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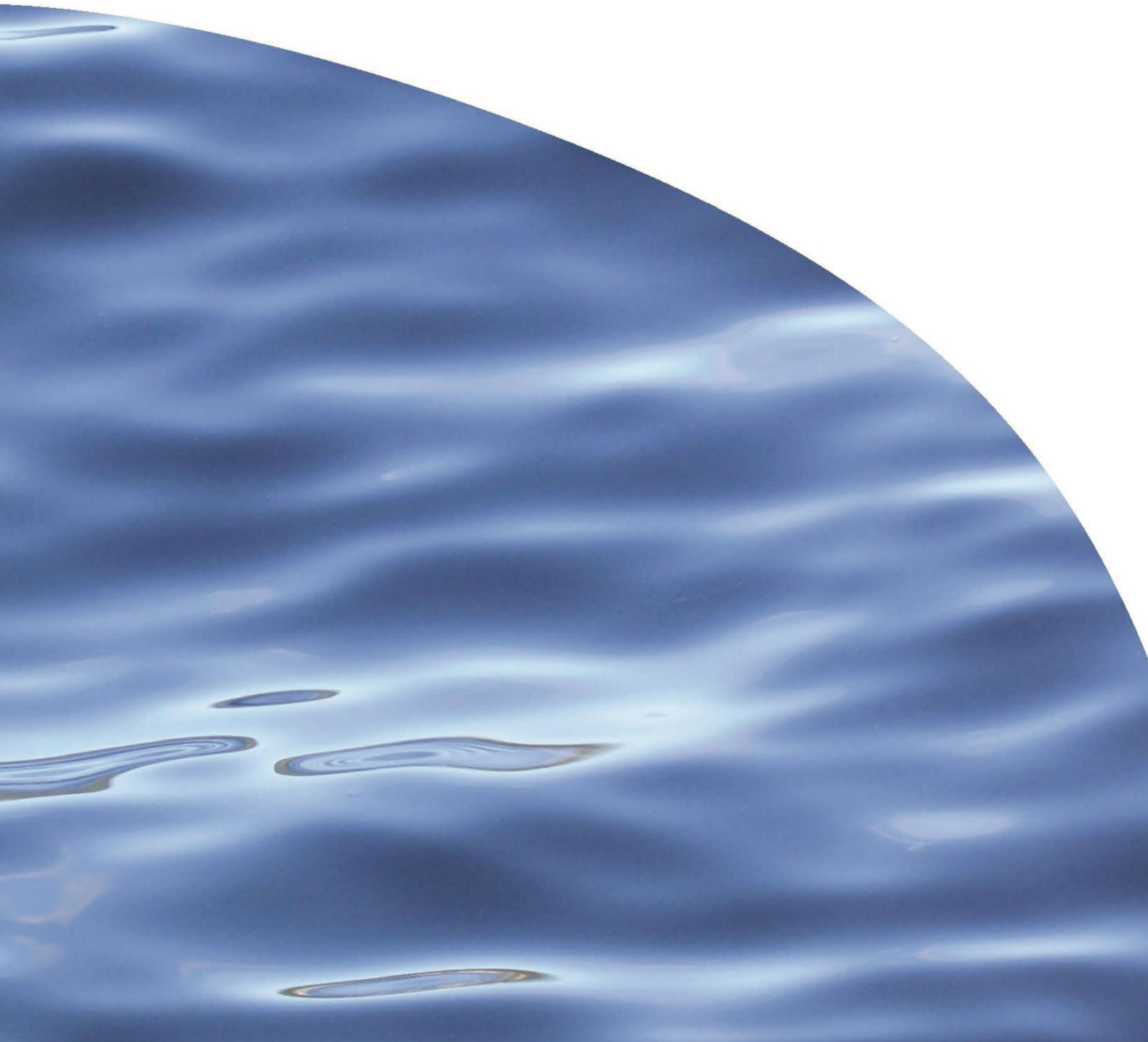
# ADVICE FOR THE NCC WHAKAMAHERE WHAKATU NELSON PLAN: COASTAL INDIGENOUS BIODIVERSITY



# ADVICE FOR THE NCC WHAKAMAHERE WHAKATU NELSON PLAN: COASTAL INDIGENOUS BIODIVERSITY

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Prepared for Nelson City Council

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# EXECUTIVE SUMMARY

Nelson City Council (NCC) is reviewing the operative Nelson Resource Management Plan (NRMP), and preparing its successor, the Whakamahere Whakatu Nelson Plan. Marine Areas of Significant Conservation Value (Marine ASCV) are currently mapped in the NRMP, but NCC has identified some weaknesses associated with the current approach. The Marine ASCV approach was reviewed in the light of available information regarding marine biodiversity.

The Nelson coastal terrestrial and marine areas are small compared to those of other New Zealand councils, and many areas are important for multiple species and ecosystems. We propose that marine indigenous biodiversity values are described for the whole coastal and marine area. This is because in such a small region it is not appropriate to identify specific areas that are of particular importance to the protection of indigenous biodiversity, and thereby exclude other areas. Moreover, rather than describing values across areas that contain a range of habitats, we recommend description of values by habitat type. This allows for more specific identification of values and threats, and recognition of the distribution of some habitat types across the region. It also allows for reflection of uncertainty, which is of particular importance in the consideration of subtidal communities. For planning purposes we recommend a focus on broad groupings of species (e.g., wading birds) rather than explicit inclusion of all species. This recognises that many species have substantially overlapping distributions and similar habitat usage, and also allows for changing threat classification status of particular species.

We define a series of intertidal and subtidal habitat types and for each, identify in tabular form the status and importance for indigenous biodiversity, and key threats. The relevance of the habitat to the New Zealand Coastal Policy Statement (2010) Policy 11 (Indigenous biological diversity) is also indicated. The inclusion of this material, or similar, in the Whakamahere Whakatu Nelson Plan may be appropriate. Mapping is likely to be a useful supplementary approach to descriptive identification of habitat.

While identification of habitats and threats has value for management purposes, the interrelationships between species and habitats means that management of any species or habitat in isolation is not realistic. Protection of any one component of indigenous biodiversity requires consideration of the multiple interrelationships with other areas, habitats and species.

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# 1. INTRODUCTION

## 1.1. Background

This work supports the Nelson City Council's review of the operative Nelson Resource Management Plan and the preparation of its successor, the Whakamahere Whakatu Nelson Plan. The NRMP replacement, the Whakamahere Whakatu Nelson Plan (WWNP), will be released as a draft for public input in January 2017 and is expected to be publicly notified in mid-2017. Nelson City Council (NCC) has commenced a full review of the operative Nelson Resource Management Plan (NRMP), under the Resource Management Act 1991 (RMA). The NRMP includes regional coastal plan provisions. Since the NRMP was made operative, the New Zealand Coastal Policy Statement 2010[1] (NZCPS) has been adopted. The regional coastal plan provisions of the NRMP need to be reviewed to account for the direction set by the NZCPS, and to reflect new information about values within the coastal environment and feedback from Plan users.

The Resource Management Act makes reference to areas of 'significant conservation value' in the context of managing effects of activities (e.g. Section 68(4)), and to 'areas of significant indigenous vegetation and significant habitats of indigenous fauna'—the latter being a matter of national importance under Section 6 of the RMA (preservation of the natural character of the coastal environment, and of wetlands, is also of national importance). Most councils have identified Areas of Significant Conservation Value (ASCV) in their regions to facilitate management of effects of activities—some are in the CMA and Nelson has called these Marine ASCV.

Marine Areas of Significant Conservation Value (Marine ASCV) are currently mapped in the NRMP (and defined in appendix 4 of the NRMP). Some activities are subject to more stringent consent requirements if they are located in a Marine ASCV. Generally, where activities in the CMA otherwise require consent, consideration is to be given to the nature of the activity and its effects on relevant Marine ASCV. NCC has identified the following weaknesses associated with the current approach to defining Marine ASCV.

- The mapping and descriptions of the values associated with Marine ASCV are general and may not reflect currently up-to-date information.
- The Marine ASCV descriptions do not assess how values accord with the specifications set out in either NZCPS Policy 11(a) or (b).
- The areas mapped as Marine ASCV may not acknowledge that significant values could be present in areas of the CMA outside their currently mapped limits.

[1] http://www.doc.govt.nz/about-us/science-publications/conservation-publications/marine-and-coastal/new-zealand-coastal-policy-statement/new-zealand-coastal-policy-statement-2010/

- The Marine ASCV were originally identified not just for their ecological value but also their value in coastal natural character and landscape terms. Marine ASCV are not in any case referenced in the current NZCPS. Recent work by NCC to address other NZCPS obligations has identified areas of outstanding coastal natural character and natural features, which can now be defined in the new WWNP on their own terms[2]. This presents an opportunity to review areas of significant conservation value on ecological terms alone.
- The current descriptions for each Marine ASCV do not identify relevant threats to the environment. Identification of these threats would assist in the broader review of consent requirements in the CMA.
- Marine ASCV are currently mapped only in locations below marine high water spring (MHWS) and yet the descriptions make reference to values and habitats found in the broader coastal environment above that mark (e.g. spits, the Boulder Bank, the Back Beach)

## 1.2. Scope of the present work

This study addresses the issues listed above in a desktop review of relevant information. The results, presented in this report, will directly inform the development of replacement Plan provisions relating to coastal and marine ecological values.

Note that (as per NCC's original project brief) 'ecological value' is defined according to Policy 11 (a) and (b) of the NZCPS. The purpose of Policy 11 is to protect indigenous biological diversity in the coastal environment, and the term 'ecological value' is therefore interchangeable with 'indigenous biodiversity' for present purposes.

Specifically, the present study:

- considers the extent to which the current Marine ASCV areas capture important areas for the protection of marine indigenous biodiversity with reference to NZCPS Policy 11y
- considers whether areas important to the protection of marine indigenous biodiversity can be:
    - better described in a general table relating to the entire CMA or the broader coastal environment, rather than mapped
    - specifically mapped and described on that basis, and / or

[2] But note that Natural character (Policies 13 and 14) includes values related to indigenous biodiversity, and Policy 26 Natural defences against coastal hazards recognises that natural defences include coastal vegetation, and also provide protection for sites of significant biodiversity.

    - best collated with other values into broader areas for mapping purposes
- considers whether current Marine ASCV areas should be retained as a spatial tool, redefined in terms of location, or dropped
- identifies suitable information sources for mapping of habitats where appropriate
- in table format, describes areas identified in Appendix 4 of the NRMP (current Marine ASCV areas), and other areas important to the protection of indigenous diversity. Identifies:
    - which of the specific criteria in NZCPS Policy 11(a) and (b) apply
    - what threats are faced by habitats or taxa (e.g. sedimentation, direct disturbance, competition from introduced species, habitat destruction etc.)
- reviews approaches taken in recently notified or adopted 'second generation' RMA regional coastal plan provisions to take advantage of best practice.
- considers habitat important to indigenous marine biodiversity, but above MHWS. Specifically included are shore or seabird habitat associated with spits, beaches or the Boulder Bank.

