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Sites and habitats of significance within the Waikato Region's coastal marine area

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Prepared for Waikato Regional Council

August 2019

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Executive summary

The Waikato Regional Council (WRC) contracted NIWA to identify significant sites and habitats within the Waikato region's coastal marine area (CMA), spanning the coastal fringe beyond the mean high water springs mark out to the 12 nautical mile limit. Significance was conferred to a site or habitat if one or more of 11 criteria set out in WRC's Regional Policy Statement was triggered. One criterion covers sites already identified as significant and recommended for the protection of biodiversity, nine criteria cover ecological values, and the remaining criterion covers a site's or habitat's role in protecting an ecologically significant area. One criterion overlapped directly with two criteria in the New Zealand Coastal Policy Statement (NZCPS) regarding protected threatened taxa. This assessment of significant sites and habitats will inform the inclusion of such sites and habitats in the next iteration of WRC's Regional Coastal Plan.

A multi-disciplinary team of NIWA scientists carried out a desktop exercise to identify sites and habitats that triggered at least one of the 11 criteria, on a criterion-by-criterion basis. Drawing on a wide range of available data, including published and unpublished texts, technical and other reports and databases, a total of 80 sites were identified as significant. Twenty-eight of these sites were located on the region's west coast, with the remainder bordering the inner Firth of Thames and the Coromandel Peninsula. We did not constrain significant sites by size and, within this total, two relatively large sites were identified as significant, primarily on the basis of their importance for threatened cetaceans (aquatic mammals), which encompassed all of the coastal waters along the region's west and east coasts. In contrast, many sites were relatively small, particularly for a number of creeks and streams that were significant on the basis of supporting threatened or at-risk diadromous fish.

Nested within the 80 significant sites, we identified two significant wetland habitats (mangrove and saltmarsh) and a further nine, relatively sensitive or biogenic habitats (rhodolith beds, seagrass, sponge gardens, rocky reefs, horse-mussel beds, green-lipped mussel beds, bryozoan beds, estuaries and dunes). A total of 45 sites were identified as significant on the basis of triggering one criterion, whereas Miranda and the southern extent of the Firth of Thames triggered eight of the 11 criteria. The presence of particular taxa or habitat types conferred significance to a site by triggering multiple criteria. For example, the presence of seagrass *(Zostera muelleri)* conferred significance by triggering criterion 3 (presence of threatened or at-risk taxa), criterion 4 (habitats that have declined substantially in extent) and criterion 8 (aquatic habitats within the CMA that support indigenous taxa). Because extensive and systematic surveys of sensitive or biogenic habitats are generally lacking for the region it is very likely that additional sites supporting these significant habitats remain to be discovered (i.e., the total number of sites identified as significant in this report is a likely underestimate). Indicative GIS layers are provided that could serve to fill information gaps; these could be used to prompt more detailed surveys to confirm presence or absence of particular habitats.

1 Introduction

1.1 Background and policy framework

In New Zealand, regional councils have management responsibilities over the coastal marine area (CMA), which extends from mean high water springs out to 12 nm. Within this context, regional councils are obliged to recognise and provide for the matters of national importance listed in Section 6 of the Resource Management Act 1991 (RMA). Specifically, regional councils must provide for the preservation of natural character of the coastal environment (including the CMA), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development (Section 6(a)), and the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna (Section 6(c)), while at the same time maintaining and enhancing public access to and along the CMA, lakes, and rivers (Section 6(d)). Regional councils also need to give effect to policies of the New Zealand Coastal Policy Statement (NZCPS: DOC 2010), in particular in the context of this report, Policy 11 – to protect indigenous biological diversity (biodiversity) in the coastal environment.

Fenwick (2018) recently reviewed significance criteria of the West Coast Regional Council, Northland Regional Council, Auckland Council, Waikato Regional Council (WRC), Greater Wellington Regional Council, Tasman District Council, Marlborough District Council and Environment Southland, comparing these criteria across councils as well as to a suite of criteria developed in a review of international biodiversity platforms and internationally significant areas for biodiversity (Asaad et al. 2017). Fenwick (2018) demonstrated that there is no nationally accepted set of criteria for defining or identifying significant coastal biodiversity, though typically criteria used at a regional level overlap both with each other and with internationally identified criteria.

In spring 2018, WRC engaged NIWA to assist in the identification of sites and habitats of significance for indigenous marine biodiversity in the CMA of the Waikato region for the purpose of informing the current review of WRC's Regional Coastal Plan.

1.2 Scope and aims

The analysis involved a desktop data collation and assessment exercise, drawing upon existing data, to identify significant sites and habitats within the CMA of the Waikato region, out to the 12 nautical mile (nm) limit. No field site visits or fieldwork were undertaken. Significance was assigned to sites and habitats on the basis of meeting one or more of 11 criteria identified in the WRC's (2016) existing Regional Policy Statement (RPS).

The specific aims of the project included:

1. Summarise the various data sets that could be used in the assessment of significant natural areas (SNA), either sites or habitats, drawing on NIWA and external databases, including data that are made available to NIWA by WRC, other information sources, published and unpublished papers, and reports and theses.

2. Apply the 11 significance criteria defined in Table 11-1 of the WRC (2016) RPS for their application to habitats and species in the CMA to identify potential sites and habitats of significance for indigenous biodiversity in the CMA of the Waikato region. Describe trigger criteria, characteristics, and threats to habitats or species that satisfy these

criteria. Further confirm the applicability of Policies 11(a)(i) and 11(a)(ii) of the NZCPS (DOC 2010) to the identification of SNAs in the marine realm.

3. Identify significant data gaps in data availability that challenge the ability to identify SNAs.

4. Provide GIS shapefiles to support SNA identification, including geospatial descriptions of potential locations of habitat types whose actual distributions are poorly known.

1.3 Report outline

This report comprises five sections:

- Section 1 (above) provides an introduction to the background and scope of the report.
- Section 2 provides a brief description of the coastal environment in the Waikato region and outlines the approach taken to identify sites and habitats of significance for indigenous marine biodiversity in the Waikato CMA.
- Section 3 outlines each of the 11 significance criteria, the biodiversity values relevant to particular criteria and sites and habitats in the Waikato CMA to which they were identified to apply.
- Section 4 summarises the results of the assessment process and applying the 11 criteria in the Waikato CMA, and provides suggestions of where currently unknown significant habitats may occur in the region.
- Section 5 provides a short conclusion.

2 Methodological assessment

This section provides a brief description of the coastal environment in the Waikato region and the approach taken to identify sites of significance for indigenous marine biodiversity.

2.1 The Waikato coastal marine area

The Waikato coastal marine area (CMA) encompasses a diversity of habitats on both the east and west coasts of the North Island (Figure 2-1). Along its western boundary, the coastal area under WRC jurisdiction encompasses the exposed west coast of the North Island from Mōkau in the south to just north of Port Waikato. On the east coast, the area incorporates the more sheltered Firth of Thames and the entire Coromandel Peninsula south to Waihi on the east coast. The CMA extends from mean high water springs out to 12 nm, covers over 10,000 km^2, includes about 1,150 km of coastline and the water depth ranges from 0 - 604 m depth (Mitchell et al. 2012).

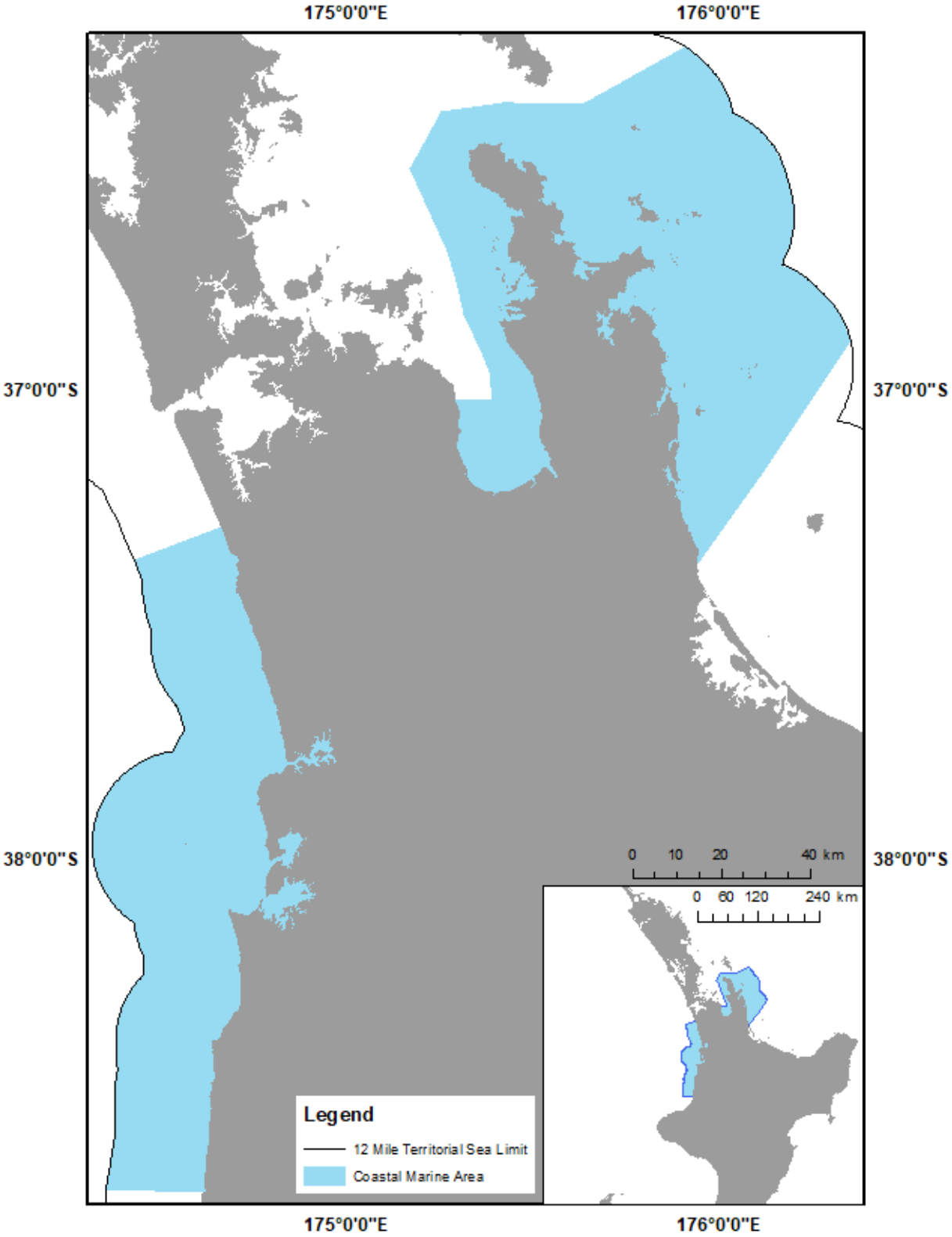


Figure 2-1: The coastal marine area of the Waikato region.

The westernmost part of the CMA runs along the rugged and exposed coast of western North Island. While significant stretches of the coastline are dominated by high cliffs, low-lying areas are often the sites where the main rivers intersect the coast: Mōkau, Awakino and Marokopa in the south and the longest river in New Zealand, the Waikato, in the north. These waterways are considered to be tidal rivers (Hume et al. 2003). The beaches comprise predominantly black beach-sands, with some coastal dune development occurring except in the vicinity of the main river mouths and the three main harbours. These harbours all originated as drowned river valleys, from south to north: Kawhia (~70 km^2), Aotea and Raglan (both ~30 km^2) (Hume et al. 2003). A large coastal dune lake, Lake Taharoa, to the southwest of Kawhia Harbour, is located in an area that is extensively mined for ironsand (Lawton and Hochstein 1993). Gannet Island, ~19 km off the mouth of Kawhia and Aotea harbours, is a wildlife sanctuary under the Wildlife Act 1953 whereby all biota is protected and hosts a prominent breeding colony of Australasian gannets *(Morus serrator*). The entire west coast of the region is also part of the West Coast North Island Marine Mammal Sanctuary, encompassing critical habitat for the threatened Māui dolphin (*Cephalorhynchus hectori maui*), the world's rarest and smallest known subspecies of dolphin.

