BEFORE THE OTAGO REGIONAL COUNCIL

AT DUNEDIN
KI ŌTEPOTI

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of the proposed Otago Regional Policy Statement 2021 (excluding those parts determined to be a Freshwater Planning Instrument)

Expert Evidence of Dr Hendrik Schultz (Coastal Environment)
for the Director-General of Conservation Tumuaki Ahurei
Dated 28 November 2022

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PART 1 – INTRODUCTION AND GENERAL PROVISIONS

Summary of key points

1. The Otago coastal environment harbours a wealth of indigenous biodiversity values, some of which are considered globally significant. Although a good basis for mapping exists a lot of these ecosystems, habitats and communities in the coastal environment are yet to be formally mapped. In my opinion, **the proposed Otago Regional Policy Statement (pORPS) will therefore need clear policy to require an integrated mapping approach to enable protection of indigenous ecosystems and habitats as well as habitats used by indigenous fauna** as required by Section 6(c) of the Resource Management Act (RMA) and the New Zealand Coastal Policy Statement (NZCPS) Objective 1 and Policy 11.

2. Fishing can have adverse effects on biodiversity values in the coastal marine area despite some protection tools being available under sections 186A or 186B of the Fisheries Act 1996. The RMA can be used as a tool to control adverse effects of fishing on biodiversity values. **The pORPS 2021 therefore needs to ensure that policies to avoid, mitigate and remedy adverse effects on coastal marine values apply to fishing when appropriate, in order to give effect to NZCPS Policy 11.**

3. An integrated approach to criteria for identifying significant ecological areas in Otago is necessary to account for the marine environment often crossing boundaries with terrestrial and freshwater systems. **I support the use of the exposure draft National Policy Statement for Indigenous Biodiversity (E draft NPSIB) significance criteria. In my view they are applicable across land, freshwater and marine domains and promote integrated management as required by the RMA.**

Introduction

5. My full name is Hendrik Schultz. I have been asked by the Director-General of Conservation Tumuaki Ahurei (D-G, Director-General) to provide evidence on the proposed Otago Regional Policy Statement 2021 (pORPS 2021).

Qualifications and experience

6. I hold a German diploma in Biology (MSc equivalent) and a PhD in Biological Sciences from the University of Auckland, New Zealand.

7. I have over 11 years of experience studying and working in the field of marine science, including government, private and tourism sectors.

8. I am currently employed by the Department of Conservation (DOC, the Department) as a Technical Advisor Marine, providing technical advice on marine topics with a focus on seabirds. I have held this position since June 2019. As part of my role, I am coordinating the hoiho / yellow-eyed penguin recovery programme and provide detailed scientific advice around threats and mitigations for hoiho, ranging from human induced threats, such as bycatch, to disease and environmental threats. I am also a member of DOC's Coastal Marine Sediment Team. Additional duties associated with my role include providing specialist ecological advice into statutory processes such as regional coastal plans and resource management applications.

9. I was previously employed as a Seabird Scientist by the Auckland Council. My PhD focussed on the foraging behaviour of brown skua, a large predatory seabird that breeds on New Zealand's Subantarctic Islands, Stewart Island and the Chatham Islands.

10. My experience relevant to the current process includes:

    a. In my current role I have provided species advice for the review of the Southland Regional Coastal Plan, which is being conducted by Environment Southland.

    b. I have provided species advice in relation to resource consent applications such as Southport capital dredging of Bluff Harbour; Hananui Salmon Farm; Waitaki District Council Moeraki land slip; Beach Energy Resources NZ (Holdings) Ltd discharge consent; OMV GSB Limited marine consent and marine discharge; DW New Zealand Limited (DWNZ) marine dumping consent.

11. I am a Full Member of the New Zealand Ornithological Society / Birds New Zealand. I am also a Committee Member of the Australasian Seabird Group.

Code of conduct

12. Although it is not strictly required at a Council hearing, I confirm that I have read the code of conduct for expert witnesses as contained in the Environment Court Practice Note 2014. I have complied with the practice and procedures note when preparing my written statement of evidence and will do so when I give oral evidence before the Hearing Panel.

13. The data, information, facts, and assumptions I have considered in forming my opinions are set out in my evidence to follow. The reasons for the opinions expressed are also set out in the evidence to follow.

14. Unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of evidence

15. I have been asked to provide evidence in relation to the following topics:

    a. An overview of the significance of the Otago marine and coastal area with reference to NZCPS Policy 11.

    b. Controls on fishing and aquaculture and why these are required.

    c. pORPS APP2 Significance criteria for indigenous biodiversity and how this relates to significant indigenous biodiversity in the coastal marine environment.

    d. Review of the s42A report (Chapter 8: CE – Coastal Environment)

    to support the D-G's submissions on these topics. I have named the chapters of my evidence accordingly.

Material considered

16. In preparing my evidence I have read and relied on the expert evidence prepared by Bruce McKinlay, Murray Brass, Marine Richarson and Cassie Mealey for the D-G.

17. I have read and considered the following documents:

    a. Proposed Otago Regional Policy Statement 2021 ('pORPS')

b. The s32 Evaluation Report dated May 2021, particularly appendices 12–14: Wildlands Reports (Wildlands 2020a, 2020b and 2021b)

c. The D-G's submission dated 3 September 2021

d. The D-G's further submission dated 12 November 2021

e. The s42A report dated 27 April 2022 and supplementary evidence (Chapter 8: CE – Coastal Environment)

f. The exposure draft of the National Policy Statement for Indigenous Biodiversity dated June 2022, particularly Appendix 1

g. The New Zealand Coastal Policy Statement 2010, particularly Policy 11

h. Scientific publications where these are referred to in my evidence

PART 2 – CHAPTER 8: CE – COASTAL ENVIRONMENT

An overview of the significance of the Otago marine and coastal area with reference to NZCPS Policy 11

18. In this section, I provide a brief description of the general character the coastal environment of Otago and provide examples of biodiversity values that occur. I then present more detailed examples and link these to the New Zealand Coastal Policy Statement Policy 11 a and 11 b.

Character of the Otago Coast

19. The Otago Coast stretches from the Waitaki River mouth in the north to Wallace Beach in the south. North Otago is characterised by a sedimentary rock coast, with both shallow subtidal reefs supporting forests of giant bladder kelp (*Macrocystis pyrifera*), as well as deeper reefs (greater than 30m depth). Further south, the coast is characterised by a prominent volcanic landform, the Otago Peninsula, that strongly influences coastal currents. The peninsula is bordered seaward by a narrow shelf, with the heads of two major canyons (Papanui, Saunders) reaching into the Territorial Sea.

20. Further south, the coastline is strongly influenced by fresh water and sediment input from the Clutha River / Mata Au. The Catlins at the southern end of Otago are characterised by a cliffed and embayed coastline with old erosion-resistant sedimentary rocks. This coastline is influenced by strong tidal currents and the outflow from Foveaux Strait (South-East Marine Protection Forum 2018).

Biodiversity values in the coastal environment of Otago

21. The coastal environment of Otago features a variety of habitats including intertidal, shallow subtidal and deep rocky reefs, as well as intertidal and subtidal soft substrate habitats. Estuaries also form an important component of the Otago coastal area. The abundant biodiversity values include bryozoan thickets on the mid and outer shelf off the Otago Peninsula, which are uncommon in New Zealand and globally rare (Batson 2000; Batson and Probert 2000). The coastal rocky reefs north of the Otago Peninsula are characterised by subtidal forests of giant bladder kelp (<30m), whereas the shallow subtidal rocky reefs on the more exposed shores south of the peninsula are dominated by dense stands of bull kelp (*Durvillaea spp*).

