Press. 2014.

[21] Ballantine, Bill 2014. Fifty years on: Lessons from marine reserves in New Zealand and principles for a worldwide network. Biological Conservation 176.

Marine reserves can benefit fisheries through 'spill over' and the export of larva, depending on reserve design, size, shape, location, and species biology and life history traits. However no long term experimental case studies exist to prove this. A recent study of larval export from 2 species of coral reef fish from a network of marine reserves on the Great Barrier Reef estimated through DNA parentage analysis that no take marine reserves produced approximately half of all juvenile recruitment of juvenile trout to both reserve and fished reefs within 30km. In addition populations resident in reserves exported 83% coral trout and 55% stripey snapper offspring to fished reefs.[22]

The Forum has excluded most of the highly fished areas and has for the most part located potential reserves in the areas least fished. There is a danger that these areas represent the least productive areas and are therefore less likely to create the benefits of a marine reserve. [23]

Marine Protected Area Type 2 Restrictions

All the proposed Type 2 MPA's need to prohibit all sea floor impact activities such as indiscriminate bulk and non-selective fishing methods; marine farms; and oil exploration and mining (e.g. dredge spoil dumping; sea bed trawling and dredge fishing; mining and oil and gas prospecting, exploration and extraction). Also the further development of marine farming along the South East Coast, which can and will have an impact on the marine environment, needs to be implemented in a sustainable manner.

Monitoring of MPAs

Forest & Bird recommends that the Forum include an outline for a long term monitoring and reporting system to assess the functioning of the MPA Network. A monitoring programme underpins the ability to report on the state of the ecosystem and the pressures on them, and enable changes to be reported. Providing understanding of the consequences of the MPA options have had on the different stakeholders and communities over time. A monitoring programme assesses the performance of an MPA network, with respect to its viability, and the effectiveness of the individual MPAs in achieving their own specific biodiversity objectives.

A monitoring programme will enable the communities and stakeholders to compare the effectiveness of other marine management tools in the region such as mataitai etc. An MPA monitoring programme should be based on the: a) site biodiversity objectives - based on the attributes of the habitats and ecosystems; and b) performance of the MPA management tools. Where monitoring reveals that the management tools are not adequately protecting the area, the management tools for that MPA should then be reviewed.

Conclusion

The seas around South Canterbury, Otago and Southland were once healthy and thriving, with hapuka, crayfish, blue cod and paua being easily caught from the shores, and thriving populations of whales and penguins. Hector's dolphins were so common they were shot from Bright Beach.

The Forum has a rare opportunity to provide some meaningful protection in our seas, allowing our marine life to recover, and enabling future generations to experience what those of the past enjoyed. As such some fully protected marine reserves must be easily accessible. Recreational

[22] Shears Nick and Thomas Hannah in Austral Ark: The State of Wildlife in Australia and New Zealand, eds. A. Stow, N. Maclean and G. I. Holwell. Published by Cambridge University Press. 2014.

[23] Thrush Simon F, et al 2012. Design criteria and research needs for soft sediment Marine Protected Areas. NIWA. Prepared for Department of Conservation

fishers rightly wish to have easy access to their 'hobby' and are concerned for their safety, it is also essential to provide easy public access to marine reserves for all those whose chosen recreational activity is snorkelling or diving.

Surveys have shown that New Zealand's want marine environmental protection – e.g. respondents indicated that 36% should be protected by no-take marine reserves.[24] A WWF NZ Colmar Brunton telephone survey of 1,003 interviews with New Zealanders aged 15 and over found that 96% of New Zealanders think a greater percentage of New Zealand's marine environment should be protected with the mean percentage area that should be protected: 2011 – 36% 2005 – 36%. [25]

Forest & Bird urges the Forum to not only recommend all the proposals and options for extension (with the exception of sites H and G) but to significantly improve the network so that it comprehensive and truly representative of Otago's marine habitats and ecosystems.