The Firth of Thames is a large (~800 km^2), relatively sheltered, mesotidal estuarine embayment on the east coast of the North Island. The Firth is characterised by extensive intertidal areas in the south, with substantial mangrove (*Avicennia marina australasica*) forests (Swales et al. 2008) and geologically significant gravel/shell cheniers (beach ridges) along its western shoreline near Miranda (Schofield 1960, Dougherty & Dickson 2012). Two main tidal rivers (Piako and Waihou) feed into the southern end of the Firth of Thames. The eastern shoreline of the Firth forms the western flank of the Coromandel Peninsula, which consists of many small, pocket gravel-sand bays and beaches and short-steep river/stream catchments, with the main harbours of Manaia (~6 km^2), Te Kouma (~3 km^2), Coromandel (25 km^2) and Colville (5 km^2) (Hume et al. 2003). The entrance of the latter is guarded by a small group of islands, the largest being Whanganui Island. The main sediments in the Firth comprise mostly silty mud (Carter & Eade 1980). The Firth of Thames is a wetland of international importance, as recognised by the Ramsar Convention on Wetlands, and is a globally important site for waders or shorebirds (see http://www.miranda-shorebird.org.nz/). The Firth of Thames also forms the southern part of the Hauraki Gulf Marine Park.

The 85 km-long Coromandel Peninsula forms a natural protective barrier to the inner Hauraki Gulf and Firth of Thames to the west. Cape Colville at the northern tip of the Peninsula is separated from Great Barrier Island by the ~19 km-wide Colville Channel, where strong wind and tidal currents prevail (Manighetti & Carter 1999). Along the eastern side of the Peninsula the rocky coastline is indented by numerous small bays and beaches, including those at Waikawau, Matarangi, Opito, Opoutere, Onemana, Whangamata, Whiritoa and Waihi (from north to south), some of which have wide coastal dunefields. Significant embayments and tidal lagoons include those mentioned previously on the Peninsula's west coast (Manaia, Te Kouma, Coromandel), with Waikawau, Kennedy (~5 km^2), Whangapoua (13 km^2), Whitianga/Mercury Bay (~50 km^2), Tairua (6 km^2), Wharekawa (~2 km^2) and Whangamata (~4 km^2) on the east coast (Hume et al. 2003). There are numerous islands off the east coast, including Cuvier Island at the seaward end of the Colville Channel, the Mercury group of seven islands (Great Mercury, Red Mercury, Korapuki, Green, Middle, Stanley and Double), Ohinau off Opito Bay, Mahurangi off Hahei, the Aldermen group (Hongiora, Middle, Ruamahuanui and Ruamahuaiti), Shoe and Slipper off Tairua/Pauanui and the smaller islands off Whangamata (Hauturu, Whenuakura). Gravels form several beaches on the western and northern coasts of the Coromandel Peninsula (Fletcher Bay, Stony Bay), while silica-rich sands are characteristic of many of the beaches on the east coast (Wood et al. 2009). Muddy and sandy sediments dominate in the tidal

flats of the harbours and estuaries (Needham et al. 2013). Offshore, the sediments are predominantly sandy, with areas of silty mud in the Firth of Thames and off Colville Bay (Carter & Eade 1980). Coarse carbonate gravels (molluscs, bryozoans; Smith & Nelson 1994) extend around the northern end of the Peninsula, through Colville Channel and other coastal constrictions, such as between the Kuaotunu Peninsula and Great Mercury Island (Carter & Eade 1980). Many of the islands that aren't privately owned are designated as wildlife sanctuaries or reserves as important breeding and nesting sites for seabirds, as well as endemic terrestrial fauna. There is also a gazetted marine reserve (Te Whanganui a Hei) at Hahei.

2.2 Criteria for determining significance of indigenous biodiversity

Chapter 11 of WRC's (2006) RPS covers indigenous biodiversity and includes Policies 11.1 to maintain or enhance indigenous biodiversity, 11.2 to protect significant indigenous vegetation and significant habitats of indigenous fauna and 11.4 to safeguard coastal/marine ecosystems. Within this framework, Chapter 11 additionally includes (in Section 11A) criteria for determining significance of indigenous biodiversity. In order for a site or habitat to be classified as significant, one or more of the criteria identified in Table 11-1 of the RPS need to be met. Table 11-1 is reproduced in this report as Table 2-1.

Two additional criteria were also assessed to confirm the applicability of policies 11(a)(i) and 11(a)(ii) of the NZCPS (DOC 2010) to the identification of SNAs in the marine realm (Table 2-1). These two criteria directly overlap with WRC's Criterion 3, which designates habitat for indigenous species or associations of indigenous species that are classified as threatened or at risk. In our assessment of this criterion, we included data from the New Zealand Threat Classification System (NZTCS) lists, which themselves are inclusive of taxa that are listed as internationally threatened by the International Union for Conservation of Nature (IUCN). In fact, the criteria used for the NZTCS assessment are intended to complement the world view provide by the IUCN Red Lists (www.iucnredlist.org) (Townsend et al. 2008). The international and national taxonomic overlaps are particularly evident when comparing marine mammals, seabirds and shorebirds.

Table 2-1: WRC (2016) RPS criteria for determining significance of indigenous biodiversity. Two additional criteria are drawn from Policy 11 of the NZCPS (Department of Conservation 2010).

WRC Criterion	Description
Previously assessed site	
1.	It is indigenous vegetation or habitat for indigenous fauna that is currently, or is recommended to be, set aside by statute or covenant or by the Nature Heritage Fund, or Ngā Whenua Rāhui committees, or the Queen Elizabeth the Second National Trust Board of Directors, specifically for the protection of biodiversity, and meets at least one of criteria 3-11.
Ecological values	
2.	In the Coastal Marine Area, it is indigenous vegetation or habitat for indigenous fauna that has reduced in extent or degraded due to historic or present anthropogenic activity to a level where the ecological sustainability of the ecosystem is threatened.
3.	It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are: • classed as threatened or at risk, or • endemic to the Waikato region, or • at the limit of their natural range.
4.	It is indigenous vegetation, habitat or ecosystem type that is under-represented (20% or less of its known or likely original extent remaining) in an Ecological District, or Ecological Region, or nationally.
5.	It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon such as geothermal, chenier plain, or karst ecosystems, hydrothermal vents or cold seeps.
6.	It is wetland habitat for indigenous plant communities and/or indigenous fauna communities (excluding exotic rush/pasture communities) that has not been created and subsequently maintained for or in connection with: • waste treatment; • wastewater renovation; • hydro-electric power lakes (excluding Lake Taupō); • water storage for irrigation; or • water supply storage; unless in those instances they meet the criteria in Whaley et al. (1995).
7.	It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type. Note this criterion is not intended to select the largest example only in the Waikato region of any habitat type.

WRC Criterion	Description
8.	It is aquatic habitat (excluding artificial water bodies, except for those created for the maintenance and enhancement of biodiversity or as mitigation as part of a consented activity) that is within a stream, river, lake, groundwater system, wetland, intertidal mudflat or estuary, or any other part of the coastal marine area and their margins, that is critical to the self-sustainability of an indigenous species within a catchment of the Waikato region, or within the coastal marine area. In this context "critical" means essential for a specific component of the life cycle and includes breeding and spawning grounds, juvenile nursery areas, important feeding areas and migratory and dispersal pathways of an indigenous species. This includes areas that maintain connectivity between habitats.
9.	It is an area of indigenous vegetation or habitat that is a healthy and representative example of its type because: • its structure, composition, and ecological processes are largely intact; and • if protected from the adverse effects of plant and animal pests and of adjacent land and water use (e.g. stock, discharges, erosion, sediment disturbance), can maintain its ecological sustainability over time.
10.	It is an area of indigenous vegetation or habitat that forms part of an ecological sequence, that is either not common in the Waikato region or an ecological district, or is an exceptional, representative example of its type.
Role in protecting ecologically significant area	
11.	It is an area of indigenous vegetation or habitat for indigenous species (which habitat is either naturally occurring or has been established as a mitigation measure) that forms, either on its own or in combination with other similar areas, an ecological buffer, linkage or corridor and which is necessary to protect any site identified as significant under criteria 1-10 from external adverse effects.
NZCPS Policy 11 additional criteria	
11(a)(i)	avoid adverse effects of activities on indigenous taxa that are listed as threatened or at risk in the New Zealand Threat Classification System lists.
11(a)(ii)	avoid adverse effects of activities on taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened.

2.3 Data sources

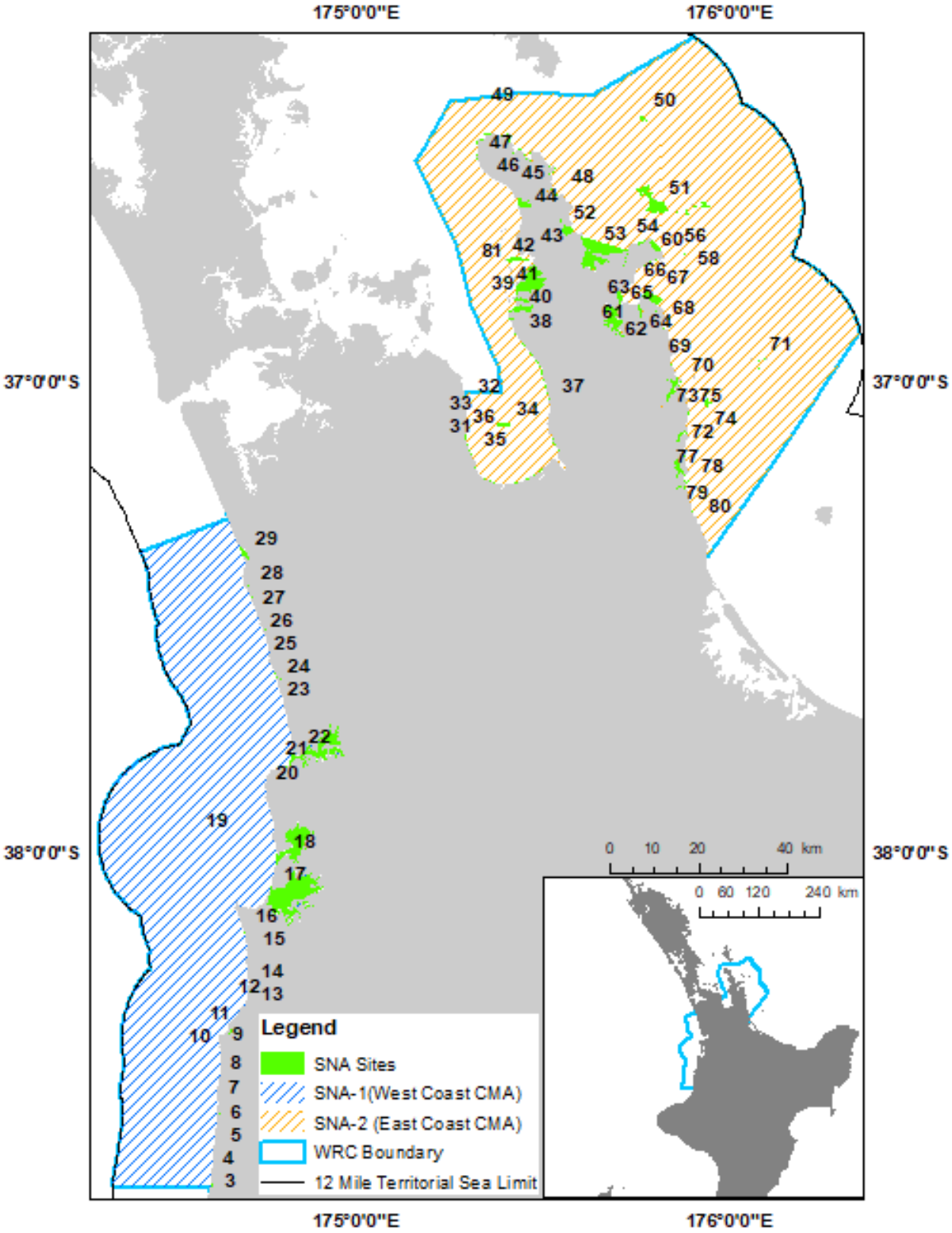
Sites and habitats of significance were assessed using a range of information sources, including primary published literature, published and unpublished technical and other reports, published and unpublished maps and charts, information held in databases, and expert assessment. Relevant information is widely scattered and has been collated and evaluated by a number of NIWA experts with complementary skills and expertise. A preliminary workshop was held with WRC staff in order to identify relevant and available data sources, including data held by WRC. The quality of data and information ranged from quantitative surveys and detailed analyses of sites and habitats through to qualitatively-collected information. We used geographic information systems (GIS) to display relevant data as appropriate, and to aid identification of sites and locations of habitats warranting further examination. Overall, we were able to successfully apply the WRC's significance criteria (Table 2-1) to the available information. Nevertheless, some information gaps were evident, as discussed in Section 4.3.