22. Observations from fishermen indicate that a variety of biogenic habitats occur throughout the coastal-marine area of Otago (Jones *et al.* 2016). These biogenic habitats are structures formed by living organisms such as bryozoans, shellfish, sponges (sponge gardens), tube worms and giant bladder kelp.

23. Biogenic habitats are known to have important ecological functions. For example, increased biodiversity, benthic-pelagic coupling (i.e., processes that connect the benthic zone and the pelagic zone through the exchange of energy, mass, or nutrients), protection from erosion, recycling of nutrients, provisioning shelter and food for marine organisms, as well as creating geological features in the long-term. Furthermore, biogenic habitats also support fisheries production for various fish species (Morrison *et al.* 2014b).

24. Estuarine habitats in Otago support saltmarsh vegetation, seagrass and shellfish beds as well as a variety of aquatic birds, and are identified as important nursey grounds for many fish species (Morrison *et al.* 2014a). Furthermore, onshore habitats such as beaches, dunes and coastal vegetation provide breeding and resting habitat for marine mammals (e.g., kekeno / New Zealand fur seals (*Arctocephalus forsteri*), whakahao / New Zealand sea lions (*Phocarctos hookeri*) and seabirds (e.g., hoiho / yellow-eyed penguins (*Megadyptes antipodes*) and kororā / little blue penguins (*Eudyptula minor*).

25. In my opinion, after reviewing the material referenced in this evidence, the values below fall into the descriptors of the NZCPS Policy 11, in particular: NZCPS Policies 11(a)(i), (ii), (iii) and (v); and Policies 11 (b)(i), (ii), (iii), (iv) and (v). The pORPS 2021 is required to give effect to these policies which require protection of indigenous biological diversity by (a) avoiding adverse effects of activities or (b) avoiding significant adverse effects of activities, and avoiding, remedying or mitigating other adverse effects of activities. In the following sections I provide tables with examples of biodiversity values that trigger each of the above policies (see Tables 1 to 6).

Policy 11(a) avoidance of adverse effects of activities

Policy 11(a)(i) and (ii) threatened or at risk indigenous taxa

26. Policy 11(a)(i) and (ii) requires adverse effects of activities to be avoided on indigenous taxa that are listed as threatened or at risk in the New Zealand Threat Classification System lists, and taxa that are listed as threatened by the International Union for Conservation of Nature and Natural Resources (IUCN). A range of

indigenous threatened taxa including marine mammals and seabirds occur and breed along the Otago Coast. Well known examples are yellow-eyed penguin/ hoiho, toroa / royal albatross (*Diomedea sanfordi*), New Zealand sea lion, southern right whale, Hector's dolphin (*Cephalorhynchus hectori*) and great white shark (*Carcharodon carcharias*). Below (in Table 1) I provide examples of indigenous taxa that trigger Policy 11(a)(i) and (ii). I also indicate the main pressures on these species, as that is relevant to how protection is to be achieved.

Table 1 – NZCPS Policy 11 (a)(i) indigenous taxa that are listed as threatened or at risk in the NZTCS and (ii) taxa that are listed as threatened by the IUCN.

Taxon / species	NZTCS status	IUCN threat status	Examples of habitat where abundant in Otago	Pressures
New Zealand sea lion / *Phocarctos hookeri*	Threatened – Nationally Vulnerable	Endangered	Coastal Otago including the Peninsula, Catlins	Diseases, fisheries interactions, pup mortality, food availability, human impacts
Hector's dolphin / *Cephalorhynchus hectori*	Threatened– Nationally Vulnerable	Endangered	Coastal waters north of the Otago Peninsula, southern Catlins	Disease, fisheries interactions, oil/gas exploration, mining, noise, tourism, boat strikes
Southern Right Whale / *Eubalaena australis*	At-risk– Recovering	Least Concern	Frequently seen in Otago in winter	Habitat loss, entanglement in fishing gear, ship strike
Yellow-eyed penguin / *Megadyptes antipodes*	Threatened– Nationally Endangered	Endangered	Breeds along the Otago Coast	Diseases, fisheries interactions, introduced predators
Northern Royal Albatross / *Diomedea sanfordi*	Threatened– Nationally Vulnerable	Endangered	Breeds at Taiaroa Head, Otago Peninsula	Fisheries interactions

Taxon / species	NZTCS status	IUCN threat status	Examples of habitat where abundant in Otago	Pressures
Black-fronted tern / *Chlidonias albostriatus*	Threatened–Nationally Endangered	Endangered	Forages in coastal waters of Otago	Harassment by humans / dogs
Red-billed gull / *Larus novaehollandiae scopulinus*	At-risk–Declining	Least Concern	Found throughout the coastal environment of Otago	Introduced predators, climate change driven changes in the distribution or abundance of prey
Spotted shag / *Stictocarbo punctatus*	Threatened–Nationally Vulnerable	Least Concern	Breeds along the Otago Coast	Fisheries interactions
Otago shag / *Leucocarbo chalconotus*	At-risk–Recovering	Vulnerable	Breeds along the Otago Coast	Fisheries interactions, disturbance while breeding
Great white sharks / *Carcharodon carcharias*	Threatened – Nationally Endangered	Vulnerable	Seasonally in Otago	Fisheries interactions, reduced abundance of prey species, coastal development / degradation of inshore breeding / feeding habitats
Goniocorella Dumosa (most corals are protected under the Wildlife Act)	At-risk–Declining	Not Evaluated	Predicted distribution east of Otago Peninsula (Stephenson *et al.* 2018)	Human activities (trawling, dredging, other physical damage from boats e.g., anchoring, sedimentation); corals have very slow recovery rates

Policy (11)(a)(iii) indigenous ecosystems and vegetation types that are threatened in the coastal environment or naturally rare

27. In my opinion, the coastal environment of Otago contains a wide range of indigenous ecosystems[1] and vegetation types that are threatened, or are naturally rare (see Table 2 for examples). In forming this opinion I have relied on Anderson *et al.* (2019) and Wiser *et al.* (2013). The pORPS will need to have clear policy to ensure that adverse effects on threatened or naturally rare indigenous ecosystems and vegetation types are avoided.

Table 2 – NZCPS Policy 11 (a)(iii) Indigenous ecosystems and vegetation types that are threatened in the coastal environment or are naturally rare

Indigenous ecosystems and vegetation types	**Examples of known locations in Otago**	**Pressures**	**Significance**
Estuarine and lagoon habitats	Pleasant River, Waikouaiti River, Blueskin Bay, Purakaunui Inlet, Aramoana, Papanui Inlet, Hoopers Inlet and Kaikorai Stream estuaries; Catlins, Papatowai, Waipati, Tahakopa and Tautuku estuaries	Sedimentation, contaminants, eutrophication, sea level rise, invasive weeds / fauna	Support saltmarsh vegetation, seagrass, shellfish beds and aquatic bird life; nursery habitat for fish; lagoons are classified as *Endangered* by the International Union for Conservation of Nature (IUCN), estuaries are classified as *Vulnerable* (Holdaway *et al.* 2012)
Saltmarsh	Aramoana, Blueskin Bay, Catlins, Kaikorai, Kakanui, Shag, Tokomairiro and Waikouaiti estuaries	Coastal development, drainage, pollution, invasive vegetation	One of the most productive habitat types on earth, carbon dioxide sink, nursery area for fish, important breeding/feeding habitat for birds; significant reduction in extent and quality