# 2. PROTECTION REQUIREMENTS AND CURRENT LEVELS OF PROTECTION

## 2.1. New Zealand Coastal Policy Statement

The purpose of the New Zealand Coastal Policy Statement (NZCPS) is to 'state policies in order to achieve the purpose of the Resource Management Act 1991…in relation to the coastal environment of New Zealand'. Regional policy statements and plans must give effect to the NZCPS. Consent authorities must also give regard to any relevant provisions of the NZCPS when considering applications for resource consents. Similarly, territorial authorities must have regard to any relevant provisions of the NZCPS when considering environmental effects of requirements for designation[3].

Objective 1 of the NZCPS is:

> To safeguard the integrity, form, functioning and resilience of the coastal environment and sustain its ecosystems, including marine and intertidal areas, estuaries, dunes and land, by:
>
> - maintaining or enhancing natural biological and physical processes in the coastal environment and recognising their dynamic, complex and interdependent nature;
> - protecting representative or significant natural ecosystems and sites of biological importance and maintaining the diversity of New Zealand's indigenous coastal flora and fauna; and
> - maintaining coastal water quality, and enhancing it where it has deteriorated from what would otherwise be its natural condition, with significant adverse effects on ecology and habitat, because of discharges associated with human activity.

The first and second of these bullets are the focus of the present study in terms of assessing the extent to which the current Marine ASCV areas capture important issues for the protection of marine indigenous biodiversity, with reference to NZCPS Policy 11.

[3] A designation is a 'spot zoning' over a site, area or route in a district plan and allows the requiring authority (Ministers of the Crown, local authorities and network utility operators approved under the RMA) to undertake works within the designated area.

The NZCPS describes the extent and characteristics of the coastal environment:

Policy 1: Extent and characteristics of the coastal environment.

1. Recognise that the extent and characteristics of the coastal environment vary from region to region and locality to locality; and the issues that arise may have different effects in different localities.
2. Recognise that the coastal environment includes:
    a) the coastal marine area;
    b) islands within the coastal marine area;
    c) areas where coastal processes, influences or qualities are significant, including coastal lakes, lagoons, tidal estuaries, saltmarshes, coastal wetlands, and the margins of these;
    d) areas at risk from coastal hazards;
    e) coastal vegetation and the habitat of indigenous coastal species including migratory birds;
    f) elements and features that contribute to the natural character, landscape, visual qualities or amenity values;
    g) items of cultural and historic heritage in the coastal marine area or on the coast;
    h) inter-related coastal marine and terrestrial systems, including the intertidal zone; and
    i) physical resources and built facilities, including infrastructure, that have modified the coastal environment.

The scope of the present review is limited to coastal and marine ecological values, as noted in Section 1.2. Consequently, items 2 (d), (f), (g) and (i), above, are outside the scope.

The purpose of Policy 11 of the NZCPS is the protection of indigenous biological diversity in the coastal environment:

Policy 11: Indigenous biological diversity (biodiversity)

To protect indigenous biological diversity in the coastal environment:

a. avoid adverse effects of activities on:
    i. indigenous taxa that are listed as threatened or at risk in the New Zealand Threat Classification System lists
    ii. taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened;

iii. indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare

iv. habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare;

v. areas containing nationally significant examples of indigenous community types; and

vi. areas set aside for full or partial protection of indigenous biological diversity under other legislation; and

b. avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on:

i. areas of predominantly indigenous vegetation in the coastal environment;

ii. habitats in the coastal environment that are important during the vulnerable life stages of indigenous species;

iii. indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh;

iv. habitats of indigenous species in the coastal environment that are important for recreational, commercial, traditional or cultural purposes;

v. habitats, including areas and routes, important to migratory species; and

vi. ecological corridors, and areas important for linking or maintaining biological values identified under this policy.

## 2.2. Protection of marine indigenous biodiversity provided by current Marine ASCV

The only coastal areas in the Nelson CMA not designated in the current plan as Marine ASCV are the area from Tahunanui Beach to Haulashore Island and a small section of coast south of the Whangamoa Estuary. The remainder of the coastal area from Cape Soucis (the northern limit of the Nelson region) to the Waimea Inlet (the eastern part of which constitutes the southern-most part of the Nelson coast) are Marine ASCV. Details of how the Marine ASCV relate to the requirements of Policy 11 are shown in Table 1.

Table 1. Summary of the extent to which current Marine ASCV capture important issues for the protection of marine indigenous biodiversity with reference to Policy 11. Information derived from Nelson City Council surveys of significant indigenous vegetation and significant habitats of indigenous fauna 2006–2007. Conservation status of organisms are from http://www.doc.govt.nz/nztcs (accessed September 2016).

| Marine ASCV Site name | Values relevant to NZCPS Policy 11 and site value |
|---|---|
| Back Beach | **11(a)(iv) habitats of indigenous species where the species are at the limit of their natural range or are naturally rare:**<br>Only known habitat of the carabid beetle *Bembidion* (*Zecillenus*) *tillyardi*<br>**11(b)(iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh:**<br>Dunelands, intertidal zones, saltmarsh |
| Boulder Bank | **11(a)(i) indigenous taxa that are listed as threatened or at risk in the NZ Threat Classification System lists:**<br>Nesting, roosting and/or feeding site for banded dotterel (Threatened: nationally vulnerable), red-billed gull (Threatened: nationally vulnerable), white-fronted tern (At risk: declining), little blue penguin (At risk: declining), variable oystercatcher (At risk: recovering), royal spoonbill (At risk: naturally uncommon)<br>Presence of:<br>*Myosotis brevis* (Threatened plant: nationally vulnerable and the only location in the Nelson district from which it has been recorded), *Melicytus crassifolius* (At risk plant: declining)<br>**11(a)(iv) habitats of indigenous species where the species are at the limit of their natural range or are naturally rare:**<br>Royal spoonbill<br>**11(b)(ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species:**<br>Nesting site for banded dotterel, red-billed gull, southern black-backed gull, white-fronted tern, Caspian tern, variable oystercatcher, royal spoonbill, New Zealand fur seal (haul-out for juveniles)<br>**11(b)(v) habitats, including areas and routes, important to migratory species:**<br>Migratory wading birds<br>**11(b)(vi) ecological corridors, and areas important for linking or maintaining biological values identified under this policy**<br>Movements of birds, fish and invertebrates among coastal habitats |
| Waimea Inlet | **11(a)(i) indigenous taxa that are listed as threatened or at risk in the NZ Threat Classification System lists:**<br>Presence of white heron (Threatened: nationally critical), Australasian bittern (Threatened: nationally endangered), banded rail (At risk: declining), red-billed gull, white-fronted tern, variable oystercatcher, South Island pied oystercatcher (At risk: declining), royal spoonbill<br>**11(a)(iv) habitats of indigenous species where the species are at the limit of their natural range or are naturally rare:**<br>Royal spoonbill |

Table 1, continued

| Marine ASCV Site name | NZCPS Policy 11 and site value |
|---|---|
| Waimea Inlet, cont. | **11(b)(ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species:**<br>Nesting, staging and / or moulting site for several bird species including variable oystercatcher, South Island pied oystercatcher, wrybill, red knot and bar-tailed godwit<br>Spawning habitat for *Galaxias* spp. (including At risk species)<br>**11(b)(iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh:**<br>Estuaries, coastal wetlands, intertidal zones, eelgrass, saltmarsh<br>**11(b)(v) habitats, including areas and routes, important to migratory species**<br>Migratory wading birds including bar-tailed godwit<br>**11(b)(vi) ecological corridors, and areas important for linking or maintaining biological values identified under this policy**<br>Movements of birds, fish, invertebrates and nutrients among freshwater, estuarine and coastal habitats |
| Nelson Haven | **11(a)(i) indigenous taxa that are listed as threatened or at risk in the NZ Threat Classification System lists:**<br>Roosting and/or feeding site for banded dotterel, red-billed gull, white-fronted tern, variable oystercatcher, South Island pied oystercatcher, royal spoonbill<br>**11(a)(iv) habitats of indigenous species where the species are at the limit of their natural range or are naturally rare:**<br>Royal spoonbill<br>**11(b)(ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species:**<br>Spawning habitat for *Galaxias* spp. (including At risk species)<br>**11(b)(iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh:**<br>Estuaries, coastal wetlands, intertidal zones, eelgrass, saltmarsh<br>**11(b)(v) habitats, including areas and routes, important to migratory species**<br>Migratory wading birds including bar-tailed godwit |
| The Glen to Cable Bay | **11(a)(vi) areas set aside for full or partial protection of indigenous biological diversity under other legislation:**<br>Horoirangi Marine Reserve<br>**11(b)(iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh:**<br>Intertidal zones, rocky reef systems |

Table 1, continued

| Marine ASCV Site name | NZCPS Policy 11 and site value |
|---|---|
| Delaware Inlet, Spit and Pepin Island | **11(a)(i) indigenous taxa that are listed as threatened or at risk in the NZ Threat Classification System lists:**<br>Nesting, roosting and/or feeding site for banded dotterel, sooty shearwater (At risk: declining – breeds on offshore islets), blue penguin (At risk: declining[4] – breeds on offshore islets) , reef heron (Threatened: Nationally endangered – possibly breeding), white-fronted tern, variable oystercatcher, royal spoonbill<br>Spotted skink (At risk: relict)<br>**11(a)(iv) habitats of indigenous species where the species are at the limit of their natural range or are naturally rare:**<br>Royal spoonbill<br>**11(b)(ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species:**<br>Nesting site for banded dotterel, variable oystercatcher, sooty shearwater, little blue penguin, reef heron(?), southern black-backed gulls, New Zealand fur seal (haul-out for juveniles)<br>Spawning habitat for native fish.<br>**11(b)(iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh:**<br>Intertidal zones, rocky reef systems, duneland, low coastal forest on bedrock, rockland plant communities, coastal flaxland, grass-shrub herbfield, sea-rush rushland, saltmarsh, coastal-margin forest |
| Whangamoa Estuary | **11(a)(i) indigenous taxa that are listed as threatened or at risk in the NZ Threat Classification System lists:**<br>Presence of banded dotterel (Threatened: nationally vulnerable), banded rail, South Island fernbird (At risk: declining), variable oystercatcher, marsh crake (At risk: relict)<br>**11(a)(iv) habitats of indigenous species where the species are at the limit of their natural range or are naturally rare:**<br>*Oleander solandri* (coastal shrub-daisy, western limit of distribution in the South Island)<br>**11(b)(ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species:**<br>Nesting site for banded dotterel, banded rail, South Island fernbird, variable oystercatcher, marsh crake<br>Spawning habitat for *Galaxias* spp. (including At risk species) |

[4] Robertson et al. 2012 list four subspecies of little blue penguin (*Eudyptula minor*), with different conservation status, but these are no longer recognised: source New Zealand Birds Online, http://nzbirdsonline.org.nz/species/little-penguin, accessed September 2016.