2.4 Approach

We held several expert workshops with NIWA biodiversity specialists to assign significance to sites and habitats. We worked through each of the criteria in turn, identifying sites and habitats that would be classified as significant for each criterion. One aspect we encountered was that Criteria 6 and 8 (Table 2-1), if taken literally, would result in virtually all of the CMA being classified as significant. These two criteria cover wetland habitats and aquatic habitats, respectively. In combination they encompass all fully marine and inter-tidal habitats, and extend landward of the mean high-water springs mark, encompassing some terrestrial habitats with strong linkages to, and influences from, the marine environment. For this reason, we decided to limit the number of habitat types considered to those with relatively high levels of biodiversity, a range of biogenic habitats and active dune habitat (see Sections 3.6 and 3.8 on Criterion 6 – Wetland habitats and Criterion 8 – Critical for life history stages of indigenous biodiversity, respectively).

For each site we have assigned latitude and longitude coordinates (Table 2-1, Table 2-2). For estuaries, harbours and embayments we have provided coordinates for a single location towards the mouth of these sites to represent the site as a whole. Likewise, for relatively large islands or island groups, centralised coordinates have been reported. For stretches of coastline we have provided two sets of coordinates identifying the start and end points of these coastal sections.

Our selections occurred independently of previous assessments that have aimed to identify significant sites for indigenous biodiversity. However, we did compare our selections to sites identified previously, such as Areas of Significant Conservation Value (ASCV) identified by the Department of Conservation in the Waikato Conservation Management Strategy (1996) as per site information available in Lundquist et al. (2004) (refer Table 2-2).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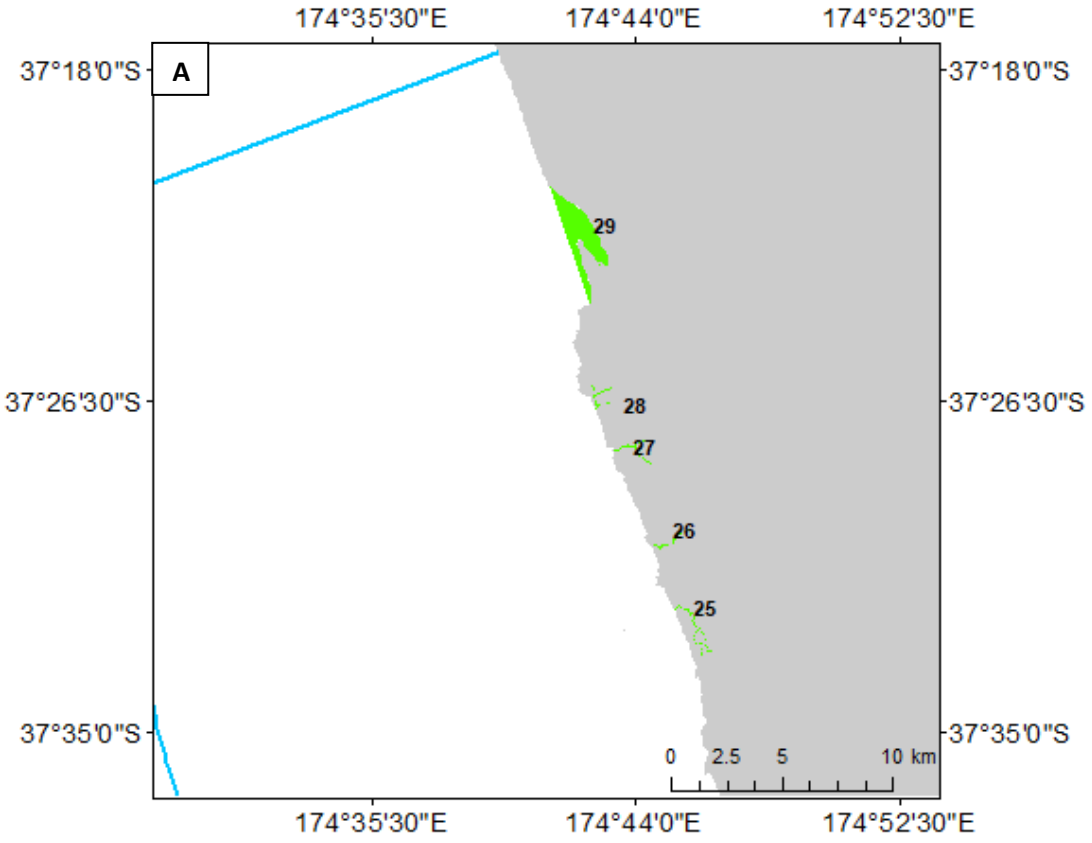
176°0'0"E
37°0'0"S
38°0'0"S
Legend
SNA Sites
SNA-1(West Coast CMA)
SNA-2 (East Coast CMA)
WRC Boundary
12 Mile Territorial Sea Limit
0 10 20 40 km
0 60 120 240 km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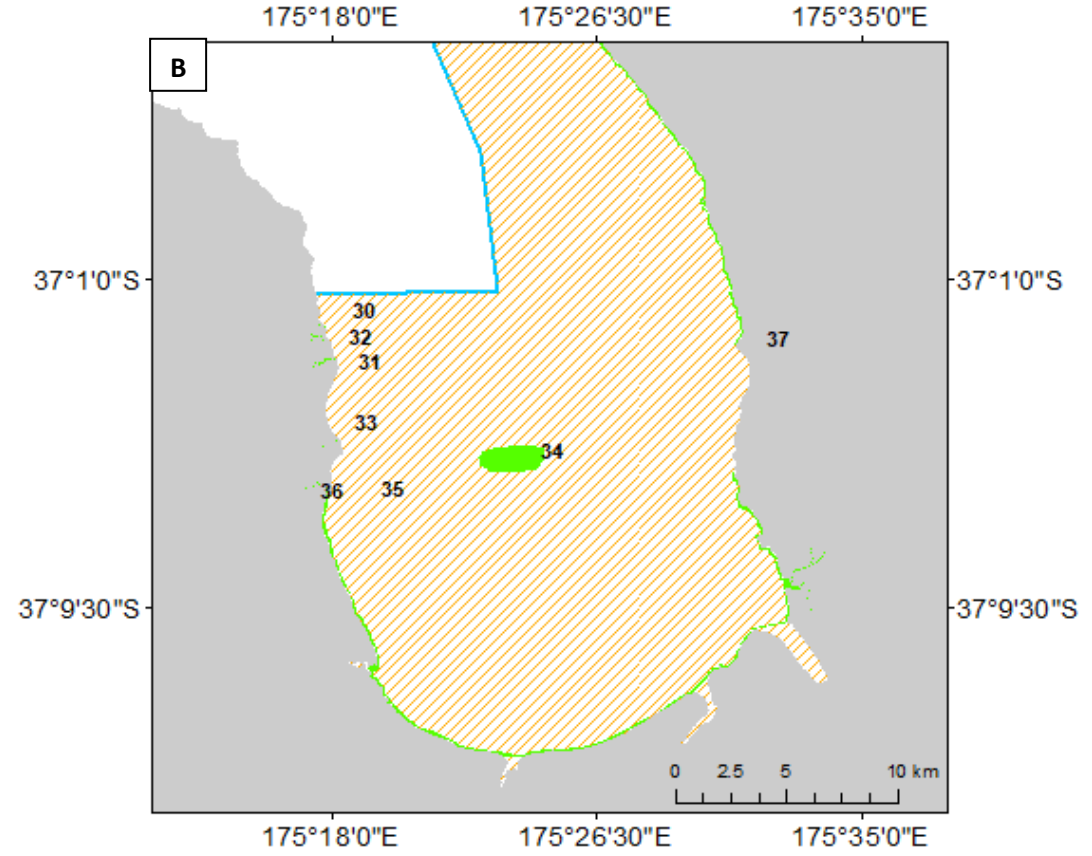
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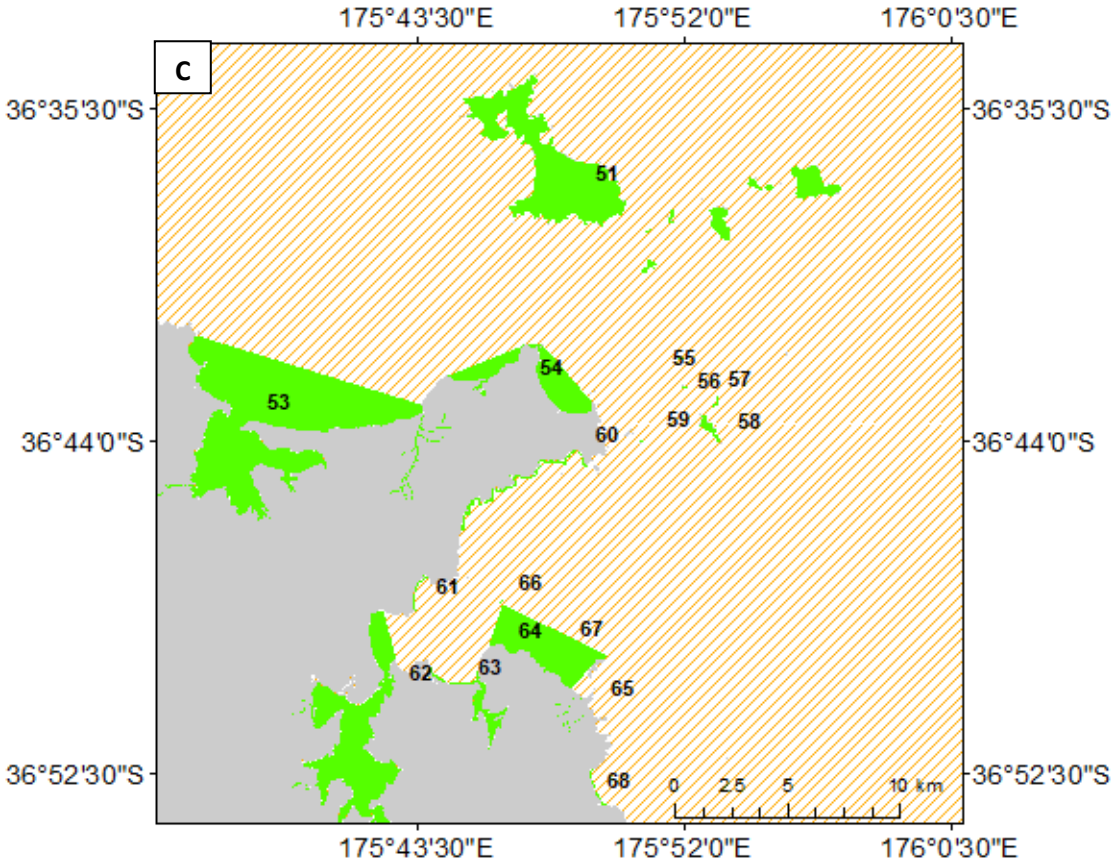

Figure 2-2: Sites in the Waikato CMA that satisfy one or more of the ecological significance criteria. Polygons are indicative of location of identified sites; further details of location, extent, and ecological significance are provided in the text. Inset figures A, B, and C show additional detail of the northern Waikato west coast, the Firth of Thames, and the east coast of the Coromandel Peninsula to allow visualisation of neighbouring sites that are obscured in the larger map. SNA-1 is marked in blue shading, and SNA-2 is marked in tan shading.