[1] I use the definition of 'ecosystem from the glossary of Te Mana o te Taiao Aotearoa New Zealand Biodiversity Strategy i.e., "*a community of plants, animals and microorganisms in a particular place or area interacting with the non-living components of their environment (e.g. air, water and mineral soil)"* (DOC 2020)

Indigenous ecosystems and vegetation types	**Examples of known locations in Otago**	**Pressures**	**Significance**
Seagrass beds (eelgrass / *Zostera muelleri*)	Otago Harbour, Papanui Inlet, Blueskin Bay, Waikouaiti River, Moeraki, Pleasant River	Physical damage by human activities, water quality, sedimentation, introduced species, disease, increased turbidity	Indigenous only to New Zealand and southern Australia, high primary productivity; sediment retention, provisioning of habitat, sink for land derived nutrients; nursery areas for fish, seagrass in New Zealand likely experienced extensive declines in late 19th and early 20th centuries, with evidence for recovery in some areas
Rhodolith beds (i.e., free living, calcified red algae)	Limited knowledge about distribution and status in New Zealand, but thought to be associated with cobble habitat near the Waitaki river	Decreased water quality, sedimentation, physical disturbance (e.g., trawling, dredging), ocean acidification	Support high diversity of marine animals, nursery areas for fish; settlement area for shellfish larvae, high primary production
Forests of giant bladder kelp (*Macrocystis pyrifera)*	Extensive forests of *M. Pyrifera* occur along the north-eastern Otago coast from Warrington to Oamaru	Land-derived sedimentation, invasive species (e.g. *Undaria pinnatifida*), ocean warming, harvest	Highly productive, nursery and refuge habitat for invertebrates and juvenile fish; assemblages of red seaweeds, sponges, bryozoans, ascidians; regulating and provisioning services, vulnerable to climate driven increases in temperature (losses are predicted to occur as seen in Australia).
Tube worm fields (Chaetopterid polychaetes)	Worm fields also referred to as ‘wire weed’ or ‘hay paddocks’ (note that while the known location is outside	Mobile bottom fishing methods, sedimentation, pollution	Highly productive areas, increased biodiversity (habitat formers), stabilise sediment, reduce current flow

Indigenous ecosystems and vegetation types	Examples of known locations in Otago	Pressures	Significance
	the Territorial Sea, to the north of the Otago Peninsula, it can be expected that they are also present within the Territorial Sea). Tube worms are also reported within the Territorial Sea off the Catlins		
Bryozoan thickets	Otago Shelf bryozoan thickets	Mobile bottom fishing methods, sedimentation, pollution, ocean warming / acidification	Enhance local biodiversity; carbon fixation, cleaning function; bryozoan thickets as found on the Otago shelf are considered globally rare (Batson 2000) and show slow recovery rates (i.e., decades) following disturbance
Dune systems	Various locations south of the Waihemo / Shag River: e.g., Karitane Beach, Doctor's Point	Invasive vegetation; damage by stock grazing, rodents, coastal development and vehicles	Important habitat for insects (e.g., red katipo spider *Latrodectus katipo – At risk declining*) and vegetation (e.g., Pingao *Ficinia spiralis*); active and stable sand dunes are characterised as endangered by the IUCN (Holdaway *et al.* 2012)
Deep water canyons	Papanui, Saunders	Human activities e.g., mobile bottom fishing methods	Rare for canyons to enter the Territorial Sea on the east coast. Areas of potentially high productivity (e.g., benthos communities)

Policy 11 (a)(v) areas containing nationally significant examples of indigenous community types

28. In Table 3 I list nationally significant community types and areas in Otago where these are known to occur. Note that these are key examples of community types and

areas that we know about, however, there are also likely to be others that we either have little information or are as yet unrecorded.

Table 3 – Policy 11(a)(v) areas containing nationally significant examples of indigenous community types

Indigenous community type	**Examples / areas in Otago**	**Pressures**	**Significance**
Bryozoan thickets	Otago shelf (off Cape Saunders in depths of approximately 70-200m)	Mobile bottom fishing methods (e.g. trawling, dredging), sedimentation, pollution, invasive species, ocean warming / acidification	Otago Shelf bryozoan thickets are considered rare globally and uncommon in NZ (Batson 2000)
Wire-weed / Hay Paddock (inshore part that is within 12 nm); sponge species, growing on polychaete (wire-weed) tubes	Worm fields (Cheatopterid polychaetes), also referred to as 'wire weed' or 'hay paddocks' (note that while the known location is outside the Territorial sea, to the north of the Otago Peninsula, it can be expected that they also occur within the Territorial Sea). Tube worms are also reported within the Territorial Sea off the Catlins	Mobile bottom fishing methods, sedimentation, pollution, invasive species, ocean warming/acidification	Considered unique environments of the east coast of the South Island. Reports of juvenile Tarakihi associated with 'hay paddocks'
Macrocystis kelp forest	Rocky reef north of the Otago Peninsula to Oamaru	Land-derived sedimentation, invasive species (e.g., *Undaria pinnatifida*), ocean warming, harvest	Significant patch of kelp forest along the northern coast of Otago, highly productive and diverse biogenic habitat

Indigenous community type	Examples / areas in Otago	Pressures	Significance
Mesophotic reef (i.e., reef below 30m)	Offshore of Shag Point (including the outer part of Danger Reef), south of Cape Saunders (including Tow Rock area), offshore of Akatore/Clutha, and the Catlins	Sedimentation, climate change and fishing impacts	Rare in Otago, with diverse invertebrate assemblages
Seagrass	Otago Harbour, Papanui Inlet, Blueskin Bay, Waikouaiti River, Pleasant River, Moeraki, Catlins Estuary	Physical damage by human activities, water quality, sedimentation, introduced species, disease, climate change	Primary productivity; sediment retention; Provisioning of habitat; sink for land derived nutrients; important nursery areas for fish

Policy 11(a)(vi) areas set aside for full or partial protection of indigenous biodiversity

29. There currently are no formally identified Marine Protected Areas in the Otago region. However, there are customary management areas such as Mātaitai and Taiāpure as well as controls (i.e., temporary closures) issued under the Fisheries Act 1996 that allow for partially protecting some marine areas. Noting that these involve restrictions on fishing rather than complete protection, and are for the purpose of fisheries management, not for the protection of indigenous biodiversity more generally.

30. In Otago, current Mātaitai and Taiāpure are (from north to south) Moeraki Mātaitai (North Otago), Waikouaiti Mātaitai, East Otago Taiāpure, Otakou Mātaitai (Otago Harbour) and Puna-wai-Toriki Mātaitai (South Otago).[2]

[2] For details and maps see: https://www.mpi.govt.nz/fishing-aquaculture/maori-customary-fishing/customary-fisheries-management-areas-rules-and-maps/

Policy 11(b) avoidance of significant adverse effects of activities and avoid, remedy or mitigate other adverse effects of activities

31. Policy 11(b) paragraphs (i), (ii), (iii), (iv) and (v) are relevant here. The pORPS 2021 will need to ensure that significant adverse effects on these values below are avoided, and other adverse effects of activities have to be avoided, remedied and mitigated. Below I present tables with examples to demonstrate the range of triggers that the NZCPS creates.

Policy 11(b)(i) areas of predominantly indigenous vegetation in the coastal environment

32. In Table 4 I provide a brief list of examples of biodiversity values in the coastal environment of Otago that, in my opinion, would trigger this policy.