Table 1, continued

| Marine ASCV Site name | NZCPS Policy 11 and site value |
|---|---|
| Whangamoa Estuary | **11(b)(iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh:** Intertidal zones, duneland, sea-rush rushland, sedgeland, saltmarsh, estuarine shrublands, coastal-margin forest |
| Whangamoa River mouth to Cape Soucis | **11(b)(iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh:** Intertidal zones, rocky reef systems |

## 2.3. Limitations of Marine ASCV in protection of marine indigenous diversity

The Marine ASCV identify many important aspects of indigenous biodiversity in the Nelson CMA, however there are a number of limitations as the areas selected:

- are strongly focussed on bird habitat and species
- do not identify the existence of a number of important habitats in the designated areas (e.g., seagrass, estuarine sponge gardens)
- exclude most subtidal habitat, including seaweed communities (rocky reef communities are specifically mentioned in NZCPS Policy 11b), the extensive soft-sediment communities, and open water that constitute the majority of the CMA
- do not consider lost/degraded habitat (e.g., shellfish reefs)[5]
- reflect a range of values, not just protection of indigenous biodiversity (for example, they incorporate natural character and geomorphological values), this could confuse consideration of biodiversity issues.

For these reasons, we do not consider that the current Marine ASCV identify the key habitats important to marine indigenous biodiversity, nor are they an adequate response to the obligations of the NZCPS.

[5] We note that degraded habitat is not explicitly considered under Policy 11, however we feel that it should nonetheless be recognised in plans to avoid the phenomenon of 'shifting' or 'sliding baselines', sensu Dayton et al. (1998).

## 2.4. Approaches taken in other coastal plans

Councils have employed a range of approaches to the protection of indigenous biodiversity, and other natural values in the coastal and marine environment. For example:

- The Horizons[6] OnePlan 2015 incorporates a very broad description of the coastal environment at the beginning of the coastal chapter (chapter 8). Schedule F identifies habitat types and conservation status. This includes wetlands and duneland, but no subtidal areas. Cape Turnagain and river mouth areas are identified as 'Protection Activity Management Areas' (part B) due to their 'Ecological and other important characteristics' (e.g., saltmarsh, or habitat for fish feeding and nursery areas, bird foraging and roosting, marine mammal haulout). These areas are mapped.
- The Bay of Plenty[7] Draft Plan 2015 includes a schedule of Indigenous Biological Diversity Areas in the Coastal Environment (schedule 2). This consists of two tables that address all clauses of the NZCPS 11a and b. There is substantial detail on birds, but also vegetation, bats, forest and freshwater fish. Marine areas include estuarine wetlands, snapper spawning grounds and subtidal rocky substrate. Dozens of areas are described and mapped.
- The Regional Coastal Plan for Southland[8] 2013 (notified prior to the NZCPS 2010) includes a substantial section describing values of the Coastal Marine Area, stated by area (chapter 3). Sections include 'Marine mammals and birds', and 'Ecosystems, vegetation, and fauna habitats'. 'Areas containing significant values' are summarised in tables in appendix 5, but it is noted that further detail is included in the descriptive material in chapter 3, i.e., tables are not comprehensive. Table headings are:
    - Description (area)
    - Maori Cultural Values
    - Protected Areas
    - Wetlands, Estuaries, Coastal Lagoons
    - Marine Mammals and Birds
    - Ecosystems, Flora and Fauna Habitats
    - Scenic Values
    - Historic Values
    - Coastal Landforms and Associated Processes.

  Accordingly, many values other than protection of indigenous biodiversity are considered.
- The draft Marlborough[9] Regional Policy Statement (RPS 2016, Chapter 8: Indigenous Biodiversity, and Chapter 13: Use of the Coastal Environment)

[6] www.horizons.govt.nz
[7] www.boprc.govt.nz
[8] www.es.govt.nz
[9] www.marlborough.govt.nz

recognises the process of identification of significant natural areas. This includes consideration of representativeness, rarity, diversity and pattern, and distinctiveness. This process has been applied to the marine environment to produce 'Ecologically Significant Marine Sites in Marlborough, New Zealand' (Davidson et al. 2011), and subsequent material[10]. However, the limitations of available data are also recognised. The Marlborough draft RPS states that 'Adverse effects from subdivision, use and development activities are to be avoided in areas having: … (c) Significant marine biodiversity value and/or are a significant wetland'. The values are to be mapped in the RPS[11] (Policy 13.1.2). The process for adding significant areas to the RPS/Resource Management Plan on the basis of new information is recognised (that being the First Schedule process of the RMA, identified in Policy 13.1.3).

- In the Northland Regional Council[12] Regional Policy Statement (2016) criteria for ecological significance are given (appendix 5): representativeness, rarity/distinctiveness, diversity and pattern, and ecological context. In the Northland Regional Council Draft Regional Plan (2016) Significant Ecological Areas are identified as: Significant Ecological Areas, Significant Bird Areas, and Significant Marine Mammal and Seabird Areas (section I.3). These areas are mapped, and the whole coast is classed as significant in one or more of the three categories. Outstanding natural features (I.4) and areas of outstanding natural character (I.5) are mapped separately.

[10] www.marlborough.govt.nz/Environment/Coastal/Coastal-Ecosystems/Significant-Marine-Sites.aspx
[11] Maps are available online at maps.marlborough.govt.nz/smartmaps
[12] www.nrc.govt.nz

# 3. CONSIDERATIONS RELATING TO COASTAL AND MARINE ECOLOGICAL VALUES

The decision regarding what is the most suitable approach to identification of areas important for marine indigenous biodiversity is influenced by a number of issues. The relationship between marine biodiversity and terrestrial coastal biodiversity is important to support productive evaluation of marine and coastal values, and is addressed in Section 3.1. The identification of important biodiversity is possible at different resolutions, from a broad habitat level to a species level. Some issues regarding the implications of different approaches are considered in Section 3.2. The changing nature of environmental health and our ability to assess current status (Sections 3.3 and 3.4), are other challenges to identifying significant areas. Consideration of these issues provides background to the recommendations made in Section 4.

## 3.1. Terrestrial coastal values

A number of coastal habitats (above MHWS) could be captured under both marine and terrestrial sections of the new Plan. Where ecologically important areas are adjacent to the coast, but above MHWS (high tide) they are often identified under terrestrial designations (Significant Natural Areas [SNAs], Reserves[13], etc.). For example, communities such as those found on Haulashore Island and the Boulder Bank (where lizards and rare plants are found) could be classified under terrestrial protocols. In fact, the Boulder Bank is a scenic reserve managed by the Department of Conservation, and Haulashore Island is a council reserve. It is beyond the scope of this report, and our expertise, to re-assess the diversity of reserves in terms of their terrestrial values. These communities do not necessarily have marine-specific values, in that there may not be strong interdependencies between the terrestrial coastal communities and the adjacent marine communities. Examples may be bush remnants adjacent to modified seashore, or persistence of a threatened species on areas of the coast. In terms of their importance to protection of indigenous biodiversity under the NZCPS, however, any ‘areas of predominantly indigenous vegetation in the coastal environment’ are captured in Policy 11 b(i). Taxa recognised as threatened or at risk are captured under NZCPS Policy 11 a(i) and (ii). In Table 2 below, coastal communities with no marine-specific values are termed ‘coastal non-marine communities’ (CNM).

Some terrestrial (CNM) communities are of particular value because they form part of a transitional marine to terrestrial indigenous community. The whole transitional zone is therefore considered to represent more ecological value than the sum of its parts. Examples may include sand dune communities on the margins of beaches, and areas

[13] e.g., Esplanade and Foreshore Reserves Management Plan 2008, http://nelson.govt.nz/assets/Our-council/Downloads/esplanade-foreshore-plan-pt4-haven.pdf

where intertidal vegetation (such as saltmarsh) transitions into intact terrestrial communities. We identify the values of these areas with the term ‘marine to terrestrial sequences’ (MTS).

A key role of coastal terrestrial areas for seabirds and marine mammals is the provision of breeding and resting areas. Wading birds also rely on terrestrial areas adjacent to their intertidal feeding grounds for roosting, shelter and breeding sites. For example, Haulashore Island and the Boulder Bank (and other rocky areas) have specific value to marine biodiversity through the provision of roosting and/or breeding sites for seabirds. These areas provide structural benefit to the protection of indigenous bird life. We term these values ‘roosting, nesting, haulout’ (RNH).

A further consideration regarding the relationship between marine and terrestrial environments is that terrestrial characteristics unrelated to indigenous biodiversity may affect marine communities. For example, independent of the naturalness of riparian plantings, they are likely to have positive effects on indigenous habitats by mitigating sediment, nutrient and contaminant runoff from terrestrial to marine habitats. Considering climate change, coastal land use will have important effects on the resilience of indigenous habitats as sea level rises. The ability for coastal wetlands to migrate inland as sea level rises will be very important to the survival of these systems. In this regard the indigenous state of the shoreline vegetation is unlikely to be a key factor determining whether successful migration occurs (although it may well restrict the indigenous community dynamics in newly inundated areas).

## 3.2. Benefits of habitat-level, broad taxonomic level, and species-level approaches

Protection of habitat can benefit many indigenous species, particularly those that have specific habitat requirements. However, many species have relatively general habitat requirements and are not strongly linked to any particular habitat type. Furthermore, the distribution of a preferred habitat, along with the organisms that live in it, may change over time. Larger, mobile species often move among different habitats and among patches of habitat. In other cases, the habitat requirements of a species are incompletely known. For example, the Back Beach beetle is associated with areas of hummocky sand in the general vicinity of saltmarsh and just above the level of mean high tide. However, as Millar (2016) concluded from his recent survey of beetle distribution, beetles were not sufficiently associated with particular parts of the habitat that a finer determination of habitat suitability could be made. Because of this variability and uncertainty, and also to give effect to Policy 11(a) (i–ii) of the NZCPS, it is useful to identify key species in addition to key habitats.

However, reliance on identification of threatened species may not be a feasible approach in planning documents, as:

- this does not allow for changing conservation status[14]
- this may require fine-scale information on species distribution
- identification of key areas of habitat (e.g., breeding, or principle foraging habitats) may not recognise important secondary habitats, or migratory routes
- changing information quality or natural changes in species distribution may cause some information in plans to become redundant
- overlapping ranges of different species may result in unnecessary complexity in documentation.