Table 2-2: Areas in the Waikato region's CMA that satisfy one or more of the ecological significance criteria. A * denotes areas as previously assessed or identified as significant by statute, covenant or other processes (see Lundquist et al. (2004)).

Site ID	Location	Latitude	Longitude	Identified as significant by statute, covenant or other processes
1	Entire west coast marine area	NA	NA	
2	Entire east coast marine area, including the Firth of Thames and waters around the Coromandel Peninsula; the east coast marine area also forms the Waikato portion of the Hauraki Gulf Marine Park	NA	NA	
	West Coast			
3	Mōkau River	38°42.30'S	174°36.94'E	*
4	Awakino River	38°39.87'S	174°37.23'E	
5	Ounutae Stream	38°34.31'S	174°37.84'E	
6	Waioroko Stream	38°33.34'S	174°37.90'E	
7	Paparahia Stream	38°31.89'S	174°38.11'E	
8	Waikawau River	38°28.70'S	174°38.21'E	
9	Mangangu Stream	38°25.43'S	174°38.45'E	
10	Ngararahae Stream	38°24.40'S	174°38.38'E	
11	Nukuhakari Stream	38°22.61'S	174°39.63'E	
12	Kiritehere Stream and beach	38°19.40'S	174°42.62'E	
13	Marokopa River	38°18.43'S	174°42.88'E	*
14	Turiakina Stream	38°17.44'S	174°42.87'E	
15	Waihekuri Stream	38°13.34'S	174°42.94'E	
16	Taharoa Beach	38°10.41'S	174°42.25'E	
17	Kawhia Harbour including Ocean Beach	38°5.20'S	174°46.68'E	*
18	Aotea Harbour including Potahi Point	38°0.77'S	174°47.93'E	*
19	Karewa/Gannet Island	37°58.37'S	174°33.93'E	*
20	Te Rekereke Stream	37°51.95'S	174°45.45'E	
21	Manu Bay	37°49.32'S	174°49.04'E	

Site ID	Location	Latitude	Longitude	Identified as significant by statute, covenant or other processes
22	Whaingaroā/Raglan Harbour	37°48.03'S	174°50.58'E	*
23	Waimai Stream	37°38.00'S	174°47.44'E	
24	Waimai Stream to Waikorea Stream	37°38.00'S to 37°37.09'S	174°47.44'E to 174°46.99'E	
25	Waikaretu Stream	37°31.87'S	174°45.31'E	
26	Kaawa Stream	37°30.26'S	174°44.53'E	
27	Waikawau Stream	37°27.78'S	174°43.36'E	
28	Huriwai River	37°26.75'S	174°42.76'E	
29	Waikato River, Port Waikato	37°21.99'S	174°42.20'E	*
	East Coast			
30	Waharau Stream	37°2.28'S	175°17.80'E	
31	Waihihi Stream	37°2.60'S	175°17.90'E	
32	Waihopuhopu Stream	37°3.09'S	175°18.12'E	
33	Whakatiwai Stream	37°5.20'S	175°18.23'E	
34	Kaiaua	37°5.64'S	175°23.82'E	
35	Hauarahi Stream	37°6.63'S	175°18.73'E	
36	Miranda and surrounding area	37°6.65'S to 37°5.99'S	175°17.18'E to 175°30.96'E	*
37	Te Puru to Matariki Bay	37°2.71'S to 36°51.57'S	175°30.99'E to 175°24.73'E	
38	Manaia Harbour	36°50.77'S	175°25.83'E	*
39	Te Kouma Harbour	36°49.58'S	175°25.62'E	
40	Coromandel Harbour	36°48.10'S	175°26.21'E	*
41	Cow Island	36°48.32'S	175°24.10'E	
42	Motuokino/Shag Rock	36°45.02'S	175°23.49'E	

Site ID	Location	Latitude	Longitude	Identified as significant by statute, covenant or other processes
43	Koputauaki Bay to Tukituki Bay	36°43.58'S to 36°38.75'S	175°27.70'E to 175°26.73'E	
44	Colville Bay	36°37.23'S	175°27.22'E	*
45	Waiaro Bay	36°35.38'S	175°25.14'E	
46	Ongohi Stream	36°33.18'S	175°20.67'E	
47	Fantail Bay to Waikawau Bay	36°31.46'S to 36°35.95'S	175°19.66'E to 175°31.71'E	*
48	Little Bay	36°36.13'S	175°32.78'E	
49	Channel Island	36°25.31'S	175°19.88'E	
50	Repanga/Cuvier Island	36°26.15'S	175°46.17'E	
51	Mercury Islands	36°37.44'S	175°48.52'E	*
52	Kennedy Bay and estuary	36°40.61'S	175°33.35'E	
53	Whangapoua Harbour including ocean beaches from New Chums Beach to Kuaotunu Beach	36°43.37'S	175°37.87'E	*
54	Otama Beach and Estuary to Opito Bay	36°42.44'S to 36°42.86'S	175°46.65'E to 175°47.73'E	*
55	Black Rocks	36°41.87'S	175°51.94'E	
56	Flat Island	36°42.62'S	175°52.05'E	
57	Ohinauiti Island	36°43.01'S	175°53.05'E	
58	Ohinau Island	36°43.64'S	175°52.82'E	*
59	Needle Rock	36°44.02'S	175°50.69'E	
60	Matapaua Bay to Whauwhau Beach	36°44.27'S to 36°46.09'S	175°48.53'E to 175°44.97'E	
61	Wharekaho Beach	36°47.80'S	175°43.47'E	
62	Whitianga Harbour and Buffalo Beach	36°49.91'S	175°42.59'E	*
63	Cooks Beach and Purangi Estuary	36°50.22'S	175°44.71'E	*

Site ID	Location	Latitude	Longitude	Identified as significant by statute, covenant or other processes
64	Whanganui A Hei	36°49.25'S to 36°50.10'S	175°45.86'E to 175°48.07'E	*
65	Wigmore Stream	36°50.55'S	175°48.81'E	
66	Motokurure/Centre Island	36°48.12'S	175°46.25'E	
67	Poikeke Island	36°49.22'S	175°47.84'E	
68	Hot Water Beach	36°52.76'S	175°49.14'E	
69	Sailor's Grave – Te Karo Bay	36°57.71'S	175°50.64'E	
70	Tairua Harbour, including Tairua Ocean Beach and Pauanui Beach	37°0.27'S	175°51.81'E	*
71	Aldermen Islands	36°57.50'S	176°4.81'E	*
72	Whakahau/Slipper Island	37°2.97'S	175°56.52'E	
73	Pauanui/Penguin Island	37°3.88'S	175°55.91'E	
74	Rabbit Island	37°4.19'S	175°55.58'E	
75	Ohui/North end of Opoutere Beach south to Wharekawa Harbour	37°4.20'S to 37°6.68'S	175°53.38'E to 175°53.27'E	*
76	Onemana Beach south to beach opposite Tokakahakaha Island	37°8.94'S to 37°10.26'S	175°52.80'E to 175°52.96'E	
77	Whangamata Harbour, including Whangamata Beach south to Otahu River	37°12.17'S	175°52.82'E	*
78	Hauturu/Clark Island group	37°12.84'S	175°53.48'E	*
79	Whiritoa Beach	37°17.00'S	175°54.23'E	
80	Mataora Bay	37°18.30'S	175°55.02'E	
81	Motumorirau Island	36°44.30'S	175 25.00'E	

3 WRC significance criteria

This section outlines each of the 11 significant criteria, the biodiversity values relevant to particular criteria and sites in the Waikato CMA to which they were identified to apply. This section should be considered as complementary to the Results (section 4) and to Appendix A.

3.1 Criterion 1 – Existing biodiversity protection

This criterion recognises that indigenous vegetation or habitat for indigenous fauna (and by extension a site containing these) has been, or is recommended to be, set aside by statute or covenant (see Table 2-1 for a complete list of mechanisms that could apply) for the protection of biodiversity. This assessment identified five such sites within the Waikato region (Figure 3-1). Firstly, the region's entire west coast marine area falls within the West Coast North Island Marine Mammal Sanctuary, established in 2008 under the Marine Mammals Protection Act 1978. This sanctuary stretches from Maunganui Bluff in the north to Oakura Beach in the south and extends out to the 12 nm limit. The Sanctuary also includes the region's main west coast harbours (Raglan, Aotea and Kawhia). The Sanctuary was established specifically to protect Māui dolphin and incorporates restrictions on fishing, seismic surveys and seabed mining. Secondly, a small Wildlife Sanctuary (Gannet Island) is also found within this broader west coast region, gazetted in 1980 for the protection of the country's largest single breeding colony of Australasian gannets. Thirdly, an area of wetland covering nearly 8,000 ha centred on Miranda in the Firth of Thames is included on the List of Wetlands of International Importance (otherwise known as a Ramsar site, named after the city of Ramsar in Iran, where the Convention was signed in 1971).[1] Fourthly, the Waikato region includes a marine reserve, Te Whanganui A Hei, which extends from the coast at approximately Cook Bluff and offshore to Motukorure/Centre Island then south-eastwards to the northern end of Hahei Beach and offshore to the northern end of Mahurangi/Goat Island. Marine reserves afford the highest level of marine protection established under the Marine Reserves Act 1971. Finally the entire Waikato east coast region forms the southern half of the Hauraki Gulf Marine Park, established under the Hauraki Gulf Marine Park Act (2000) to promote integrated management and the protection and enhancement of the Hauraki Gulf. This Act recognises the life-supporting capacity of the environment of the Hauraki Gulf and its islands as a matter of national significance. Sea Change – Tai Timu Tai Pari delivered a marine spatial plan using an innovative stakeholder process. Implementation of the recommendations of this plan are currently being discussed through a recently selected ministerial committee.

[1] New Zealand became a party to the Ramsar Convention on Wetlands in 1976 and the Firth of Thames is one of six such Ramsar sites now recognised in New Zealand.