Table 4 – Policy 11(b)(i) areas of predominantly indigenous vegetation in the coastal environment

Indigenous vegetation type	**Examples in Otago**	**Pressures**	**Significance**
Seagrass	Otago Harbour, Papanui Inlet, Blueskin Bay Bay, Pleasant River, Waikouaiti River, Moeraki	Physical damage by human activities, water quality, sedimentation, introduced species, disease, climate change	Seagrasses support one of the most valuable ecosystems worldwide, and represent a significant ecological and economical component of coastal habitats
Saltmarsh	Aramoana Saltmarsh, Blueskin Bay, Catlins, Kaikorai, Kakanui, Shag, Tokomairiro and Waikouaiti estuaries	Coastal development, pollution	Nursery area for fish, important breeding / feeding habitat for birds
Rhodolith beds	Thought to be associated with cobble habitat near the Waitaki river	Decreased water quality, sedimentation, physical disturbance (e.g., trawling, dredging)	Support a high diversity of marine animals, nursery areas for fish

Indigenous vegetation type	**Examples in Otago**	**Pressures**	**Significance**
Macroalgae beds	e.g., red algae meadows *Adamsiella chauvinii* grows on soft sediment of Otago Harbour; Macrocystis kelp forest along northern Otago Coast	Sedimentation, increased sea temperatures	Important habitat for many marine species, provide ecosystem services such as carbon storage and nutrient cycling

Policy 11(b)(ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species

33. I provide examples of habitats in Otago that trigger this policy in Table 5.

Table 5 – Policy 11(b)(ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species.

Habitat type	**Examples in Otago**	**Pressures**	**Significance**
Estuarine and lagoon habitats	Tahakopa Estuary, Catlins – a relatively pristine, area of salt marsh turf and an extensive area of oioi (*Apodasmia similis*)	Sedimentation, contaminants, eutrophication, sea level rise	special significance for wading birds and galaxiid breeding
	Tautuku Estuary, Catlins – largely unmodified; contains pristine saltmarsh and estuarine communities		important breeding ground for black flounder (*Rhombosolea retiaria*) and yellow-belly flounder (*Rhombosolea leporina*)
Biogenic habitats	Hay Paddock (inshore part), Otago shelf bryozoan thickets	Mobile bottom fishing methods, sedimentation, pollution, invasive species, ocean warming / acidification	Important nursery habitat for fish
Breeding sites	Breeding colonies of seabirds (e.g., yellow-eyed penguin nests in the coastal environment of Otago)	Human activities (disturbance, coastal development, invasive predators, trampling by life stock)	Crucial for the reproduction of seabirds

Policy 11(b)(iii) indigenous ecosystems and habitats found only in the coastal environment that are particularly vulnerable to modification

34. These ecosystems and habitats include estuaries, lagoons, coastal wetlands, dune lands, intertidal zones, rocky reef systems, eelgrass and saltmarsh. Below in Table 6, I list examples of ecosystems that I consider would trigger this policy.

Table 6 Policy 11(b)(iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification

Ecosystem type	**Area / examples**	**Pressures**	**Significance**
Estuaries	Tahakopa, Tautuku and Pounawea / Catlins River estuaries in the Catlins	Sedimentation, contaminants, eutrophication, sea level rise	Support saltmarsh vegetation, seagrass beds, shellfish beds and aquatic bird life; nursery habitat for fish
Seagrass	Otago Harbour, Papanui and Hoopers Inlets, Blueskin Bay Bay, Waikouaiti River, Moeraki, Catlins Estuary, Tokomairiro Estuary	Physical damage by human activities, water quality, sedimentation, introduced species, disease, climate change	Primary Productivity; sediment retention; Provisioning of habitat; sink for land derived nutrients; important nursery areas for fish
Coastal wetlands	Aramoana Saltmarsh, Kaikorai Lagoon Swamp, Tomahawk Lagoon	Sea-level rise, pollution, biological invasions, land reclamation / coastal development, pollution	Support a range of native birds, fish, invertebrates, and plants; improve water quality (filter sediments / nutrients)
Saltmarsh	Waikouaiti River Estuary, Shag Estuary, Tokomairiro Estuary, Blueskin Estuary, Catlins Estuary, Kaikorai Estuary, Kakanui Estuary	Coastal development, pollution	Nursery area for fish, important breeding / feeding habitat for birds

Policy 11(b)(iv) habitats of indigenous species of importance for recreational, commercial, traditional or cultural purposes in the coastal environment

35. There are a number of popular diving and other recreational spots in the coastal marine area of Otago that I consider would trigger this policy. Popular examples are Danger Reef, Green Island, and Tow Rock.

Policy 11(b)(v) habitats including areas and routes important to migratory species

36. Among key habitats for migratory shorebirds in Otago in terms of non-breeding roosting habitat are Blueskin Bay, Aramoana, Otago Harbour, Hoopers Inlet, Papanui Inlet and Catlins Lake. Sooty shearwaters (*Ardenna grisea*) show one of the most long-distance migrations known in a seabird (Shaffer *et al.* 2006). They arrive in October from the North Pacific and move down the coast of the southern New Zealand South Island to the breeding colonies along isolated headlands of the eastern South Island (e.g., Taiaroa Head, Otago Peninsula) and the Rakiura / Stewart Island group (e.g., Whenua Hou / Codfish Island, Tītī / Muttonbird Islands).

Parts of the Otago Coast where there isn't currently good information on the values present

37. In the following section, I provide information on biodiversity values and areas along the Otago Coast that we currently know little about. I further provide a gap analysis based on a review of appendices 12-14 to the Section 32 report.

Examples of significant coastal biodiversity values we know very little about

38. Jones *et al.* (2016) identified biogenic habitats based on Local Ecological Knowledge (LEK) from interviews with fishers (Figure 1). Jones *et al*. 2018 then performed a national scale field survey and analysis for a subset of the habitats identified in 2016. The reports show that while many features were identified by fishers, few of these areas have been verified by targeted field surveys.