If more general ecological or taxonomic groups are identified, however, then useful generalisations about important habitat can be made. For example, for the purposes of their use of the Nelson CMA, cetacean species can be considered as a group, because several species have overlapping distributions which encompass the majority of the subtidal area. Wading birds and seabirds are two other useful groupings, as each constitutes a number of species with similar behaviours and overlapping ranges, and are present across all available suitable habitat within the Nelson CMA. Identification of distribution and habitat requirements for these groups is informative. Consideration of the conservation status of particular species would need to be given at the time when an activity that may impact the group generally was being considered.

Species-specific approaches are particularly problematic for marine species, and invertebrates in particular. The vast majority of marine invertebrates (95%) have not been assessed for conservation status (Freeman et al. 2013), and it is therefore difficult to assess their status under Policy 11 a. Many invertebrates are classified as data deficient, and of those that have been classified, the majority are classified ‘At risk – Naturally uncommon’. This uncertainty substantially limits the utility of a species-specific approach to protection of indigenous marine invertebrates and communities. Consequently, while this approach is informative, it is important to note that limitations exist and conservation status should be reviewed periodically.

While identification of habitats and threats has value for management purposes, the interrelationships between species and habitats means that management of any species or habitat in isolation is not realistic. Protection of any one component of indigenous biodiversity requires consideration of the multiple interrelationships between other areas, habitats, and species. For example, it is clear that protection of brooding and roosting areas is insufficient to sustain seabird communities if their prey are over-fished or if they suffer high mortality during foraging expeditions. Similarly, a substantial reduction in the number of birds would be likely to cause changes in their

[14] www.doc.govt.nz/nztcs

prey communities. Effective management requires consideration of all aspects of the environments supporting a local species. In extreme cases, such as that of the bar-tailed godwit, this may involve consideration of habitat across hemispheres of the globe. In contrast, the majority of the environmental factors influencing some species (like estuarine plants) could be considered on the catchment scale (i.e., relatively very small-scale).

## 3.3. Restoration and recovery

A number of restoration initiatives are underway in coastal (and inland) areas in the Nelson region. These are undertaken by Council, the Department of Conservation (DOC) and community groups. These include predator / pest eradication, replanting, and other activities, and are taking place at a number of sites, including Tahunanui, riparian areas of the Maitai River, the Boulder Bank, and Delaware Bay. The impact of such initiatives may change the nature of threats and the degree of vulnerability of species and ecosystems, and accordingly is an important consideration in the protection of indigenous biodiversity.

A more passive approach to restoration is taken in the marine environment, where removal of fishing activity is the main means of allowing ecosystems to recover. The Horoirangi Marine Reserve was gazetted in 2006. After ten years protected from fishing activity, it now presents an opportunity to partly understand the extent to which marine habitats have been degraded in the Nelson CMA. The reserve includes both sediment and hard substrate areas (Cole et al. 2003). The marine reserve is monitored as part of the Department of Conservation reserve monitoring programme, however seaweed cover is not included in these surveys (Davidson et al. 2013), and recovery of this habitat is therefore not able to be quantified[15]. Monitoring of soft sediment habitats has not taken place since the baseline survey (Keeley et al. 2006). Some information on likely responses to protection are available from the Separation Point no-trawling zone (Handley et al. 2014). A repeat survey of Horoirangi would provide further, and local, important information regarding the recovery of soft sediment habitat following protection from fishing disturbance. Habitat-focussed surveys of the marine reserve would provide useful information for understanding the local marine environment, and for setting management objectives for the Nelson CMA.

## 3.4. Challenges in identifying significant areas in the Nelson CMA

The Nelson CMA is very small compared to that of other councils in New Zealand, and many areas are important for multiple species and ecosystems. This is reflected

[15] Surveys of seaweeds were included in the baseline survey for the reserve, allowing changes in seaweeds communities to be assessed in the future (pers. comm. Andrew Baxter, Department of Conservation).

in the fact that the current Marine ASCV already cover the majority of the NCC coastal area. While some areas have higher importance for certain aspects of indigenous biodiversity, the identification of particular areas at the expense of others is problematic, particularly given that:

- habitat within the Nelson CMA is limited, so most habitat is of high local importance
- areas of a given habitat type are often contiguous, and designation of special areas would be arbitrary
- important areas of habitat may exist but not have been clearly identified (particularly in the subtidal) due to limited data, and changing conditions
- known distribution of many species may change due to natural mobility or improving knowledge.

Accordingly, we do not recommend that areas of the Nelson CMA are specifically included in, or excluded from, identification as important for protection of indigenous biodiversity. Rather, we recommend that all areas are described, and the nature of the importance of each is identified.

# 4. RECOMMENDED APPROACH FOR NELSON CITY COUNCIL

A descriptive approach (rather than a mapping-centred approach) of all habitats in the CMA and associated coastal area would be appropriate to the management of indigenous biodiversity values in the Nelson region. This is feasible for NCC due to its relatively small CMA. Moreover, a CMA-wide description also allows for incorporation of data-poor areas, and uncertainty can be reflected in value descriptions. This approach could identify biodiversity values by habitat type, rather than attempting to describe sections of coast, each of which may encompass an overlapping range of habitat types.

The suggested approach does not necessarily specify a higher level of protection of coastal and marine areas than that that accorded by the Marine ASCV in the NRMP. Rather, it would more specifically identify the key aspects of the environment relevant to protection of indigenous biodiversity. This also allows for clear indication of which aspects of Policy 11 are applicable in each case, and therefore the NZCPS requirements regarding management of activities. Also, key threats can be identified for specific habitat types.

The manner in which our recommended approach is reflected in plans is a decision for council planners to make. A possible approach would be for Table 2 (Habitats and threats to marine indigenous biodiversity in the Nelson CMA and coastal environment), or similar, to be included in the Plan. A table reflecting vulnerable species status such as Table 4 could be created as a living document (perhaps hosted on the NCC website) to be updated throughout the life of the plan. Alternatively the plan could refer to species vulnerability information sources, as identified in Policy 11 a(i)[16] and a(ii)[17].

[16] www.doc.govt.nz/nztcs
[17] www.iucn.org/resources/conservation-tools

## 4.1. Values and threats

Table 2. Habitats and threats to marine indigenous biodiversity in the Nelson CMA and coastal environment.

| **Key habitats** | Status and importance for indigenous biodiversity. **Key areas (such as those included in SNAs) are shown in bold** | Key threats[18] | Policy 11 relevance | References[19] (m=mapping source) | Amenability to mapping |
|---|---|---|---|---|---|
| **Terrestrial margins –** The indigenous biodiversity value of terrestrial margins falls into three main categories:<br>• Coastal, but non-marine, indigenous habitat and species[20] (CNM)<br>• Intact marine to terrestrial sequences (MTS)<br>• Habitat for species that cross marine-terrestrial boundaries (roosting nesting haulout sites: RNH) | | | | | |
| **Coastal, but non-marine, indigenous habitat / species (CNM)**<br>Including: | | | | | |
| CNM values (terrestrial margins) | Coastal sand dunes - naturally uncommon ecosystem nationally[21] (nine individual dune sites occur in the NCC area).<br>Threatened or At Risk birds, invertebrates and plants<br>**Tahunanui, Delaware spit, Sand spit at mouth of Whangamoa River** | Weeds<br>Rabbit browsing<br>Disturbance and erosion[22] (human, vehicle)<br>Human and dog disturbance of breeding birds<br>Predation on breeding birds<br>Subdivision | a(i)<br>a(iii)<br>b(iii) | Various SNA reports (m) | Small number of discrete sites amenable to mapping |

[18] Results of climate change will affect many different habitats and species, and accordingly are not detailed in the table. For example, sealevel rise will affect all shallow subtidal, intertidal, and low-lying terrestrial areas and ecosystems. Increased frequency of storms will affect all marine ecosystems by increasing disturbance and sediment input, and ocean acidification will have implications for many marine food webs.

[19] References for estuarine surveys are listed in Table 3, all are suitable resources for mapping.

[20] These are not the main focus of the current project, but nonetheless are heavily represented in historical considerations and source material, and fall within NZCPS criteria for coastal indigenous biodiversity.

[21] See http://www.landcareresearch.co.nz/publications/factsheets/rare-ecosystems/coastal

[22] Marram and ice plant currently reducing erosion at Delaware spit

Table 2, continued

| Key habitats | Status and importance for indigenous biodiversity. **Key areas (such as those included in SNAs) are shown in bold** | Key threats | Policy 11 relevance | References[23] (m=mapping source) | Amenability to mapping |
|---|---|---|---|---|---|
| CNM values (terrestrial margins) | Coastal forest, shrublands and scrublands—generally rare in the Nelson region, particularly where there is a sequence from wetland to coastal forest.<br>Threatened or At Risk birds, reptiles and plants.<br>**Kokorua Estuary, Wakapuaka Estuary, Delaware spit, Margins of Delaware Inlet, Whangamoa Estuary, The Glen to Cable Bay, Nelson Haven, Haulashore Island** | Subdivision<br>Weeds<br>Stock access (browsing and trampling)<br>Possum browsing | a(i)<br>a(iii)<br>a(iv)<br>b(i)<br>b(ii)<br>b(iii) | Davidson and Preece 1994<br>Various SNA reports (m) | Low – extensive, difficult to identify all areas and many in private ownership |
| | Cliffs and rocklands - coastal cliff communities, coastal shrub-herb-grassland communities, coastal dry forest, coastal flaxland and coastal silver tussockland are all rare in the Nelson region.<br>Threatened or At Risk birds and reptiles.<br>**The Glen to Cable Bay, North coast of Pepin Island, Delaware Inlet to Cape Soucis** | Stock access (browsing and trampling)<br>Weeds<br>Predators<br>Possum browsing | a(i)<br>a(iii)<br>a(vi)[24]<br>b(i)<br>b(ii)<br>b(iii)<br>b(v) | Davidson and Preece 1994<br>Boffa Miskell 2015<br>Various SNA reports (m) | Low – extensive, may be in private ownership |
| | Marginal freshwater wetlands (*Gahnia* wetland, reedland, rushland and sedgeland communities.<br>Threatened or At Risk birds, fish and plants.<br>**All estuaries (Waimea, Nelson Haven, Wakapuaka, Whangamoa / Kokorua)** | Sedimentation<br>Enrichment<br>Reclamation | a(i)<br>a(iii)<br>b(i)<br>b(ii)<br>b(iii)<br>b(v)<br>b(vi) | Davidson and Preece 1994<br>Boffa Miskell 2015<br>Various SNA reports (m) | Low – extensive, difficult to identify all areas and many in private ownership |
| | Boulder Bank and Haulashore Island cobble and boulder habitat.<br>Lizards (including At Risk species). Threatened and locally rare plants and moss and lichen communities. The most intact and healthy vegetation remnants of the Boulder Bank ecosystem is between Boulder Bank drive and Cawthron Aquaculture Park. This also adjoins a saltmarsh/shrubland community (possible MTS value).<br>**Boulder Bank scenic reserve, Haulashore Council Reserve** | Weeds<br>Predators<br>Rabbit browsing<br>Disturbance (human, dog, vehicle (illegal)) | a(i)<br>a(vi) | Davidson & Preece 1994<br>SNA report (SNA029)<br>NCC 2008<br>DOC 2015 | Discrete sites amenable to mapping |

[23] References for estuarine surveys are listed in Table 3, all are suitable resources for mapping.
[24] Areas of coastal forest between the Glen and Cable Bay protected by QEII covenant.