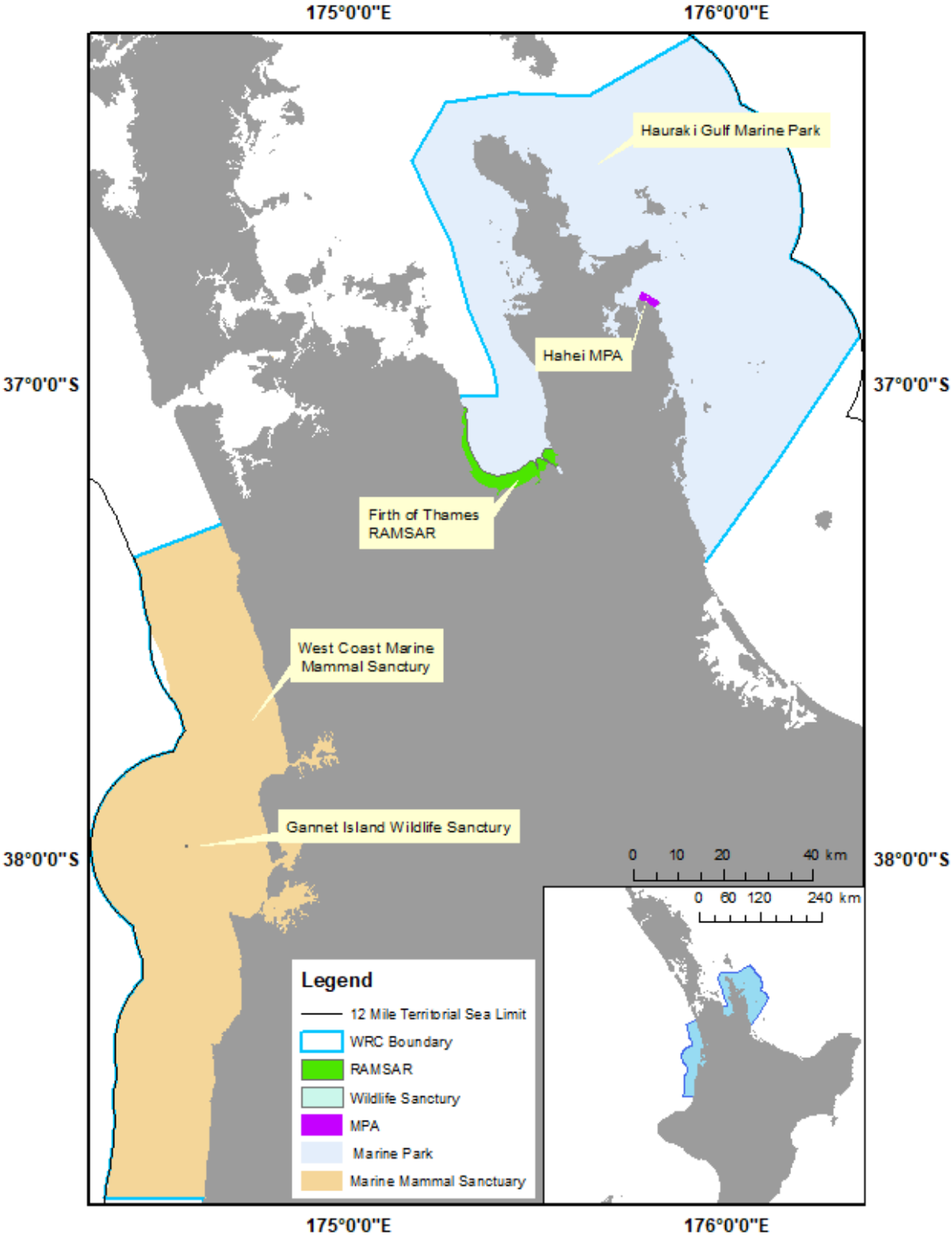

Figure 3-1: Existing biodiversity protection (Criterion 1) in the CMA of the Waikato region.

3.2 Criterion 2 – Reduced or degraded habitat, ecological sustainability threatened

This criterion confers significance to habitats that have been reduced in extent or degraded through anthropogenic activity to a point where the ecological sustainability of the ecosystem is threatened. Overall, we found few data sets available to support the use of this criterion. This is because typically New Zealand lacks historical data of the original extent of most coastal habitats (such as subtidal biogenic habitats, saltmarsh, seagrass meadows, mangrove forests, sand dunes, and other coastal wetland habitats) to be able to specifically assess how much they have been reduced in extent. Further, we lack robust evidence for individual habitats and species as to minimum thresholds below which the habitat or the species that depend on it are no longer ecologically sustainable.

Habitat assessments have occurred for some locations, particularly intertidal habitats in many of the Waikato estuaries, and could be used to provide at least a recent baseline upon which future assessments of this criterion could be assessed (Needham et al. 2013, 2014). However, information on subtidal habitats is particularly limited, and it is anticipated that substantial degradation has occurred due to anthropogenic activity, particularly for subtidal biogenic habitats (e.g., estimated distributions of green lip mussels in the Hauraki Gulf prior to dredging (Greenway 1969)).

Here, we use Criterion 2 to apply to the Waikato River where habitat degradation of fringing estuarine vegetation threatens spawning sites of inanga (*Galaxias maculatus*), noting that we were instructed by WRC to include assessment of sites of significance for indigenous biodiversity that span the CMA-land interface as appropriate (Figure 3-2).

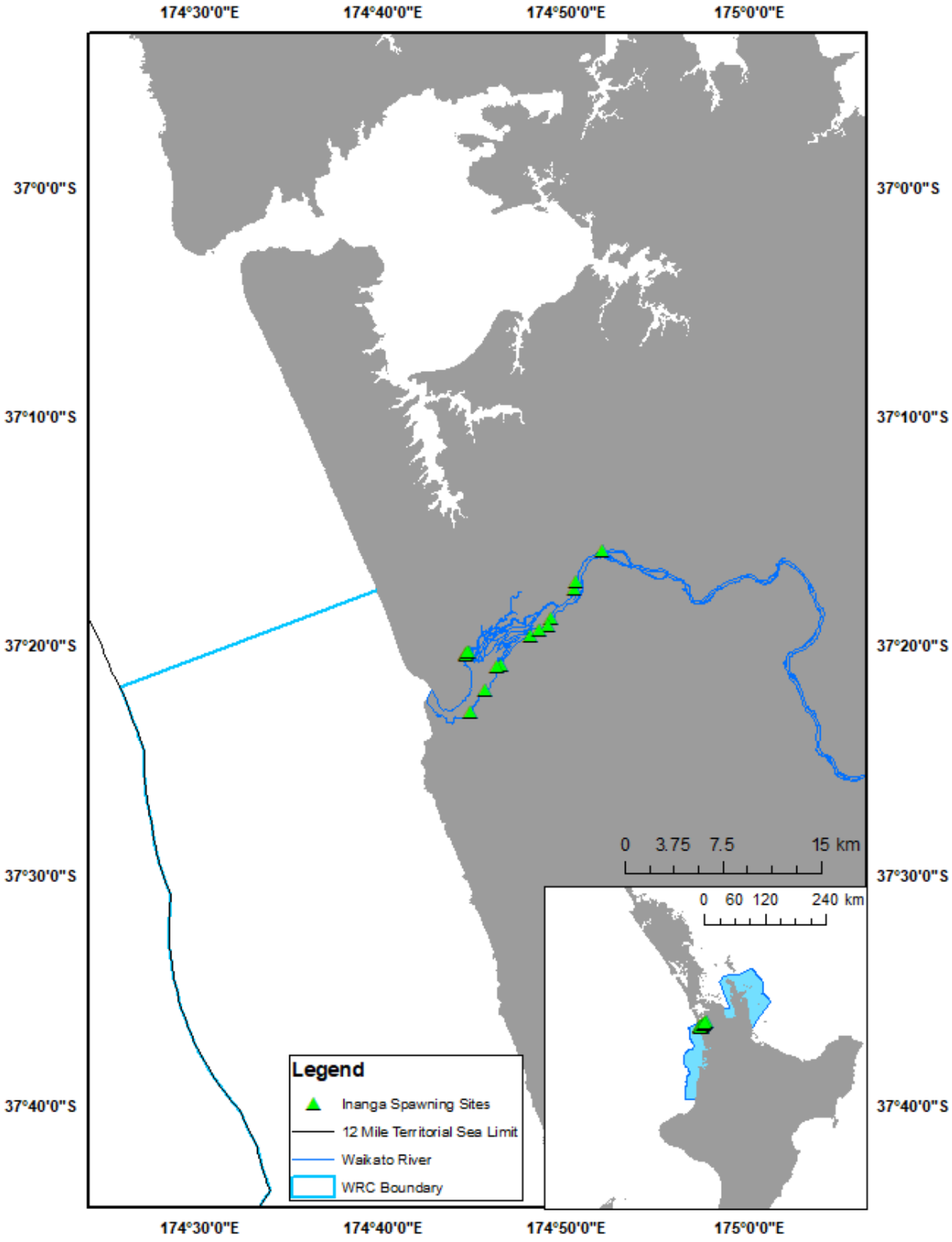

Figure 3-2: Known spawning sites of inanga in the Waikato River estuary and delta. Spawning site locations provided in digitised format by WRC.

3.3 Criterion 3 – Habitat for threatened/at risk; endemic; taxa at edge of natural range

For Criterion 3, which relates primarily to 'threatened' or 'at risk taxa', we used the latest versions of the Department of Conservation's conservation status reports that classify biota, by taxonomic group, using the threat classification system (Townsend et al. 2008). We include NZCPS Policy 11(a)(i) and 11(a)(ii) criteria within assessment of WRC Criterion 3. Taxa classified as either threatened or at-risk followed Baker et al. (2019) for marine mammals, Robertson et al. (2017) for birds, Dunn et al. (2018) for freshwater fishes, de Lange et al. (2018) for vascular plants, and Nelson et al. (2019) for macroalgae. The threat classification system utilises three sub-categories for threatened taxa; in descending threat order these are 'nationally critical', 'nationally endangered' and 'nationally vulnerable'. For at-risk taxa, the classifications do not follow a similar order of high to low threat. For example, some taxa classified as 'at-risk – relict' can have relatively large and stable populations, but currently occupy a relatively small proportion of their historic range. The four at-risk sub-categories are 'declining', 'recovering', 'relict' and 'naturally uncommon'.

Stephenson et al. (2018) prepared a national dataset of point records of all threatened taxa listed within the NZTCS (with the exception of macroalgae which were not yet assessed on the NZTCS). Individual point records (i.e., not comprehensive surveys of threatened taxa, from national and international marine biodiversity databases) are provided for the Waikato region, showing the diversity of threatened taxa inhabiting the Waikato region, including new additions of macroalgal threatened taxa as per Nelson et al. (2019) (Figure 3-3 to Figure 3-9). There are no threatened invertebrate records in the Waikato region within this dataset, and all threatened fish records (including only chondrichthyan (cartilaginous fishes) species in this dataset) are in deep (> 200 m) water off the Waikato's east coast (Stephenson et al. 2018). The digitised data prepared by Stephenson et al. (2018) and presented here in Figures 3-3 to 3-9 generally refelect presence only data and are included to illustrate the level of information currently available in digital form.

For threatened or at-risk taxa that are also highly mobile (marine mammals, birds and cartilaginous fish) the presence or occurrence of a taxon within the Waikato region was insufficient to trigger significance under Criterion 3. For such mobile taxa we referred to non-digitised data sources (usually published papers and reports) in order to determine whether a particular site within the region was either a breeding site (including the presence of marine mammal calves/pups with adult animals), a known roosting site or whether a site represented a frequently and persisitently used feeding site. For non-mobile threatened or at-risk taxa (e.g. plants), presence alone was sufficient to trigger Crietrion 3. The region is very likely to be visited friom time to time by a much larger group of threatened or at-risk mobile taxa than noted in this report, but we have not included such cases when considering Criterion 3. Highly mobile taxa often have very large ranges and distributions, for many species extending far beyond New Zealand's EEZ. For such taxa it would be extremely difficult to quantify the 'importance' of the Waikato region, compared to other parts of their range.