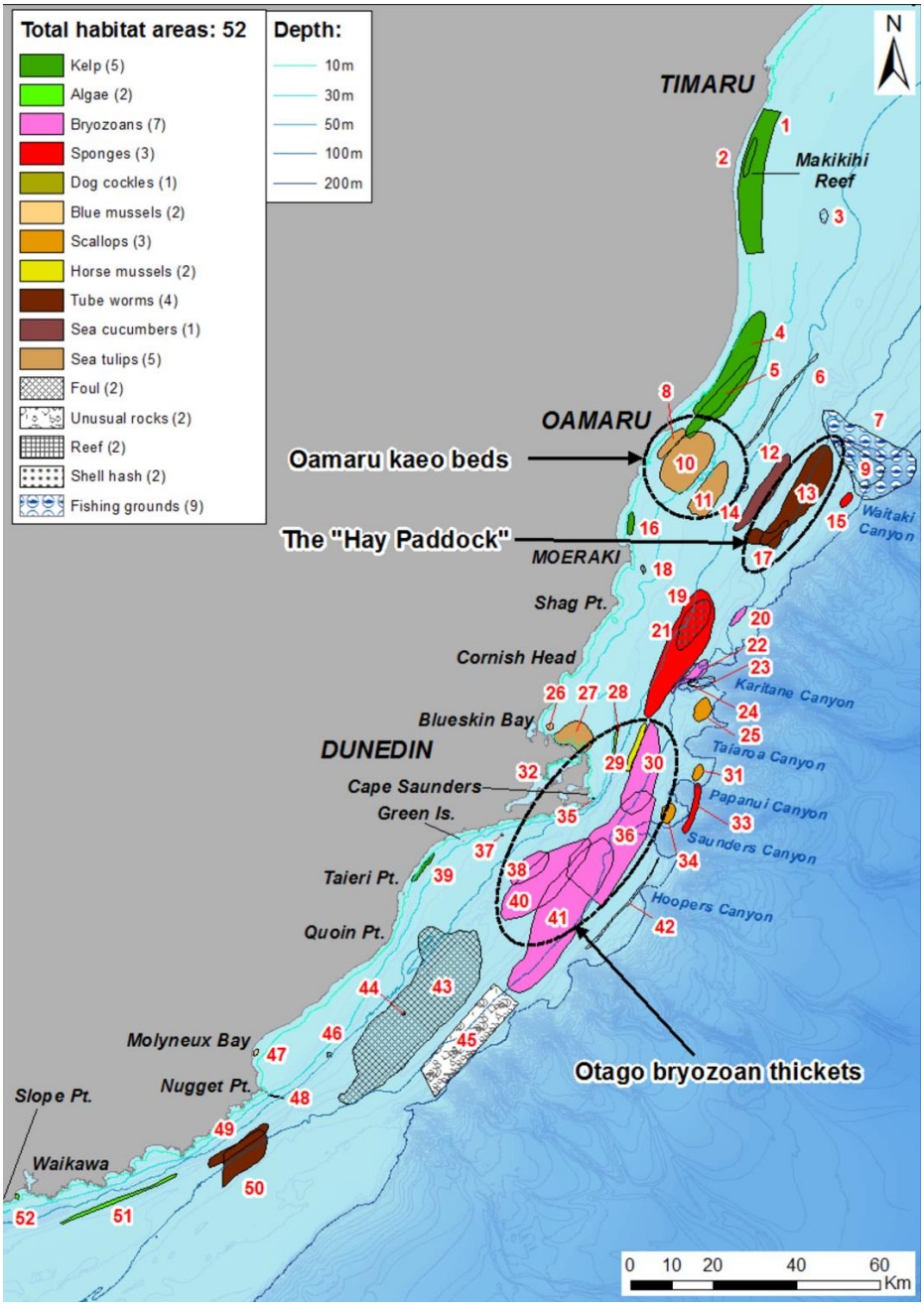

Figure 1 from Jones *et al*. 2016 (Figure 16). Local Ecological Knowledge (LEK) sites identified by interviews with fishers. A subset of these sites have since been verified (see Figure 41 in Jones *et al.* 2018).

39. Chaetopterid tubeworms or 'wire weed' likely constitute significant habitats which we don't know the extent of within the territorial sea of Otago – and they are susceptible to bottom contact fishing methods (e.g., trawling). Wire weed is known to be distributed on the east coast of the South Island from Otago to Kaikoura**.** While the presence of 'wire weed' is known over this range, the limited evidence available suggests that the appearance of this habitat varies from south to north. The examples

presented by Jones *et al.* (2018) indicate that the wire weed further south are longer and of higher density (Figure 2).

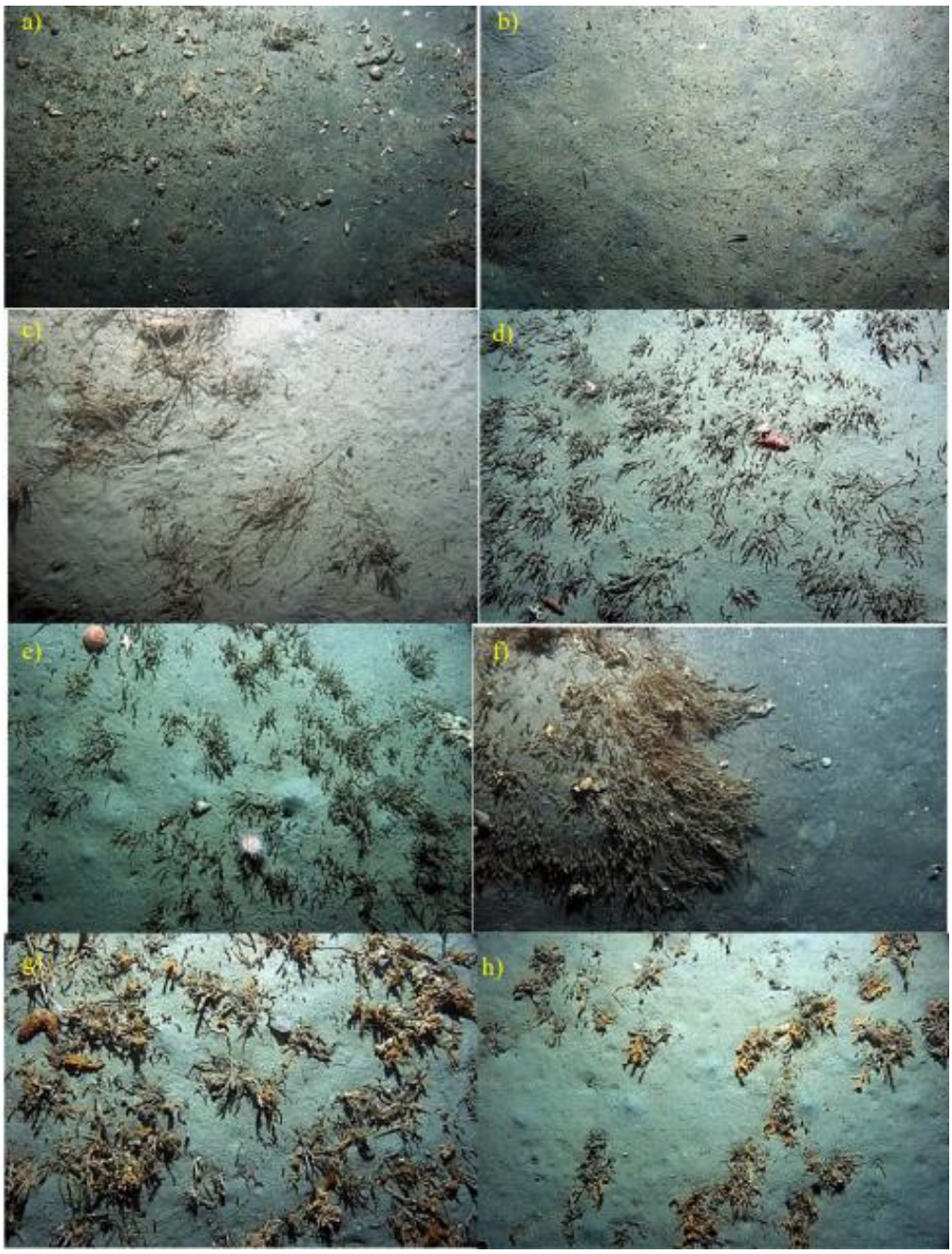

Figure 2 from Jones *et al.* 2018 (Figure 92): "Variation in chaetopterid tube worm appearance from east coast South Island sites. a) short, medium–high density, clumped (Station 156); b) short, low density, sparse (Station 25); c) long, medium–high density, clumped (Station 9); d, e) long, medium, clumped (Station 169); f) long, high, clumped (Station 156); g) long, high, clumped; h) long, medium, clumped."

40. Very little is known about the biodiversity values associated with mesophotic reefs (>30m depth) or their extent. Some limited sampling associated with Jones *et al.* 2018 inshore off the 'Hay Paddock' (off Oamaru) found that "Often abundant 'sponge

gardens' were associated with the harder reef areas, including both mound (e.g., *Polymastia croceus*) and finger forms, along with bryozoans, ophiuroids, and holothurians…" (Figure 3).

Figure 3 from Jones *et al*. 2018 (Figure 45): "Area inshore of the Hay Paddock, within a LEK [Local Ecological Knowledge] sea tulip area. a) rubble, sponge, sleeping blue cod, bryozoans, ophiuroid, b) low rock ledge with sponges, saw-shell, holothurian, c–e) sponge flats, with sleeping pigfish against fawn sponge in (d), f) coarse gravel interspersed with low reefs. Bright yellow sponges are *Polymastia croceus*."