Table 2, continued

| Key habitats | Status and importance for indigenous biodiversity. **Key areas (such as those included in SNAs) are shown in bold** | Key threats | Policy 11 relevance | References (m=mapping source) | Amenability to mapping |
|---|---|---|---|---|---|
| **Intact marine to terrestrial sequences (MTS)** Including: | | | | | |
| MTS values (terrestrial margins) | Sandy subtidal and intertidal to beach and dune (see CNM) **Tahunanui, Delaware spit, Sand spit at mouth of Whangamoa River** | Weeds<br>Rabbit browsing<br>Disturbance and erosion[25] (human, vehicle)<br>Human and dog disturbance of breeding birds<br>Predation on breeding birds<br>Subdivision | a(i)<br>a(iii)<br>b(iii) | Davidson and Preece 1994<br>Boffa Miskell 2015<br>Various SNA reports (m) | Small number of discrete sites amenable to mapping |
| | Estuary to coastal forest (see CNM) **Delaware Inlet, Kokorua Estuary, Wakapuaka Estuary** | Subdivision<br>Weeds<br>Stock access (browsing and trampling)<br>Possum browsing<br>Sedimentation<br>Enrichment<br>Reclamation | a(i)<br>a(iii)<br>a(iv)<br>b(i)<br>b(ii)<br>b(iii)<br>b(v)<br>b(vi) | Davidson and Preece 1994<br>Boffa Miskell 2015<br>Various SNA reports (m) | Low – extensive, difficult to identify all areas and many in private ownership |
| | Estuary – freshwater wetland (see CNM) **Kokorua Estuary, Wakapuaka Estuary** | Subdivision<br>Weeds<br>Stock access (browsing and trampling)<br>Possum browsing<br>Sedimentation<br>Enrichment<br>Reclamation | a(i)<br>a(iii)<br>a(iv)<br>b(i)<br>b(ii)<br>b(iii)<br>b(v)<br>b(vi) | Davidson and Preece 1994<br>Boffa Miskell 2015<br>Various SNA reports (m) | Low – extensive, difficult to identify all areas and many in private ownership |

[25] Marram and ice plant currently reducing erosion at Delaware spit

Table 2, continued

| Key habitats | Status and importance for indigenous biodiversity. **Key areas (such as those included in SNAs) are shown in bold** | Key threats | Policy 11 relevance | References (m=mapping source) | Amenability to mapping |
|---|---|---|---|---|---|
| **Habitat for species that cross marine-terrestrial boundaries – Roosting, Nesting, Haul-out (RNH)** Including: | | | | | |
| RNH values (terrestrial margins) | Sand and gravel beaches and dunes used for breeding and roosting by coastal birds **Delaware spit, spit at mouth of Whangamoa River** | Weeds<br>Rabbit browsing<br>Disturbance and erosion[26] (human, vehicle)<br>Human and dog disturbance of breeding birds<br>Predation on breeding birds<br>Subdivision | a(iv)<br>b(ii)<br>b(v)<br>b(vi) | Davidson and Preece 1994<br>Boffa Miskell 2015<br>Various SNA reports (m) | Low – extensive, difficult to identify all areas |
| | Cliffs and offshore islet used for breeding and roosting by coastal birds and by fur seals for hauling out **The Glen to Cable Bay, North coast of Pepin Island, Delaware Bay to Cape Soucis** | Stock access (browsing and trampling)<br>Weeds<br>Predators<br>Possum browsing | a(iv)<br>b(ii)<br>b(v)<br>b(vi) | Davidson and Preece 1994<br>Boffa Miskell 2015<br>Various SNA reports (m) | Low – extensive, difficult to identify all areas |
| | Coastal trees used for nesting and roosting by shags and herons **Boulder Bank, Haulashore Island, Delaware spit** | Removal | b(ii)<br>b(v) | Davidson and Preece 1994<br>Boffa Miskell 2015<br>Various SNA reports (m) | Small number of discrete locations but subject to change over time |
| | **Boulder Bank, Haulashore, and nearby artificial structures** used for feeding, nesting and roosting by coastal birds (including penguins), and haul-out for fur seals | Predators<br>Disturbance (human, dog, vehicle (illegal)) | a(i)<br>b(ii)<br>b(vi) | Davidson and Preece 1994<br>Boffa Miskell 2015<br>Various SNA reports (m) | High |

[26] Marram and ice plant currently reducing erosion at Delaware spit

Table 2, continued

| Key habitats | Status and importance for indigenous biodiversity. **Key areas (such as those included in SNAs) are shown in bold** | Key threats | Policy 11 relevance | References (m=mapping source) | Amenability to mapping |
|---|---|---|---|---|---|
| **Estuaries and beaches - benthic (sediment-dominated intertidal/shallow subtidal)**<br>Four estuaries fall within the Nelson CMA, and state of the environment monitoring surveys have been undertaken in all estuaries. Waimea (largely TDC) and Nelson Haven are adjacent to urban centres, and are highly modified in places. They are nonetheless still important for indigenous biodiversity. Delaware Bay and Whangamoa / Kokorua estuaries are less heavily impacted by human activity. Most species and habitats are common to several or all estuaries. The Back Beach is of particular importance due to the presence of the endemic Back Beach beetle, and therefore warrants special consideration. Other beaches have not been well-studied. | | | | | |
| Back Beach beetle habitat | Vulnerable endemic beetle habitat<br>**Back beach intertidal hummocks slightly above MHW** | Sea level rise, habitat damage, disturbance | a(i) | Miller 2016 (m) (SNA033) | Moderate - Habitat moves within Back Beach area |
| High intertidal vegetation (saltmarsh, brackish or saltwater rushland and sedgeland) [DT] | Bird foraging habitat, including fernbird, marsh crake, banded rail, South Island pied and variable oystercatchers.<br>Fish foraging, breeding and migration pathways, including galaxiids, lampreys, eels and other native fish.<br>East Waimea Inlet of national or international importance for several wader species.<br>**All estuaries (Waimea, Nelson Haven, Wakapuaka, Whangamoa / Kokorua), wetlands around North Nelson oxidation ponds.** | Sedimentation<br>Enrichment<br>Reclamation | a(i)<br>b(i)<br>b(ii)<br>b(iii)<br>b(v) | Davidson and Preece 1994<br>Boffa Miskell 2015<br><br>Various SNA reports (m)<br>Estuary reports – broadscale monitoring (m) | Low – extensive, difficult to identify all areas |
| Seagrass | Bird foraging habitat, including South Island pied and variable oystercatchers, and red-billed gulls.<br>Fish breeding and juvenile habitat (including snapper), foraging and migration pathways.<br>East Waimea Inlet of national or international importance for several wader species.<br>**Waimea, Nelson Haven, Wakapuaka** | Sedimentation<br>Enrichment and reduced water clarity<br>Reclamation | a(i)<br>b(i)<br>b(ii)<br>b(iii)<br>b(iv)<br>b(v) | Davidson and Preece 1994<br>Boffa Miskell 2015<br><br>Various SNA reports (m)<br>Estuary reports – scale monitoring (m) | Low – extensive, difficult to identify all areas. Distribution changes over time within each location. |
| Intertidal mudflat and sandflat [DT] | Bird and fish foraging habitat, including banded dotterel, South Island pied and variable oystercatchers, red-billed gulls and royal spoonbills.<br>East Waimea Inlet of national or international importance for several wader species.<br>Cockles, ray feeding grounds | Sedimentation<br>Enrichment<br>Reclamation | a(i)<br>b(ii)<br>b(iii)<br>b(iv)<br>b(v) | Davidson and Preece 1994<br>Boffa Miskell 2015<br>Various SNA reports (m)Estuary reports (m) | Low – extensive, difficult to identify all areas |

Table 2, continued

| Key habitats | Status and importance for indigenous biodiversity. **Key areas (such as those included in SNAs) are shown in bold** | Key threats | Policy 11 relevance | References (m=mapping source) | Amenability to mapping |
|---|---|---|---|---|---|
| Intertidal mudflat and sandflat, continued | Habitat more extensive in estuaries than prior to human settlement due to increased sedimentation.<br>**All estuaries (Waimea, Nelson Haven, Wakapuaka, Whangamoa / Kokorua), beaches** | | | | |
| Subtidal estuarine areas DT | Feeding areas for fish and birds.<br>Possible nursery areas for fish species.<br>Migratory pathways for fish species such as galaxiids, lampreys, eels and other native fish.<br>Likely degraded as a result of sediment input. Historically may have included biogenic habitat, including tubeworm mounds, shellfish reefs and more extensive sponge gardens.<br>**All estuaries (Waimea, Nelson Haven, Wakapuaka, Whangamoa / Kokorua)** | Sediment input and (less so) physical disturbance preventing recovery to original state<br>Reclamation, dredging (Haven) | b(ii)<br>b(iii)<br>b(v)<br>b(iv) | Davidson and Preece 1994<br>Various SNA reports (m)<br>Sneddon 2014 | Low – extensive, minimal survey data |
| Estuarine sponge gardens | Biogenic habitat, filtering.<br>Monaco-Saxton channel most established estuarine sponge gardens in Waimea Inlet.<br>**Monaco-Saxton channel** | Disturbance, hydrological changes, sedimentation | b(iii) | Asher et al. 2008 (m) | Moderate (though possibly variable distribution as sandbanks move) |
| Artificial habitat | Hard substrate such as piles, marina pontoons, concrete 'Mole' in the Cut, navigational markers, rockwalls<br>Subtidal / intertidal: Sessile invertebrate and algal communities, many exotic species. Low indigenous biodiversity values, (Potential threat as hub for dispersal of invasive species)<br>**Port and Marina, The Cut** | NA | none | e.g. Inglis et al 2006 | Moderate-high (habitat, not communities, mapped in Port and city maps) |