This criterion also is defined to include habitats that support species endemic to the Waikato region. To the best of our knowledge, we are unaware of any taxa that are endemic to the region. While Bouma (2016) in a summary of Waikato marine biodiversity notes four regional endemic breeding seabirds in the Hauraki Gulf as per Gaskin and Raynor (2013), descriptions on national seabird databases (http://nzbirdsonline.org.nz/) suggest none breed only on Waikato offshore islands. However, a number of outer Hauraki Gulf islands in the Waikato CMA are listed as breeding sites for seabirds (e.g., Mercury Island group), and the NZ Birds Online website records a translocation of a breeding colony of Pycroft's petrel (*Pterodroma pycrofti*, one of the four 'regional' endemic species)

to Cuvier Island in 2001-2003 (although they are also found breeding on other island groups in Northland).

Additionally, this criterion includes habitats, and therefore sites, that support indigenous species at the limit of their natural range. Within the Waikato region, New Zealand fur seal (*Arctocephalus forsteri*) reaches the northern limit of its breeding range at Gannet Island and mangrove reaches the southern limit of its range at Kawhia Harbour.

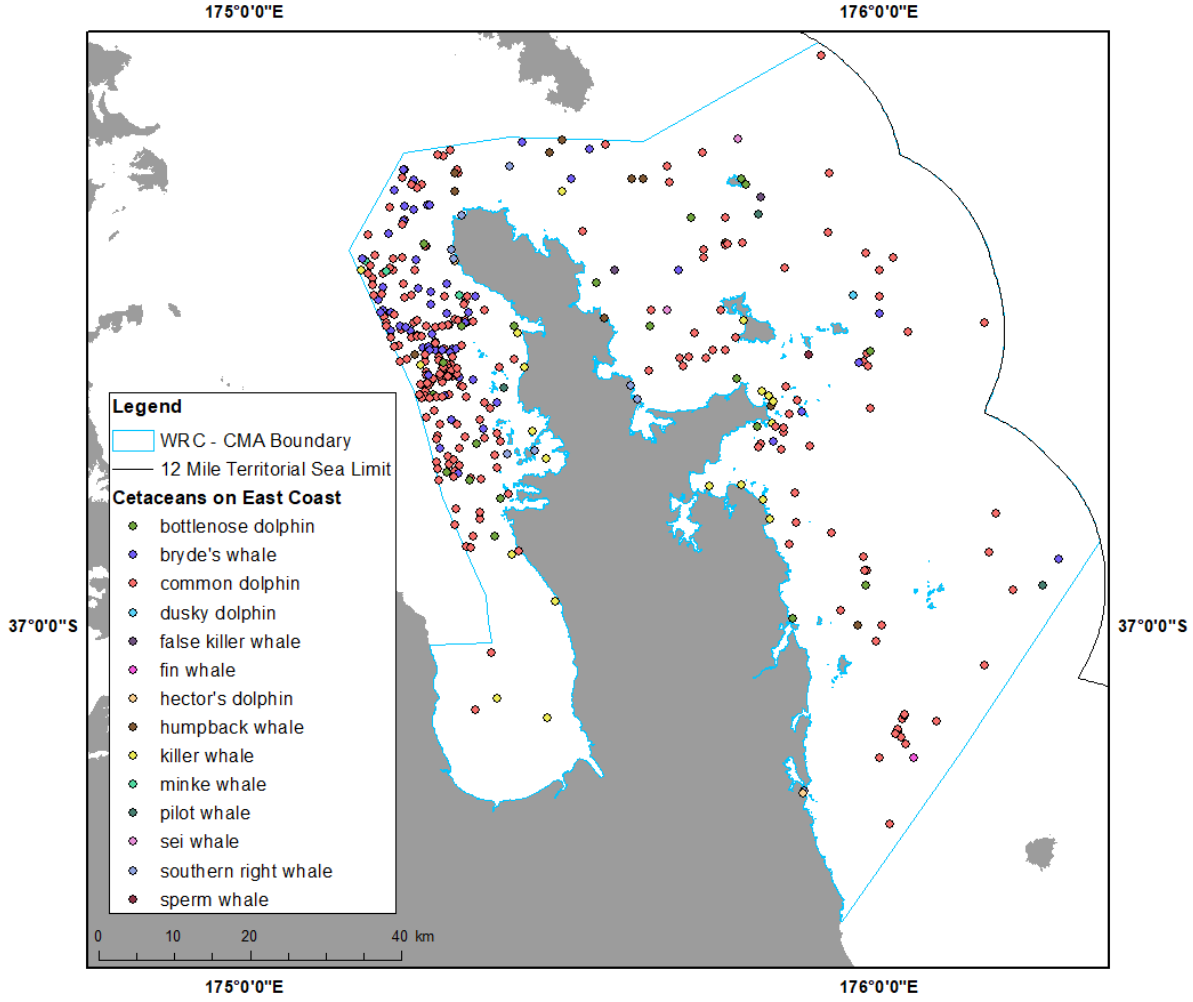

Figure 3-3: Point records (presence only) of cetacean taxa in the CMA east coast of the Waikato region (Stephenson et al. 2020).

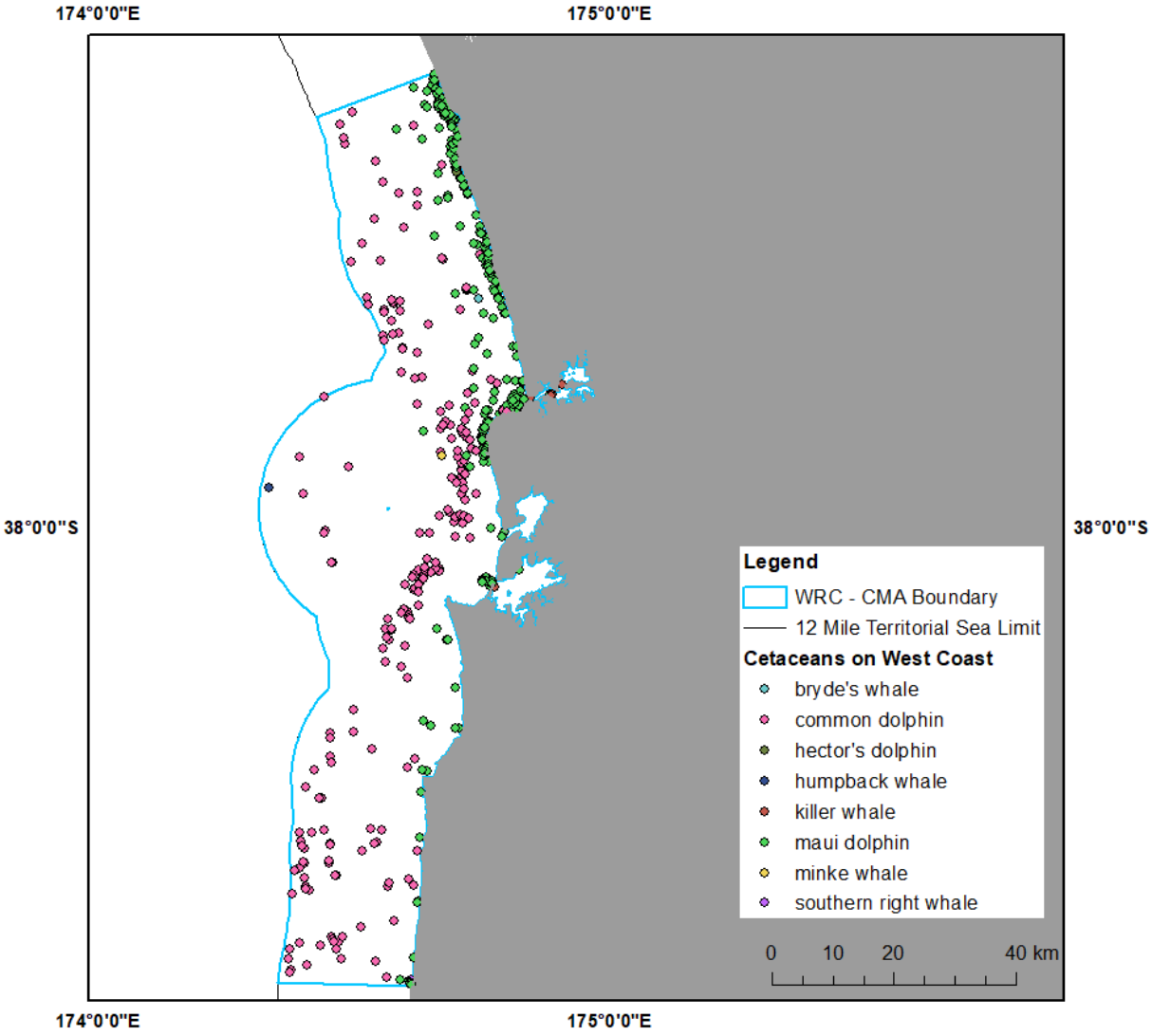

Figure 3-4: Point records (presence only) of cetacean taxa in the CMA west coast of the Waikato region (Stephenson et al. 2020).

3.3.1 Marine mammals

Our assessment of Criterion 3 determined that the CMA of the Waikato region was very important for four species of marine mammal: Māui dolphin, Bryde's whale (*Balaenoptera edeni brydei*), killer whale (*Orcinus orca*) (all threatened – nationally critical) and bottlenose dolphin (*Tursiops truncates*) (threatened – nationally endangered) (Stephenson et al. 2020). Māui dolphin is restricted in its distribution to coastal waters of the northern part of North Island. A relatively large proportion of the overall Māui dolphin distribution occurs within the Waikato region making the region's waters off the west coast critically important for this species. Bryde's whale, killer whale and bottlenose dolphin have far less restricted distributions compared to Māui dolphin and range widely through waters beyond the Waikato region. Nevertheless, while the region's east coast waters are probably not as critical for these species as the west coast is for Māui dolphin the eastern coastal waters are considered important for Bryde's whale, killer whale and bottlenose dolphin, with regular calving and

feeding within the region (Visser 2000, Baker & Madon (2007), Dwyer et al. (2014), Hupman et al. (2014), Dwyer et al. (2016), Tezanos-Pinto et al. (2017)).

3.3.2 Birds

For our assessment, significance was conferred to a site through the presence of breeding birds or through the presence of temporally predictable flocking or roosting birds (e.g., aggregations of non-breeding birds). Occurrence alone of a threatened or at-risk taxon was insufficient to confer significance. The Waikato region supports a diverse assemblage of breeding shorebirds and seabirds. Shorebirds tend to breed above the high-water mark at the upper reaches of beaches or within transitional vegetation from coastal and estuarine habitats to more terrestrial habitats. Breeding seabirds are generally, but not exclusively, confined to islands, rocks and stacks that are free of mammalian predators. Two reports commissioned by WRC (Dowding et al. 2019 reflecting updates in species knowledge and distributions and to NZTCS threatened classification originally presented in Dowding et al. 2013) were used to assess sites for shorebird ecological criteria, although digital layers were not provided for the sites identified in these reports. Stephenson et al. (2018) compiled datasets of seabird distributions for 70 species (generally showcasing the broad foraging distributions of seabirds in New Zealand waters). A map of Important Bird Areas (Forest and Bird 2014) includes nearly all of the Waikato region's CMA, although this map does not include waters deeper than 200 m off the region's east coast. Stephenson et al. (2018) also compiled available digital records of individual seabird breeding colonies (Figure 3-5). National seabird and shorebird datasets are in process of updating and integrating across multiple national and international databases, including iNaturalist research-grade observations that are publically accessible and available for download on GBIF (Global Biodiversity Information Facility) (Carolyn Lundquist, unpublished technical report for the Department of Conservation).