41. There is limited information on the extent and / or location of offshore rocky reefs in Otago. Some areas have been incidentally surveyed by Land Information New Zealand (LINZ) as part of their shipping lane projects, and other data collected through research surveys (e.g., Fisheries New Zealand trawl surveys) have shown

the presence of reef-associated taxa (and hence assumed a reef is present at that location), but much of the region remains unsurveyed.

42. In addition to lack of knowledge of distribution of rocky reef habitat, gaps in information include:

    a. the distribution of intertidal benthic invertebrates (apart from Dunedin and the Otago Peninsula).

    b. mapping of subtidal benthic invertebrates south and north of the Otago Peninsula is limited, and particularly offshore (>3 nautical miles).

    c. in the Otago region there is poor characterisation of key biogenic habitats including sponge gardens, sea tulips, rhodoliths, horse mussels and oyster beds.

    d. there remains a lack of comprehensive mapping data for several estuaries

    e. there is limited data of surveys for marine mammals in offshore areas (>3 nautical miles) and;

    f. gaps remain in the at-sea distribution data for seabirds (particularly in areas other than the Otago Peninsula).

Gap analysis of appendices to the section 32 report

43. In the following section, I provide a brief gap analysis of the appendices to the section 32 report that relate to coastal-marine values in Otago. The section 32 report provides an overview of coastal marine values in the Otago region. To prepare this evidence, I have read the section 32 report focussing on the following appendices:

    a. Section 32 report Appendix 12: Wildlands Report (2020a) (Wildlands 2020a)

    b. Section 32 report Appendix 13: Wildlands Report (2020b) (Wildlands 2020b)

    c. Section 32 report Appendix 14: Wildlands Report (2021b) (Wildlands 2021b), collectively the reports

44. The reports generally provide a good overview of values that are present in Otago without going into extensive detail. Wildlands (2020a) mapped significant habitats of indigenous fauna in the marine environment. These include biogenic and rocky reefs, kelp beds, important seabird and marine mammal feeding areas, cockle beds (*Austrovenus stutchburyii*), and seagrass beds. Key information for mapping was drawn from the online mapping platform Seasketch (Kelp and seagrass beds), Forest

& Bird Important Bird Areas (IBAs) i.e., areas important for bird conservation (seabird breeding sites), the online databases ebird (holds bird observation data) and movebank (holds animal tracking data) depositories (seabird foraging), consultation with experts (marine mammal sites) and other available data.

45. As the authors acknowledge, the mapping of marine habitats presented is at best a starting point and that more surveys and up-to-date data are required to paint a comprehensive picture of significant habitats of indigenous fauna. Nevertheless, I consider that existing mapping provides a good basis for policy to protect these coastal values.

46. The pORPS will need to give effect to NZCPS Objective 1 to safeguard the integrity, form, functioning and resilience of the coastal environment and sustaining its ecosystems, including marine and intertidal areas, estuaries, dunes and land. The pORPS will further need to give effect to the NZCPS Policy 11 to protect indigenous biological diversity in the coastal environment (see my analysis in chapter one of my evidence). In my view, identifying the types and extents of habitats in the coastal marine area (habitat mapping) is a very high priority.

47. It is my understanding that the maps provided in the Wildlands (2020a) report show examples of coastal / marine values, and do not include all mapping that is referred to in the report. For example, the report refers to biogenic habitats and estuaries being mapped but these maps are not provided as part of the report. Similarly, seagrass is only presented for the Otago Harbour region although this has also been reported elsewhere (e.g., Papanui Inlet, Blueskin Bay, Waikouaiti River and at Moeraki, see Inglis 2003). Furthermore, Wildlands (2020b) states that "*Otago Regional Council commissioned mapping of the significant habitats of indigenous fauna across Otago Region, including the coastal marine part of the Region*…" and refers to two maps of "*Ecosystem types*" and "*Coastal/marine habitats of significant indigenous fauna.*". However, these maps are not shown in the report. I requested and received additional mapping material from ORC staff that I was advised support the references to mapping referred to in the Wildlands reports. This dataset includes layers of biogenic habitats and more detail on seagrass distribution than is presented in Wildlands 2020a.

48. With respect to hoiho / yellow-eyed penguin, Wildlands (2020a) provide maps of foraging distributions based on data collected from 2007 and 2013 (see Figure 12 in Wildlands 2020a). Importantly, there now is more up to date tracking data available

for hoiho throughout their range including for the southern South Island and Rakiura (Mattern and Ellenberg 2021; Mattern and Ellenberg 2022) and for juvenile birds, which differ in their distribution compared to adults (Young *et al.* 2022).

49. For seabirds more generally, terrestrial distributions for some species are mapped (see Figure 3 in Wildlands 2020a). Mapping is based on ebird and IBA data, but additional information is available in the literature (see e.g., Hand 2013). Importantly, no at-sea foraging distributions of seabirds other than hoiho appear to be mapped.

50. In my opinion, the pORPS therefore needs clear policy on an integrated mapping approach (land and at-sea distribution) to protect habitats used by indigenous fauna.

Filling the gaps

51. Significant gaps remain in the mapped coastal environment of Otago, with most mapping effort being focused within or close to Otago Harbour. Furthermore, the Wildlands (2021b) report states that "*Marine ecosystems are not currently managed for the indigenous biodiversity values, and there is no network of marine protected areas off the Otago coast. Estuaries are vulnerable to infilling, drainage, and the influences of upstream land use activities*." and that "*There are also significant information deficiencies, e.g. identification by councils of significant indigenous vegetation and significant habitats of indigenous fauna has been patchy, and relatively few sites have been scheduled in district plans to date*".

52. I agree with their analysis and conclude that there needs to be clear policy requiring comprehensive and accurate mapping i.e., via targeted surveys of the coastal marine environment (and particularly of biogenic habitats) to manage and safeguard Otago's coastal marine habitats as required NZCPS Objective 1 and Policy 11.

Controls on fishing and aquaculture and why these are required

53. In this section, I address submissions made on the notified pORPS with respect to fishing.

54. Harbour Fish, Southern Fantastic and Fantastic Holdings submitted seeking to add a section at CE-P10/11 "Commercial fishing recognise and provide for the role of commercial fishing activity in the region in contributing to the social, cultural and economic well-being of individual and communities". In addition, Otago Rock Lobster Industry Association Inc and PauaMac 5 Incorporated oppose the 'references to

overfishing and downward trends in fish and crayfish catches (SRMR-17)' in the pORPS 2021.

55. The D-G opposed these submissions as if the ORC followed the proposed changes, they would not give effect to the NZCPS. I agree with the D-G's submissions. In the following section, I provide evidence to support why I consider the pORPS 2021 needs to ensure that policies to avoid, mitigate and remedy adverse effects on coastal marine values apply to fishing when appropriate, in order to give effect to NZCPS Policy 11.

Response to submissions by Harbour Fish, Southern Fantastic and Fantastic Holdings

56. Bottom contact fishing methods can adversely affect benthic communities (Wood *et al.* 2012). MacDiarmid *et al*. (2012) performed a ranking of different threats to marine habitats in New Zealand, which included 65 human activities in New Zealand's territorial sea and the EEZ. Bottom trawling and shellfish dredging both ranked highly (3rd equal and 7th, respectively) in terms of adverse effects on benthic habitat. The physical effects of bottom trawling include the formation of trenches on the seabed from heavy fishing gear (Ivanović *et al*. 2011). This also results in the re-suspension and dispersion of sediment into the water column (O'Neill *et al*. 2013).