[24] Eddy TD 2014. One hundred-fold difference between perceived and actual levels of marine protection in New Zealand. Marine Policy 46: 61-67)

[25] New Zealanders' attitudes towards their oceans and marine reserves, 2011. Colmar Brunton research commissioned by WWF-New Zealand. http://awsassets.wwfnz.panda.org/downloads/colmar_brunton_research_nzers_attitudes_to_their_oceans_and_marine_reserves_published_26_1.pdf

Appendix One: Gap analysis of representation habitats in SEMPF region with smallest and largest marine reserve options

Representation of habitats for Marine Reserve proposals with smallest options

	Area Km2									% SEMPF Area
Habitat	**B**	**D**	**H Pap**	**I Op 1**	**K**	**M**	**0**	**MR Totals**	**SEMPF**	
Deep Gravel			5.2	0.7				5.9	1042.6	0.56
Deep Mud								0	125	0
Deep Reef				0.3	1.1		0.6	1.7	348.1	0.5
Deep Sand			83	7.1	0.5		50	140.6	4594.1	3
Deep Water Sand			18.1					18.1	62.8	28
Exposed Intertidal Reef				0.4		0.7	0.4	1.5	6.9	22
Exposed Sandy Beach				0.6		0.1	0.2	0.9	5.6	16
Exposed Shallow Gravel				0.2				0.2	6.5	3
Exposed Shallow Reef				2.6	3.4	3.1	3.7	12.8	121.2	10.4
Exposed Shallow Sand				17.2		2.3	10.5	30	489	6.13
Moderate Gravel Beach	0.4							0.4	3.2	12.5
Moderate Intertidal Reef		0.2						0.2	4.8	4.2
Moderate Sandy Beach		0.2						0.2	5.5	3.6
Moderate Shallow Gravel	106							105.7	901.8	12
Moderate Shallow Mud	13.6							13.6	132.9	10
Moderate Shallow Reef		14.6						14.6	113.3	13
Moderate Shallow Sand		0.3						0.3	761.2	0.04
Sheltered Intertidal Reef									0.4	0
Sheltered Sandy Beach									1	0
Sheltered Shallow Reef									4.5	0
Sheltered Shallow Sand									25.9	0
Totals								**346.7**	**8756.3**	**3.9%**

Representation of Habitats for Marine Reserve Proposals with largest options

	Area Km2									% Sempa Area
Habitat	B	D	F Saun	I Op 2	K	M	0	**MR Totals**	SEMPA	
Deep Gravel			15.4	0.9				16.3	1042.6	1.5
Deep Mud		9.6						9.6	125	7.7
Deep Reef			8.2	0.3	1.1		0.6	10.2	348.1	2.9
Deep Sand		1.7	109.8	12.5	0.5		50	172.8	4594.1	3.7
Deep Water Sand			52.5					52.5	62.8	83
Exposed Intertidal Reef				0.4		0.7	0.4	1.5	6.9	22
Exposed Sandy Beach				0.6		0.1	0.2	0.9	5.6	16
Exposed Shallow Gravel				0.2				0.2	6.5	3
Exposed Shallow Reef				2.4	3.4	3.1	3.7	12.6	121.2	10.4
Exposed Shallow Sand				17.6		2.3	10.5	30.4	489	6.2
Moderate Gravel Beach	0.4							0.4	3.2	12.5
Moderate Intertidal Reef		0.2						0.2	4.8	4.2
Moderate Sandy Beach		0.2						0.2	5.5	3.6
Moderate Shallow Gravel	106							105.7	901.8	12
Moderate Shallow Mud	13.6	10.7						24.3	132.9	18.2
Moderate Shallow Reef		26						26	113.3	23
Moderate Shallow Sand		1.7						1.7	761.2	0.04
Sheltered Intertidal Reef									0.4	0
Sheltered Sandy Beach									1	0
Sheltered Shallow Reef									4.5	0
Sheltered Shallow Sand									25.9	0
Totals								465.5	8756.3	5.3%