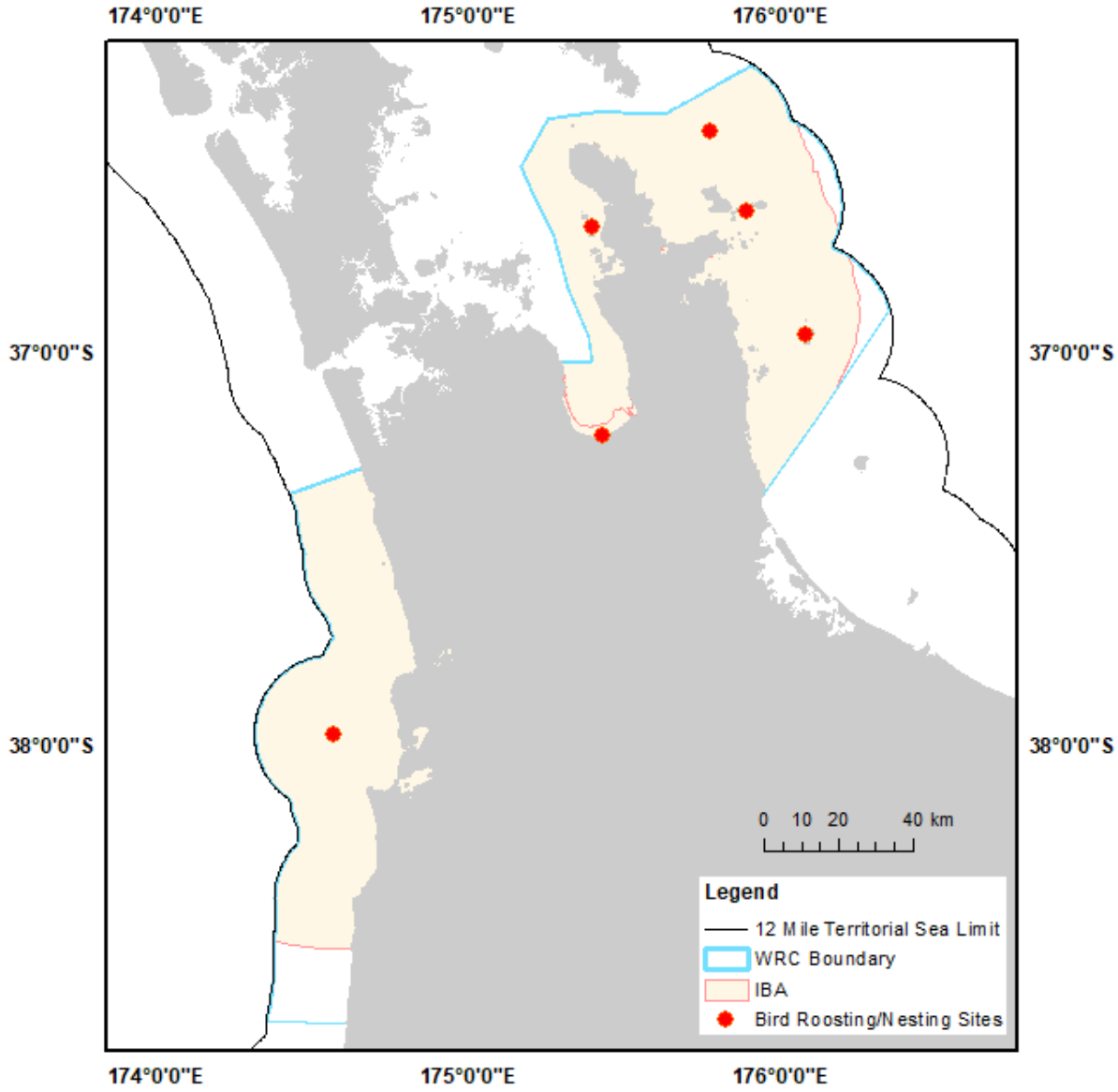

Figure 3-5: Seabird breeding colonies, BirdLife International 'Important Bird Areas (IBAs)', and point record extracts for seabirds. Compiled by Stephenson et al. (2018) for DOC's national key ecological areas database; note point records and roosting/nesting sites often overlap. Light gray outline indicates Ramsar site in Firth of Thames.

Overall, the Waikato region supports nine threatened shorebird or seabird taxa that breed or aggregate at predictable sites following breeding: Australasian bittern (*Botaurus poiciloptilus*), black-billed gull (*Larus bulleri*), black stilt (*Himantopus novaezelandiae*) (all threatened – nationally critical), reef heron (*Egretta sacra sacra*) (threatened – nationally endangered), banded dotterel (*Charadrius bicinctus bicinctus*), Caspian tern (*Hydropogne caspia*), flesh-footed shearwater (*Puffinus carneipes*), lesser knot (*Calidris canutus rogersi)* and wrybill (*Anarhynchus frontalis*) (all threatened – nationally vulnerable). A further 16 at-risk taxa are supported: banded rail (*Gallirallus philippensis assimilis*), bar-tailed godwit (*Limosa lapponica baueri*), northern blue penguin (*Eudyptula minor iredalei)*, red-billed gull (*Larus novaehollandiae scopulinus*), South Island pied oystercatcher (*Haematopus finschi)*, sooty shearwater *(Puffinus griseus*), spotless crake (*Porzana tabuensis tabuensis)* and white-fronted tern (*Sterna striata striata*) (all at risk – declining), northern New Zealand dotterel (*Charadrius obscurus aquilonius*), North Island little shearwater (*Puffinus assimilis haurakiensis*), pied shag

(*Phalacrocorax varius varius*), Pycroft's petrel and variable oystercatcher (*Haematopus unicolor*) (all at-risk – recovering) and fluttering shearwater (*Puffinus gavia*), New Zealand white-faced storm petrel (*Pelagodroma marina maoriana*) and northern (common) diving petrel (*Pelecanoides urinatrix urinatrix*) (all at-risk - relict).

Generally, sites identified as significant from this assessment on the basis of shorebirds and seabirds align with those classified as 'Priority 1' and 'Priority 2' sites by Dowding (2019). Dowding (2019) defined Priority 1 and 2 sites using criteria from the Ramsar Convention on Wetlands of International Importance and WRC criterion 3 (Table 2-1). Criterion 2 of the Convention states that *"a wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species"* (as defined by the International Union for the Conservation of Nature), while criterion 6 of the Convention states that *"a wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird".* Dowding (2019) combined the above two Convention criteria with WRC criterion 3 (Table 2-1), such that a Priority 1 site *"regularly holds 1% of the global population of one or more species or subspecies that are classified as threatened or at risk under the New Zealand Threat Classification System List for 2016"* (Robertson et al. 2017), and a Priority 2 site *"regularly holds one or more threatened or at risk species or subspecies (but not at the 1% level), or values are insufficiently known but type of habitat, older data, and/or other factors suggest that this is probable."*

3.3.3 Chondrichthyes (sharks, rays)

Stephenson et al. (2018) compiled records of threatened fish (including only chondrichthyan species in this dataset); while this dataset is national and does include some records in shallow water, point records were compiled predominantly from fishery research trawls in deeper water. While the Waikato region is noted as a potentially valuable for key life history stages for a number of Chondrichthyes, the national dataset includes few records in the region due to biases in sampling effort such as these trawls are typically not performed inshore, and these records all occur in deep (> 200 m) water off the Waikato's east coast (Figure 3-6) (Stephenson et al. 2018). We are unaware of any evidence of the Waikato marine area being an important nursery area for white sharks (*Carcharodon carcharias*) or other threatened or at-risk cartilaginous fish taxa, and while juvenile and adult female white sharks occur throughout the Waikato region (as they do all around northern North Island (juveniles) or New Zealand generally (adults)), available records do not identify Waikato waters as having more white sharks than elsewhere.

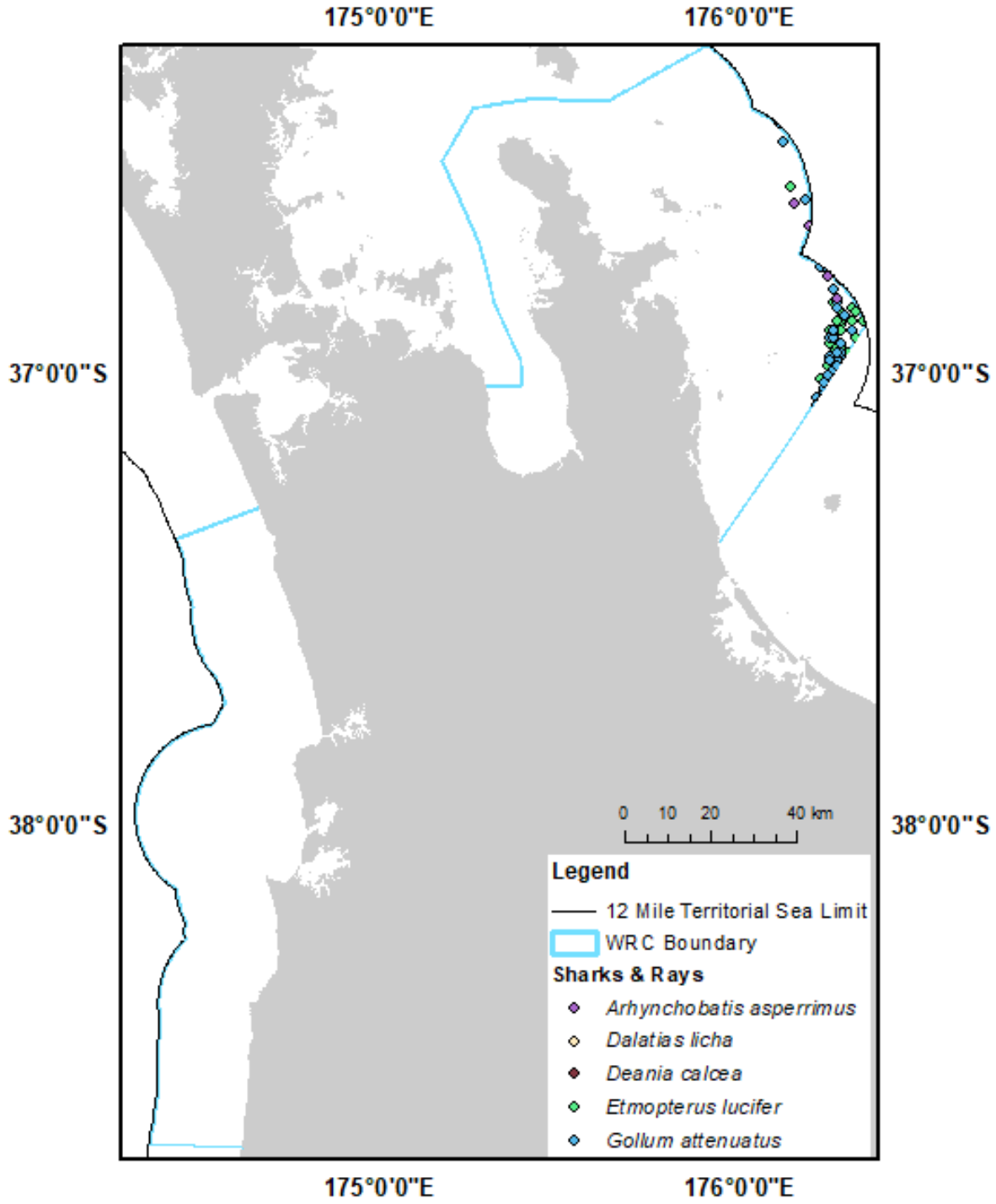

Figure 3-6: Point records of chondrichthyes (sharks/rays) in the Waikato CMA based on Stephenson et al. (2018).