57. Furthermore, trawling can lead to decreased heterogeneity of benthic habitat and benthic communities, with particularly strong adverse effects on biogenic habitats (Rice 2006; Kaiser *et al*. 2006). Longer-lived, slow-growing and fragile species or communities (e.g., sponges, hydroids, cold water corals, brachiopods, tubeworms, bryozoans, horse mussels, rhodoliths, and red algae beds) are particularly susceptible to disturbance by bottom-towed fishing gear (e.g., shellfish dredges, bottom trawls, Danish seines). Recovery times depend on the affected habitat or community type, physical conditions as well as scale and intensity of fishing operations. Figure 4 shows the bottom contact trawling effort in the territorial sea of Otago (within 12 nautical miles) between October 2009 and September 2019 and suggests substantial trawling effort in much of the coastal marine area of Otago, with reduced effort in the area adjacent to the Otago Peninsula.

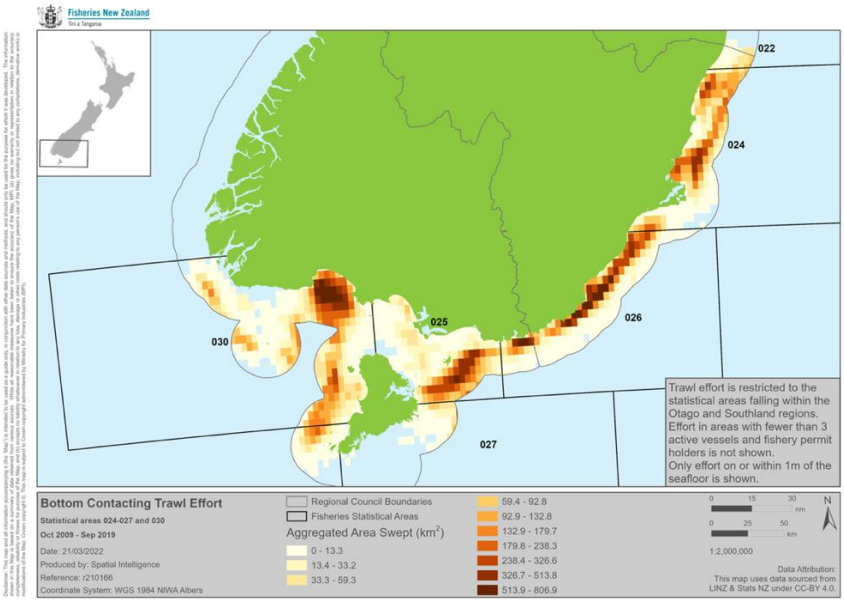

Figure 4 Map showing trawl effort for Otago between 2009 and 2019. The grid size is 3 nautical miles (Source: Ministry for Primary Industries).

58. Adverse effects from other fishing methods on marine habitats including potting / trapping, line fishing and netting ranked much lower according to (MacDiarmid *et al*. 2012). Importantly, the ranking of effects was carried out at a national scale, leading to a higher ranking of activities (e.g., trawling) that are carried out widely in New Zealand than those that are more localised. Therefore, comparing rankings at local / regional scale may not be appropriate without taking the local context into account.

59. In my opinion, bottom-towed fishing gear can have adverse and lasting effects on benthic communities. The pORPS needs to ensure that policies to avoid, mitigate and remedy adverse effects on coastal marine values apply to fishing when appropriate, in order to give effect to NZCPS Policy 11.

Response to submission by Otago Rock Lobster Industry Association Inc and PauaMac 5 Incorporated

60. Where the Fisheries Act 1996 (FA) cannot be relied upon to protect biodiversity values in the coastal marine area, the Resource Management Act 1991 (RMA) can be used as a tool to control adverse effects of fishing methods on biodiversity values.

61. In 2019, a decision by the Court of Appeal in the Motiti court case confirmed that regional councils have jurisdiction under the RMA to manage the effects of fishing as long as this is for the purpose of maintaining indigenous biodiversity or for managing

other resource values, but not for managing fisheries resources, which are managed under the FA.

62. I consider that the pORPS should include clear policy to enable protection of marine biodiversity values where this is not able to be achieved by FA tools. Counsel for the D-G will provide legal submissions addressing this further.

Adverse effects of aquaculture on marine biodiversity values

63. Aquaculture is an example of a threat that ranked relatively low at a national scale (MacDiarmid *et al.* 2012), but aquaculture can have adverse localised effects on marine habitats (Forrest *et al.* 2007). Direct benthic effects and other effects of aquaculture ranked 19th and 36th respectively in the assessment by MacDiarmid *et al.* 2012.

64. Direct adverse effects on benthic communities from finfish aquaculture include the deposition of faeces and surplus food as well as the accumulation of trace contaminants (e.g., copper and zinc) from artificial food and antifouling coatings of farm structures beneath finfish cages (Forrest *et al*. 2007). This can lead to anoxic zones, changes in the chemistry of the seafloor as well as a reduced species diversity. Other potential adverse effects are smothering, shading and physical damage to benthos communities (e.g., from anchors), as well as nutrient enrichment in the water column, potentially stimulating toxic algae blooms. There is also a biosecurity risk associated with pest fouling species settling on farm structures (Forrest *et al.* 2007) (Figure 5).