Table 2, continued

| Key habitats | Status and importance for indigenous biodiversity. **Key areas (such as those included in SNAs) are shown in bold** | Key threats | Policy 11 relevance | References (m=mapping source) | Amenability to mapping |
|---|---|---|---|---|---|
| **Soft sediment subtidal (non-estuarine)**<br>The majority of the CMA is made up of gently-sloping sands and muds, with patches of coarser-grained material (e.g., identified near the base of reef areas, and as a result of dredge disposal). Shellfish reefs were once much more widespread, but are very depleted. Current sediment characteristics and distribution of shellfish reef is uncertain[27]. | | | | | |
| Shellfish reefs<br>HMR | Biogenic habitat created by shellfish including mussels and oysters, and horse mussel beds. Filtering of seawater by shellfish improves water quality. Reef structure stabilises sediments and increases biodiversity**.** Shellfish are recreationally and commercially important. Horse mussel beds known to be mobile.<br>**Original extent unknown, currently rare/absent** | Disturbance, sedimentation | a(iii)<br>b(ii)<br>b(iii)<br>b(iv) | Handley 2006 | Low – unknown historical and current extent |
| Loose sediment<br>HMR | Invertebrate-dominated, often mobile disturbance-tolerant taxa. Important as habitat for fish food (macroinvertebrates), historically important for commercially- and recreationally- harvested bivalves, including scallops. Benthic productivity important for shellfish food supply.<br>Homogenised and likely more extensive as a result of sediment input and disturbance. Extent of coarser areas generally unknown, some examples recorded, e.g., shell rubble off Ataata Point.<br>Shells and shellfish near Boulder Bank edge.<br>**Extensive** | Disturbance, sedimentation preventing establishment of more diverse communities | b(iv) | Handley 2006<br>McLean & Grange 1995<br>Grange & Cole 1996<br>McKnight 1969<br>Mitchell 1986<br>Gillespie 2003 | Low – extensive. Minimal recent data on fine-scale characteristics |

[27] For example, shellfish reefs were observed in the entrance to Delaware Estuary in the late 1970s or early 1980s (Paul Gillespie, pers. comm), but it is not known whether these persist. Sediment characteristics were broadly mapped by Mitchell (1986).

Table 2, continued

| Key habitats | Status and importance for indigenous biodiversity. **Key areas (such as those included in SNAs) are shown in bold** | Key threats | Policy 11 relevance | References (m=mapping source) | Amenability to mapping |
|---|---|---|---|---|---|
| **Rocky reefs (hard-substrate dominated)**<br>The coast from the Glen north contains a large part of the rocky reef habitat in Tasman Bay, the only other area of note being the reefs in Abel Tasman.<br>The Nelson rocky coast between the Cawthron Aquaculture Park and eastern Pepin Island (area incorporating the Horoirangi Marine Reserve) has been relatively well-studied, less data is available for sites to the north and south.<br>On the Boulder bank and Haulashore, movement of boulders in intertidal and shallow subtidal areas limits potential for communities to establish. Seaweed and sponge communities may have been strongly impacted by the direct and indirect effects of fishing activity and depletion of fished populations. | | | | | |
| Reef and seaweed communities HMR | Structure provides shelter, nursery habitat,<br>Seaweeds and other algae provide benthic primary productivity.<br>Intertidal/shallows foraging area for birds.<br>Habitat for reef fish and invertebrates, e.g. echinoderms, ascidians, and kaimoana such as paua and crayfish.<br>Algal and invertebrate communities are broadly similar to those at Long Island (Marlborough) and Abel Tasman (Tasman), also lower western North Island. However, there are important differences, such as the lack of laminarian macroalgae in north Nelson.<br>Seaweed has a patchy distribution throughout rocky areas of whole CMA, not well documented. Likely largely degraded. More dense algal growth in and beyond the **northern section of Horoirangi Marine Reserve**. Seasonally dominated by invasive *Undaria pinnatifida* in Haven / Haulashore. | Over grazing<br>Suspended sediment – light limiting<br>Sedimentation | b(ii)<br>b(iii)<br>b(iv) | Grange and Cole 1996<br>McLean and Grange 1995<br>Shears & Babcock 2007 | Low- Patchy and uncertain distribution. Historical distribution unknown |
| Deep (non-estuarine) sponge gardens and bryozoan beds HMR | Biogenic habitat, filtering.<br>At base of Boulder Bank and reefs. **Particularly substantial at sites near Glenduan**, also present at sites south of and around Pepin Island. Wider distribution and change over time unknown. | Disturbance<br>Sedimentation | b(ii)<br>b(iii)<br>b(iv) | Grange and Cole 1996<br>McLean and Grange 1995 | Low – uncertain distribution, historical distribution unknown |

Table 2, continued

| **Key habitats** | Status and importance for indigenous biodiversity. **Key areas (such as those included in SNAs) are shown in bold** | Key threats | Policy 11 relevance | References (m=mapping source) | Amenability to mapping |
|---|---|---|---|---|---|
| **Sea surface and water column** [HMR] | | | | | |
| Planktonic productivity, seabird (including penguin) passage, resting and foraging. Marine mammal resting and foraging habitat and passage. Benthic and pelagic fish. | | Birds and mammals – Disturbance (including noise)<br>Vessel strike<br>Entanglement<br><br>Productivity - sedimentation | b(iv)<br>b(v) | Forest & Bird 2014<br>Handley et al. 2011<br>MacKenzie & Gillespie 1986<br>Schuckard & Melville 2013 | Low - extensive |

[HMR] Some habitat included in the Horoirangi Marine reserve and therefore has high protection from localised fisheries impacts. Policy 11 relevance a(vi), b(iv). See Cole et al. (2003) Davidson et al. (2013), Grange & Cole (1996), Keeley et al. (2006), McLean & Grange (1995).
[DT] Some habitat captured in the Delaware Taipure (Ataata Point to Whangamoa Head). Protected for cultural reasons, largely related to kaimoana resources, and therefore has moderate protection from localised fisheries impacts. Policy 11 relevance a(vi), b(iv), see Davey et al. (2005).

Table 3. Estuarine surveys in the Nelson CMA.

| Location | Survey type | Date | Source |
|---|---|---|---|
| Waimea | Preliminary survey | 2002 | Robertson et al. (2002) |
| | Habitat map | 1990 | Davidson & Moffat (1990) |
| | | 1999 | Robertson et al. (2002) |
| | | 2006 | Clark et al. (2008) |
| | | 2014 | Stevens & Robertson (2014) |
| | Fine scale survey | 2001 | Robertson et al. (2002) |
| | | 2006 | Gillespie et al. (2006) |
| | | 2013/14 | Robertson & Robertson (2014) |
| | Historical map | 2003 | Tuckey & Robertson (2003) |
| Nelson Haven | Preliminary survey | 2008 | Gillespie (2008) |
| | Habitat map | 2009 | Gillespie et al. (2011a) |
| | Fine scale survey | 2012 | Gillespie et al. (2012) |
| Delaware | Habitat map | 1998 | Franko (1988a,b) |
| | Preliminary survey | 2009 | Gillespie (2009) |
| | Habitat map | 2009 | Gillespie et al. (2011b) |
| | Fine scale survey | 2009 | Gillespie et al. (2009) |
| Whangamoa / Kokorua | Preliminary survey | 2013 | Gillespie (2013) |
| | Habitat map | 2015 | Stevens & Robertson (2015) |
| | Fine scale survey | 2014/2015 | Robertson & Stevens (2015) |

A record of species conservation status could be employed as a living information source for the distribution and conservation status of Threatened and At Risk species. This would provide a centralised reference for information such as that relevant to NZCPS Policy 11 a(i) and a(ii). A non-exhaustive example is given in Table 4.

Table 4. Selected species currently captured under Policy 11a(i) of the NZCPS

| **Key indigenous species** | Key areas | Key threats | Species and New Zealand Threat Classification System conservation status |
|---|---|---|---|
| **Wading birds** | See below | See below | Banded dotterel (Threatened: Nationally vulnerable)<br>Bar-tailed godwit (At risk: Declining)<br>Lesser knot (Threatened: Nationally vulnerable)<br>Reef heron (Threatened: Nationally endangered)<br>Royal spoonbills (At risk: Naturally uncommon)<br>South Island pied oystercatcher (At risk: Declining)<br>Variable oystercatcher (At risk: Recovering)<br>White heron (Threatened: Nationally critical)<br>Wrybill (Threatened: Nationally vulnerable) |
| Breeding habitat | Haulashore Island (SNA029: variable oystercatcher)<br>Delaware spit east and west (variable oystercatcher and banded dotterel)<br>Boulder Bank (variable oystercatcher)<br>Nelson Haven (banded dotterel)<br>Waimea Inlet (variable oystercatcher | Predators (rats, hedgehogs, stoats, cats, dogs)<br>Human, dog and vehicle disturbance<br>Habitat damage (subdivision/coastal development, weeds, human and vehicle disturbance)<br>Sea-level rise | See above<br>Wakapuaka flats (head of Nelson Haven) and the Delaware spit are among four locations in Tasman Bay for regular breeding attempts by banded dotterel (Schuckard & Melville 2013). |
| Foraging habitat | Wetlands around mouths of Wakapuaka River and Toi Toi and Frenchman's Streams<br>Kokorua estuary wetlands<br>Haulashore Island (SNA029)<br>Delaware spit east and west<br>Boulder Bank<br>Nelson Haven<br>Waimea Inlet<br>Tasman Bay / Cook Strait Important Bird Areas | Human, dog and vehicle disturbance<br>Habitat damage (coastal development, flood control, weeds, human and vehicle disturbance)<br>Sea-level rise | See above<br>Eastern Waimea Inlet is of national or international importance for variable oystercatcher, pied oystercatcher, wrybill, red knot and bar-tailed godwit (Schuckard & Melville 2013) |

Table 4, continued

| **Key indigenous species** | Key areas | Key threats | Species and New Zealand Threat Classification System conservation status |
|---|---|---|---|
| Roosting areas | Haulashore Island (SNA029)<br>Delaware spit east and west<br>Boulder Bank<br>Waimea Inlet | Predators (rats, hedgehogs, stoats, cats, dogs)<br>Human, dog and vehicle disturbance<br>Sea-level rise<br>Habitat damage (subdivision, weeds, human and vehicle disturbance, tree removal) | See above |
| **Seabirds** | | | Caspian tern (Threatened: Nationally vulnerable)<br>Little blue penguin (At risk: Declining)<br>Pied shag (Threatened: Nationally vulnerable)<br>Red-billed gulls (Threatened: Nationally vulnerable)<br>Sooty shearwater (At risk: Declining)<br>White-fronted tern (At risk: Declining)<br>Various passage species of albatross, shearwater, petrel, prion, tern and gull recorded in Cook Strait Important Bird Area (threat classifications from Naturally Uncommon to Threatened: Nationally critical) |
| Breeding habitat | Haulashore Island (SNA029)<br>Delaware spit east<br>North coast of Pepin Island<br>Boulder Bank | Predators (rats, hedgehogs, stoats, cats, dogs)<br>Human, dog and vehicle disturbance<br>Habitat damage (subdivision, weeds, human and vehicle disturbance)<br>Sea-level rise | See above |
| Foraging habitat | All subtidal (forms part of Cook Strait Important Bird Area)<br>Haulashore Island (SNA029)<br>Delaware spit east<br>Nelson Haven<br>Waimea Inlet | Human, dog and vehicle disturbance<br>Habitat damage (weeds, human and vehicle disturbance) | See above |

Table 4, continued

| Key indigenous species | Key areas | Key threats | Species and New Zealand Threat Classification System conservation status |
|---|---|---|---|
| Roosting areas | Haulashore Island (SNA029)<br>North coast of Pepin Island<br>Boulder Bank<br>Waimea Inlet | Predators (rats, hedgehogs, stoats, cats, dogs)<br>Human, dog and vehicle disturbance<br>Habitat damage (subdivision, tree removal, weeds, human and vehicle disturbance)<br>Sea-level rise | See above |
| **Wetland birds** | Wetlands around mouths of Wakapuaka River and Toi Toi and Frenchman's Streams<br>Kokorua estuary wetlands<br>Margins of Delaware Bay<br>Whangamoa Estuary | Predators (rats, hedgehogs, stoats, cats, dogs)<br>Human, dog and vehicle disturbance<br>Habitat damage (subdivision, weeds, human and vehicle disturbance) | Banded rail (At risk: Declining)<br>Marsh crake (At risk: Relict)<br>South Island fernbird (At risk: Declining) |
| **Migratory fish** | Wetlands around mouths of Wakapuaka River and Toi Toi and Frenchman's Streams<br>Kokorua estuary wetlands<br>Margins of Delaware Bay<br>Whangamoa Estuary<br>Nelson Haven<br>Waimea Inlet | Sedimentation<br>Enrichment<br>Reclamation<br>Hydrological changes | Longfin eel (At risk: Declining)<br>Lamprey (Threatened: Nationally vulnerable)<br>Torrentfish (At risk: Declining)<br>Giant kokopu (At risk: Declining)<br>Koaro (At risk: Declining)<br>Inanga (At risk: Declining)<br>Shortjaw kokopu (Threatened: Nationally vulnerable)<br>Bluegill bully (At risk: Declining)<br>Redfin bully (At risk: Declining) |
| **Marine mammals** | | | |
| **Cetaceans** | All subtidal, including Nelson Haven | Disturbance (including noise)<br>Vessel strike<br>Entanglement | Bottlenose dolphin (Threatened: Nationally endangered)<br>Hector's dolphin (Threatened: Nationally endangered)<br>Killer whale (Threatened: Nationally critical)<br>Other species - Not threatened, but protected under Marine Mammal Protection Act. 1978 |

Table 4, continued

| **Key indigenous species** | Key areas | Key threats | Species and New Zealand Threat Classification System conservation status |
|---|---|---|---|
| **Pinnipeds** | All subtidal<br>Intertidal/terrestrial haul-out sites<br>Pepin Island, Boulder Bank, Haulashore | | Fur seals (Not threatened, but protected under Marine Mammal Protection Act. 1978) |
| **Back beach beetle** (*Bembidion* (*Zecillenus*) *tillyardi*) | Tahunanui back beach (SNA033) | Sea level rise, habitat damage (including erosion of preferred types of sediment and deposition of fine sediments) and disturbance (human and vehicle) | Threatened: Nationally critical |

## 4.2. Role of mapping

Species distributions overlap, and there is a lack of certainty regarding species and habitat distribution. As a result, from an ecological perspective it is unrealistic to attempt to map all relevant habitat and species ranges at a fine scale, and it is not advisable to strictly define areas in the Nelson CMA that should be included in or excluded from categorisation as important to the protection of coastal indigenous biodiversity. Mapping should therefore not be the primary tool used to identify areas important to the protection of indigenous biodiversity. Nonetheless mapping is widely used by councils in identifying biodiversity and other natural values, and mapping may complement the descriptive approach.

Some areas are easily spatially delineated and mapped, most obviously areas such as marine reserves whose boundaries are already described in legislation. Coastal SNAs have been mapped, although many are on private land, and information is not publically available. Many other parts of the coastal area have also been mapped. For example, broad-scale surveys of estuaries are centred around mapping of estuarine habitat types[28] (see Table 3), substrate imaging and descriptive transects have been taken in and around the Horoirangi Marine reserve (McLean & Grange 1995; Grange & Cole 1996; Cole et al. 2003), and estuarine sponge gardens were mapped in Waimea Inlet (Asher et al. 2008). Known habitats of some individual species (e.g., roosting sites of threatened species) have been identified (although areas have not necessarily been delineated) at some sites (e.g., Schuckard & Melville 2013). Inclusion of such maps in plans may be appropriate. However, care should be taken to avoid any implication that mapped habitats are necessarily of higher importance to the protection of indigenous biodiversity than habitats that do not appear on maps.

The extent to which maps are incorporated into planning documents warrants consideration, as mapping of information available at one point in time may limit the accuracy and longevity of the information incorporated into the plan. This is due to some of the challenges of mapping, which include that:

- habitat may move (e.g., seagrass beds)
- knowledge of species and habitat distribution may be limited (e.g., coastal sponge and bryozoan gardens)[29]
- historical habitat that has been degraded or lost cannot be mapped (e.g., shellfish reefs, seaweed communities, more extensive seagrass beds)
- some species use nearly the whole CMA (seabirds, marine mammals).

[28] According to the NRMP, ‘estuaries’ extend 1km above where the river opens to the coast. It may be appropriate to extend broad-scale mapping inland to align with this definition.

[29] In this case classification of areas into categories of certainty may be appropriate, for example, the use of “known/likely/unlikely” presence of a given habitat type.

While mapping provides apparent certainty, in many cases this will not be a true reflection of the state of knowledge about a habitat. It is important to recognise uncertainty when mapping species distributions and habitats. While change and uncertainly are still assured, descriptive information is more adaptable and able to reflect the true state of affairs, and capture the range of issues present in the marine environment. It also potentially provides for improved knowledge to be incorporated in decision-making over the life of the plan.

# 5. CONCLUSIONS

The Nelson coastal area and CMA is small compared to those of other New Zealand councils, and many areas are important for multiple species and ecosystems. We propose that marine indigenous biodiversity values are described for the whole coastal and marine area. This is because in such a small region it is not appropriate to identify specific areas that are of particular importance to the protection of indigenous biodiversity, and thereby exclude other areas. Moreover, rather than describing values across areas that contain a range of habitats, we recommend description of values by habitat type. This allows for more specific identification of values and threats, and recognition of the distribution of some habitat types across the region. It also allows for reflection of uncertainty, which is of particular importance in the consideration of subtidal communities. For planning purposes we recommend a focus on broad groupings of species (e.g., wading birds) rather than explicit inclusion of individual species. This recognises that many species have substantially overlapping distributions and similar habitat usage, and also allows for changing threat classification status of particular species.

We have defined a series of intertidal and subtidal habitat types, and for each identified in tabular form the status and importance for indigenous biodiversity, and key threats. The relevance of the habitat to the New Zealand Coastal Policy Statement (2010) Policy 11 (Indigenous biological diversity) is also indicated. The inclusion of this material, or similar, in the Whakamahere Whakatu Nelson Plan may be appropriate. Mapping is likely to be a useful supplementary approach to descriptive identification of habitat.

While identification of habitats and threats has value for management purposes, the interrelationships between species and habitats means that management of any species or habitat in isolation is not realistic. Protection of any one component of indigenous biodiversity requires consideration of the multiple interrelationships with other areas, habitats, and species.

# 6. REFERENCES

Asher R, Clark K, Gillespie P 2008. Waimea Inlet Sponge Gardens. Prepared for Tasman District Council. Cawthron Report No. 1467. 18 p.

Baker CS, Chilvers BL, Childerhouse S, Constantine R, Currey R, Mattlin R, Van Helden A, Hitchmough R, Rolfe J 2016. Conservation status of New Zealand marine mammals, 2013. New Zealand Threat Classification Series 14. 18 p.

Boffa Miskell Limited 2015. Nelson coastal study: Natural character of the Nelson coastal environment. Report prepared by Boffa Miskell Limited for Nelson City Council 138 p plus appendices.

Clark K, Gillespie P, Forrest R, Asher R 2008. State of the environment monitoring of Waimea Inlet: broad scale habitat mapping November 2006. Prepared for Tasman District Council and Nelson City Council. Cawthron Report No. 1473. 24 p.

Cole R, Grange K, Morrisey D 2003 Marine habitats, fish and benthic species within a proposed marine reserve, North Nelson. NIWA Client Report: NEL2003-005 40 p plus appendices.

Davey N, Bradley A, Grange K 2005. Habitat mapping of Wakapuaka Taiapure. NIWA client report Nel2005-023 prepared for Department of Conservation, Nelson.

Davidson RJ, Moffat CR 1990. A report on the ecology of Waimea Inlet, Nelson. Department of Conservation, Nelson/Marlborough Conservancy. Occasional Publication 1: 160.

Davidson RJ, Preece J 1994. Internationally and nationally important coastal areas from Waimea Inlet to Cape Soucis, Nelson, New Zealand - Recommendations for Protection. Department of Conservation, Nelson / Marlborough Conservancy Occasional Publication No. 15. 46p.

Davidson R, Duffy C, Gaze P, Baxter A, DuFresne S, Courtney S, Hamill P 2011. Ecologically significant marine sites in Marlborough, New Zealand. Co-ordinated by Davidson Environmental Limited for Marlborough District Council and Department of Conservation. 172 p.

Davidson R, Richards L, Bayly S, Devries D, Bodin G 2013. Horoirangi Marine Reserve, North Nelson, report on rocky shore biological monitoring: 2006–2013. Prepared by Davidson Environmental Limited for Department of Conservation.

Dayton PK, Tegner MJ, Edwards PB and Riser KL 1998. Sliding baselines, ghosts, and reduced expectations in kelp forest communities. Ecological Applications 8(2): 309-322.

DOC 2015. Boulder Bank habitat assessment. Notes based on a field trip on 25th 26th August 2015. 6 p.

Forest & Bird 2014. New Zealand seabirds: sites at sea, seaward extensions, pelagic areas. The Royal Forest & Bird Protection Society of New Zealand, Wellington, New Zealand. 91 p. Available at: http://www.forestandbird.org.nz/files/file/NZSEABIRDS_compressed.pdf.