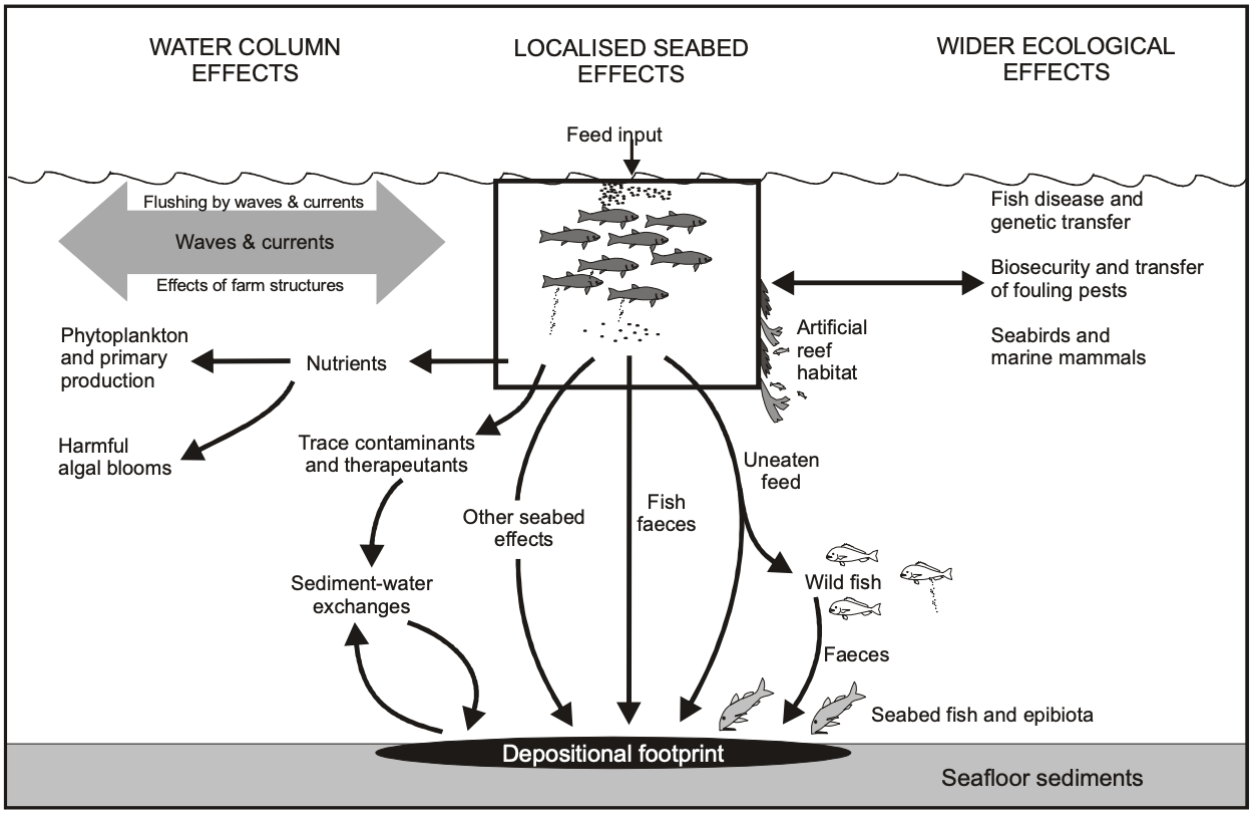

Figure 5. Schematic of potential ecological effects from fish farming (Source: Forrest et al. 2007). Note: anchor field impacts are not shown in this figure.

65. In my opinion, aquaculture can have adverse and lasting effects on benthic communities. I consider the pORPS needs clear policy to balance avoidance of adverse effects of aquaculture on indigenous biodiversity while recognising its potential benefits.

pORPS APP2 Significance criteria for indigenous biodiversity and how this relates to significant indigenous biodiversity in the coastal marine environment.

66. I have reviewed criteria as proposed in APP2 the pORPS, the recommended changes by the section 42A report and compared them to criteria in the exposure draft National Policy Statement for Indigenous Biodiversity (E draft NPSIB). The E draft NPSIB provides guidance for identifying significant indigenous vegetation or significant habitats of indigenous fauna in a specific area. According to the E draft NPSIB, an area qualifies as a significant area if it meets at least one out of four criteria (i.e., (a) representativeness; (b) diversity and pattern; (c) rarity and distinctiveness; or (d) ecological context. I further compared the E draft NPSIB criteria with those proposed in the pORPS (as of APP2 in s42A report for chapter 10, dated 4 May 2022) and criteria with Key Ecological Area (KEA) criteria (Freeman *et al.* 2017).

67. I support the use of the E draft NPSIB criteria because in my view they are applicable across land, freshwater and marine domains and promote integrated management as required by the RMA**.** Such integrated application is necessary as the marine environment often crosses boundaries with terrestrial (e.g., yellow-eyed penguins breeding on land, foraging at sea) and freshwater systems (e.g., whitebait lay eggs in freshwater, move to the sea as larvae, grow into juveniles at sea, then travel back upstream growing into adults).

68. In my view, after analysing criteria in the pORPS and section 42A report, the proposed criteria (as per amendments made in the s42A report) are generally appropriate as they are guided by criteria in the E draft NPSIB and mostly align with KEA criteria and Policy 11 criteria in the NZCPS. However, the detail in the sub clauses of each significance criterion should be fine-tuned by an expert panel to set appropriate threshold levels for each criterion in the context of the pORPS (see Appendix 1 for a comparison of significant indigenous biodiversity criteria of the existing and proposed policies mentioned above).

Review of the s42A report (Chapter 8: CE – Coastal Environment)

69. I have read the s42A report for Chapter 8 and the corresponding supplementary evidence. I note that the policy CE-P2 'Identification' does not currently cover areas of significant indigenous taxa and ecosystems. I consider it therefore fails to give effect to NZCPS 2010 Policy 11.

70. I therefore support the submission made by the D-G that clause 1 of policy CE-P2 should be amended to include areas of significant indigenous taxa and ecosystems. I further recommend that clause 2 should be amended to include indigenous vegetation and fauna as well as ecosystems for completeness.

Hendrik Schultz

Dated 28 November 2022

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Appendix 1

Comparison of significant indigenous biodiversity criteria for existing and proposed policies.

NZCPS Policy 11	KEA	pORPS (as of s42A)	E draft NPSIB
		Representativeness s42 considers **naturalness** to be included in this point	Representativeness Indigenous vegetation **typical** for ecological district Habitat supporting typical indigenous fauna
a(v) areas containing nationally significant examples of indigenous community types; a(vi) areas set aside for full or partial protection of indigenous biological diversity under other legislation;	6. Biological diversity Area contains comparatively higher diversity of ecosystems, habitats, communities or species, or has higher genetic diversity.	Diversity s42 considers that areas containing **diverse ecosystem services** are captured under diversity/ecological context	Diversity and pattern criterion **Diversity** of indigenous species, vegetation, habitats of indigenous fauna or communities Presence of indigenous **ecotones**, complete or partial gradients or sequences
a(i) indigenous taxa that are listed as threatened or at risk in the NZ TCS; a(ii) taxa that are listed by the IUCN as threatened; a(iii) indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare; a(iv) habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare;	2. Uniqueness / rarity / endemism Area contains either (i) unique ("the only one of its kind" rare (occurs only in a few locations) or endemic species, populations or communities; and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanography features 4. Importance for threatened/declining	Rarity Distinctiveness s42 recommends adding the following sub-criterion to Distinctiveness: Vegetation, habitats, species, populations, and species assemblages that have relatively high natural productivity" Covered by existing criteria: Importance for Threatened and declining species/habitats (assumed	Rarity and distinctiveness Provides habitat for an indigenous species that is listed as **Threatened or At Risk (Declining)** indigenous vegetation type or an indigenous species that is **uncommon** Indigenous species or plant community **at or near its natural distributional limit** Indigenous vegetation that has been reduced to **less than 20**

NZCPS Policy 11	KEA	pORPS (as of s42A)	E draft NPSIB
a(vi) areas set aside for full or partial protection of indigenous biological diversity under other legislation	species and habitats Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species 5. Biological productivity Area containing species, populations or communities with comparatively higher natural biological productivity	means here but S42 is non-specific)	**per cent of its pre-human extent** Indigenous vegetation or habitat of indigenous fauna occurring on **naturally uncommon ecosystems** **Type locality** of an indigenous species Presence of a **distinctive** assemblage or community of indigenous species Presence of a **special ecological** or scientific feature
b(ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species; b(v) habitats, including areas and routes, important to migratory species; b(vi) ecological corridors, and areas important for linking or maintaining biological values identified under this policy;	8. Ecological function Area containing species or habitats that have comparatively higher contributions to supporting how ecosystems function	Ecological Context s42 considers **importance for life history stages** to be included in Ecological Context	Ecological Context At least moderate **size** and a compact **shape** Well-**buffered** relative to remaining habitats Provides an important full or partial **buffer to or link between, one or more important habitats** of indigenous fauna or significant natural areas Important for the natural **functioning of an ecosystem** relative to remaining habitats in the ecological district.
a(ii) taxa that are listed by the IUCN as threatened;	1. Vulnerability, fragility, sensitivity, or slow recovery	s42 recommends adding criterion: Vulnerable and sensitive species	

NZCPS Policy 11	KEA	pORPS (as of s42A)	E draft NPSIB
b(iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification	Areas that contain a relatively **high proportion of sensitive habitats, biotopes or species** that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery 3. Special importance for life history stages Areas that are required for a population to survive and thrive 7. Naturalness Area with a comparatively **higher degree of naturalness** as a result of the lack of or low level of human-induced disturbance or degradation		
b(iv) habitats of indigenous species in the coastal environment that are important for recreational, commercial, traditional or cultural purposes;			