Franko G 1988a. A guide to Delaware Inlet. DSIR Publishing, Wellington. 42 p.

Franko G 1988b. Vegetation map of the intertidal zone of Delaware Inlet, South Island, New Zealand. Department of Scientific and Industrial Research, Wellington.

Freeman D, Schnabel K, Marshall B, Gordon D, Wing S, Tracey D, Hitchmough R 2014. Conservation status of New Zealand marine invertebrates, 2013 New Zealand Threat Classification Series 9. 20 p.

Grange K, Cole R 1996. A further survey of potential marine reserve sites off the Boulder Bank. NIWA report 1996/NEL60412/1 Prepared for Royal and Bird Society Nelson. 9 p plus appendices.

Gillespie P 2003. Benthic and planktonic microalgae in Tasman Bay: biomass distribution, and implications for shellfish growth. Prepared for Stakeholders of the Motueka Integrated Catchment Management Programme. Cawthron Report No. 835. 26 p.

Gillespie P 2008. Preliminary assessment of the environmental status of the Nelson Haven. Prepared for Nelson City Council. Cawthron Report No. 1545. 17 p.

Gillespie P 2013. Preliminary assessment of the environmental status of the Whangamoa Inlet, Nelson. Prepared for the Nelson City Council. Cawthron Report No. 2446. 18 p. plus appendix.

Gillespie P, Clark K, Conwell C 2006. Waimea Estuary state of environment monitoring: fine-scale benthic assessment, April 2006. Prepared for Tasman District Council. Cawthron Report No. 1315. 27 p.

Gillespie P, Clement D, Asher R 2009. Delaware Inlet fine-scale benthic baseline 2009. Prepared for Nelson City Council. Cawthron Report No. 1594. 28 p.

Gillespie P, Clement D, Asher R 2011a. Nelson Haven state of environment monitoring: broad-scale habitat mapping, January 2009. Prepared for Nelson City Council. Cawthron Report No. 1978. 46 p.

Gillespie P, Clement D, Asher R 2011b. State of the environment monitoring of Delaware Inlet: broad-scale habitat mapping January 2009. Prepared for Nelson City Council. Cawthron Report No. 1903. 33 p.

Gillespie P, Clement D, Clark DE, Asher R 2012. Nelson Haven fine-scale benthic baseline 2012. Prepared for Nelson City Council. Cawthron Report No. 2209. 22 p. plus appendices.

Handley S 2006. An analysis of historical impacts and composition of the benthic environment of Tasman and Golden Bays. Prepared for Tasman District Council. NIWA Client Repot: NEL2006-002. 28 p.

Handley S, Sagar P, Cairney D, Carter M 2011. Seabird, marine mammal and surface fish surveys of Golden and Tasman Bays Part C: Boat surveys. Prepared for Friends of Nelson Haven and Tasman Bay Incorporated and AWE New Zealand Pty. Ltd. 33 p plus appendix.

Handley SJ, Willis TJ, Cole RG, Bradley A, Cairney DJ, Brown SN,Carter ME 2014. The importance of benchmarking habitat structure and composition for understanding the extent of fishing impacts in soft sediment ecosystems. Journal of Sea Research 86: 58-68.

Inglis G, Gust N, Fitridge I, Morrisey DJ, Floerl O, Woods C, Kospartov M, Hayden B, Fenwick G 2006. Port of Nelson second baseline survey for non-indigenous marine species. MAF Biosecurity New Zealand Technical Paper No: 2008/05. Prepared by NIWA for MAFBNZ Post Border Directorate. 146 p.

Keeley N, Gillespie P, Bennett C 2006. Horoirangi Marine Reserve soft sediment baseline ecological survey, 2006. Prepared for Department of Conservation. Cawthron Report No. 1186. 15 p.

MacKenzie AL, Gillespie P 1986. Plankton ecology and productivity,nutrient chemistry, and hydrography of Tasman Bay, New Zealand, 1982-1984. New Zealand Journal of Marine and Freshwater Research 20: 365–395.

McKnight D 1969. Infaunal benthic communities of the New Zealand continental shelf. New Zealand Journal of Marine and Freshwater Research 3: 409–444.

McLean M, Grange K 1995. A marine habitat survey of marine reserve options, north-east of Nelson. NIWA report 1995/NEL60402/1 Prepared for Royal and Bird Society Nelson. 12 p plus appendices.

Miller I 2016. A re-survey for the endemic “back beach beetle” *Bembidion tillyardi* (Brookes, 1927) at the Tahunanui Beach high shore inlet, January-February, 2016. Unpublished report for Nelson City Council. 6p.

Mitchell JS 1986. Tasman Bay bathymetry, 2nd edition. NZ Oceanographic Institute Chart, DSIR, Coastal Series, 1:200,000.

NCC 2008. Esplanade and Foreshore Reserves Management Plan 2008 http://nelson.govt.nz/assets/Our-council/Downloads/esplanade-foreshore-plan-pt4-haven.pdf

Robertson HA, Dowding JE, Elliot GP, Hitchmough RA, Miskelly CM, O’Donnell CFJ, Powlesland RG, Sagar PM, Scofield RP, Taylor GA 2012. Conservation status of New Zealand birds, 2012. New Zealand Threat Classification Series No. 4. New Zealand Department of Conservation, Wellington. 22 p.

Robertson B, Robertson B 2014. Waimea Inlet fine-scale monitoring 2013 / 2014. Wriggle Coastal Management report prepared for Tasman District Council. 19 p. plus appendices.

Robertson B, Gillespie P, Asher R, Frisk S, Keeley N, Hopkins G, Thompson S and Tuckey B 2002. Estuarine environmental assessment and monitoring: a national protocol. Part A. Development, Part B. Appendices, and Part C. Application. Prepared for supporting Councils and the Ministry for the Environment, Sustainable Management Fund Contract No. 5096. Part A. 93 p. Part B. 159 p. Part C. 40 p plus field sheets.

Robertson B, Stevens L, 2015. Kokorua Inlet Fine Scale Monitoring 2014/15 Wriggle Coastal Management report Prepared for Nelson City Council. 23 p. plus appendices.

Schuckard R, Melville DS 2013. Shorebirds of Farewell Spit, Golden Bay, and Tasman Bay. Prepared for Nelson City Council and Tasman District Council 74 p. plus appendices.

Shears NT, Babcock RC 2007. Quantitative description of mainland New Zealand's shallow subtidal reef communities. Science for Conservation 280. 126 p.

Sneddon R 2014. Port Nelson and Nelson Haven long-term monitoring programme: Report on compiled data 1996-2014. Prepared for Port Nelson Ltd and Nelson City Council. Cawthron Report No. 2482. 86 p. plus appendices.

Stevens L, Robertson B 2015. Kokorua Inlet 2015 Broad scale habitat mapping .Wriggle Coastal Management report. Prepared for Nelson City Council.18 pp plus appendices.

Stevens L, Robertson B 2014. Waimea Inlet 2014 Broad scale habitat mapping. Wriggle Coastal Management report. Prepared for Tasman District Council. 33pp plus appendices.

Tuckey B, Robertson B 2003. Broad scale mapping of Waimea and Ruataniwha Estuaries using historical aerial photographs. Prepared for Tasman District Council. Cawthron Report No. 828. 28 p.

# 7. APPENDIX

Appendix 1. Marine ASCV definitions from existing NRMP appendix 4.

| Site Name | No. | Status | Summary of Known Values |
|---|---|---|---|
| Back Beach | 01 | International | Back Beach is a small estuarine area semi-enclosed by the barrier spit which also forms Tahunanui Beach. Sand substrata in this embayment provides habitat for only known population of the carabid ground beetle (*Bembidion* (*Zecillenus*) *tillyardi*). |
| Boulder Bank | 02 | International | The Boulder Bank extends approximately 15 km from The Glen to Fifeshire Rock. The Boulder Bank is considered a landform of international importance and has been formed through a natural process of sediment along-shore movement and deposition. A small number of rare variable oystercatchers nest along the Boulder Bank, while the threatened banded dotterel breed on adjacent saltmarsh areas. Gulls and white fronted tern breed on the Boulder Bank. |
| Waimea Inlet | 01 | National | Waimea Inlet is the largest barrier enclosed estuarine area in the South Island (approximately 3,455 ha). Despite a high level of human modification around its edges, Waimea Inlet has high biological values. The inlet supports high numbers of wader species as well as various threatened or endangered species including white heron, banded rail, royal spoonbill and Australasian bittern |
| Nelson Haven | 02 | National | Nelson Haven is an estuarine area of approximately 1600 ha enclosed by the Nelson Boulder Bank and the hills and alluvial flat of Nelson City. Although the landward margins of the estuary have been extensively modified by human activity, the estuary retains relatively high values. The Haven is an important feeding and roosting area for waders, including bar-tailed godwit and southland pied oystercatcher. The rare variable oystercatcher, threatened banded dotterel and Australasian bittern are also present in the Haven. |
| The Glen to Cable Bay | 03 | National | This open rocky coastline extends approximately 6.5 km from The Glen to Cable Bay. This coast represents part of the sequence between exposed marine habitats through to adjacent terrestrial protected areas which also have important ecological values. Ataata Point is an important roost site for approximately 2,000 spotted shags. The subtidal area supports dense populations of the ambush starfish (*Stegnaster inflatus*) and sponge garden. The area is under investigation as a potential marine reserve by the Royal Forest and Bird Society |

Appendix 1, continued

| Site Name | No. | Status | Summary of Known Values |
|---|---|---|---|
| Delaware Inlet, Spit and Pepin Island | 04 | National | Located north of Nelson, this area includes an estuary, barrier spit (tombolo), Boulder Bank and island.<br>Delaware Inlet is an estuary of approximately 420 ha with a low level of human impact. A large area of salt marsh located at the mouth of the Wakapuaka River supports threatened banded rail. The estuary also supports banded dotterel and variable oystercatcher. The sand dune forest on the spit is a regionally important feature, while Pepin Island is an important roost site for spotted shag. |
| Whangamoa Estuary | 05 | National | Whangamoa Estuary is a small estuary of approximately 120 ha enclosed by a small barrier sand spit. The estuary supports threatened banded rail, banded dotterel and rare variable oystercatcher. This estuary represents a relatively unmodified estuarine environment. |
| Whangamoa River Mouth to Cape Soucis | 06 | National | An exposed stretch of coast of approximately 8.5 km located between the Whangamoa River mouth and Cape Soucis. This coast represents a combination of sand beaches and rocky shores, reefs and offshore stacks. The ecology of this area is relatively poorly known. The coast is known to support the only known Tasman Bay population of sand dune plant spinifex. The threatened reef heron have also been regularly observed from this control area. |