3.3.4 Diadromous fish

Diadromous fish are considered freshwater species (Dunn et al. 2018) but make two migratory movements between marine and freshwater environments during their life cycles. Because passage to and from the sea is essential for diadromous fish, we considered estuaries, river mouths and the marine environment more generally to be significant sites and habitats for this group of fish. Diadromous fish adopt three migratory strategies:

1. Anadromy – anadromous fish spend their adult life in the sea, move to fresh water to breed, then die;
2. Catadromy – catadromous fish adopt the reverse strategy to anadromous fish, spending most of their adult life in fresh water before a final migration to the ocean to breed and die, and;
3. Amphidromy – amphidromous fish adopt an intermediate strategy in which adults live in fresh water, usually breed yearly, and the juveniles spend time in the ocean before returning to fresh water.

For those species that spawn in freshwater, we have assumed that occurrence in a particular river or stream, or an embayment fed by one or more rivers or streams, is indicative of spawning in those freshwater systems. Precise locations of spawning are rarely known but see Taylor (2002) for the locations of inanga spawning sites in the lower Waikato River from the period 1983 to 1999. For species that don't spawn in freshwater we still considered occurrence in a river, stream or creek sufficient to confer significance to those sites because the junction between the freshwater and marine sections of rivers form part of critical migration routes navigated by these taxa as part of their life cycle (see above).

For a total of nine threatened (shortjaw kokopu *(Galaxias postvectis)* and lamprey *(Geotria australis)*, both nationally vulnerable) or at-risk (longfin eel *(Anguilla dieffenbachia)*, torrentfish *(Cheimarrichthys fosteri)*, giant kokopu *(Galaxias argenteus)*, koaro *(G. brevipinnis)*, inanga and bluegill bully *(Gobiomorphus hubbsi)*, all declining, and giant bully *(G. gobioides)*, naturally uncommon) diadromous fish, information on occurrence in rivers and streams within the Waikato region was extracted from NIWA's national freshwater fish database (Crow 2017). The data extraction was limited to the period 2000 to 2019 to minimise the likelihood of relatively old records being included which may no longer be accurate. The sites included through this data extraction process may underestimate the full extent of threatened or at-risk diadromous fish occurrence in the region.

3.3.5 Vascular plants

Within the Waikato region's CMA, seagrass *(Zostera muelleri)* was the most conspicuous and widespread plant classified as threatened or at risk by the Department of Conservation (https://www.doc.govt.nz/seagrass-and-mangrove-extent), and the only vascular plant species considered under Criterion 3 as conferring significance to a site. However, it should be noted that dune habitat could support several threatened or at-risk plant taxa (see section 3.8.9) but site assessments would be required to confirm the presence of any such plants on particular dunes. Similarly, we have not considered saltmarsh plants but it is likely that threatened or at-risk species occur within this habitat type in the Waikato CMA. For example, native musk *(Mimulus repens)*, classified as at-risk – naturally uncommon, was reported from Otama Estuary (Graeme 2010).

Seagrass maps were available from the Waikato Regional Council 'Estuarine Vegetation and Harbours - GIS Layer' (Figure 3-7).

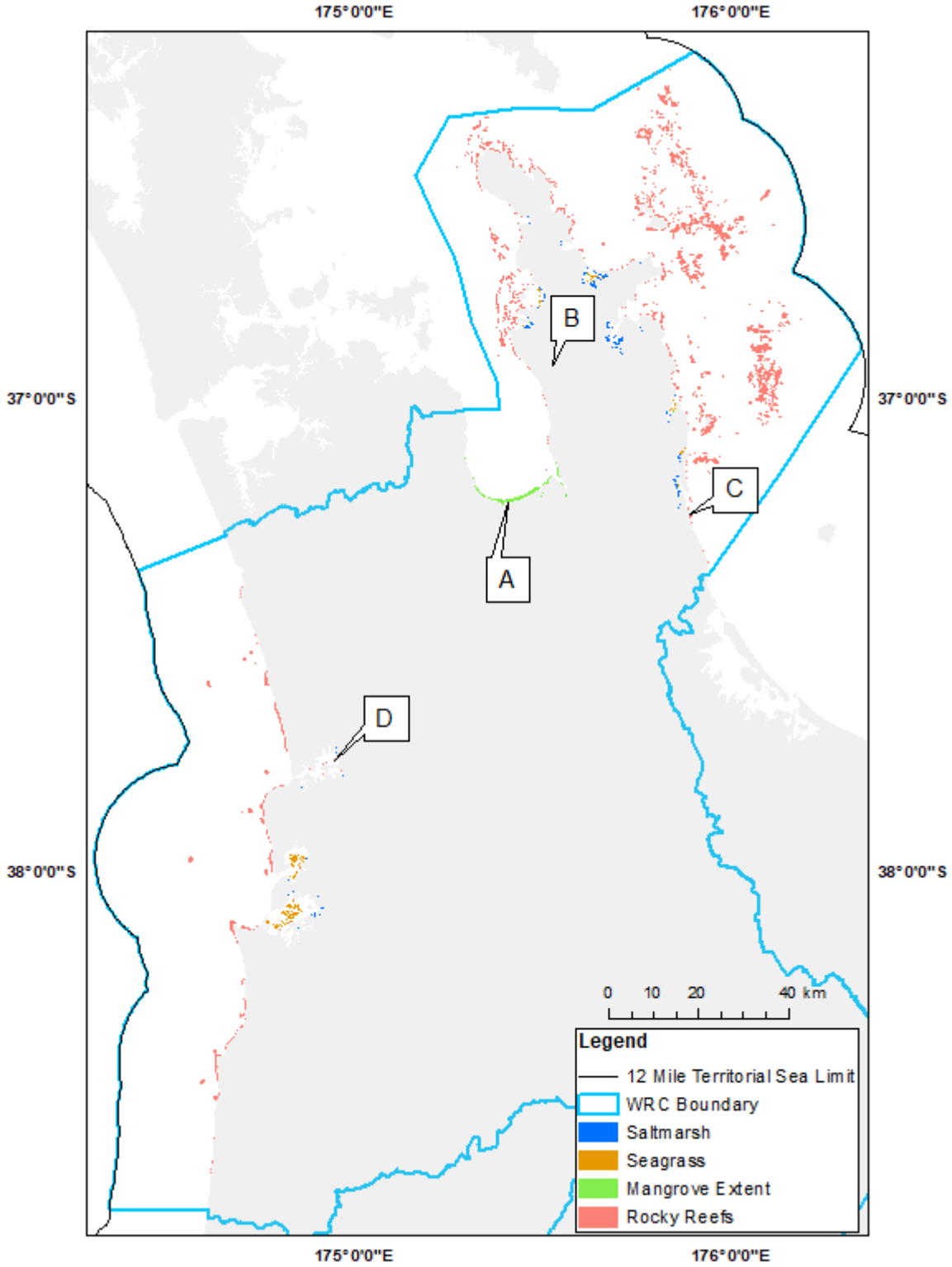

Figure 3-7: Coastal vegetated habitat and rocky reef habitat distributions in the Waikato CMA. Mangrove and rocky reef distributions provided by WRC; seagrass distributions based on data compiled for the Hauraki Gulf Marine Spatial Plan. See Figure 3-8 for insets A to D and Section 3.8.5 for description of rocky reef layer.

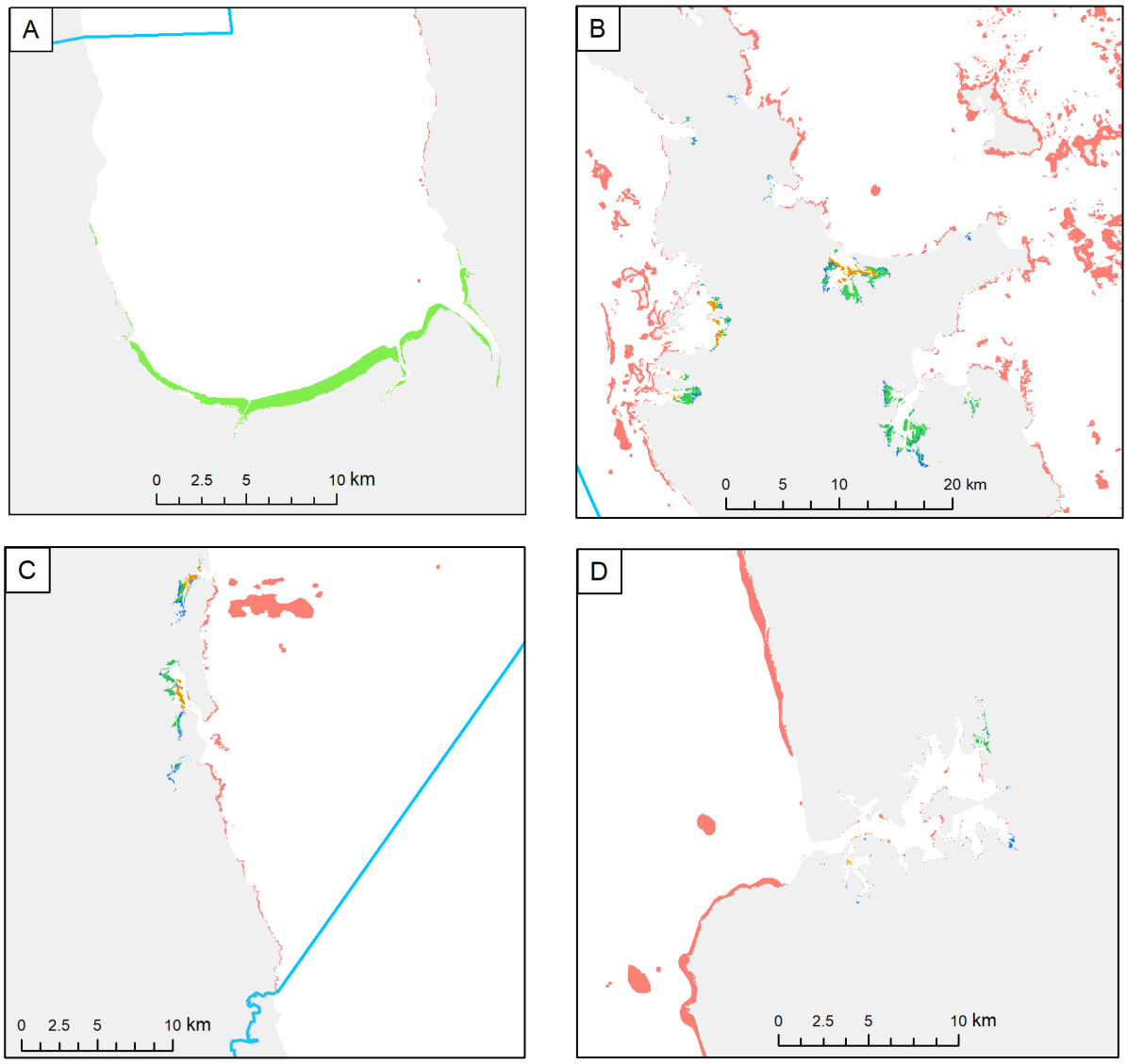

Figure 3-8: Insets of coastal vegetated habitat and rocky reef habitat distributions in the Waikato CMA. Mangrove and rocky reef distributions provided by WRC; seagrass distributions based on data compiled for the Hauraki Gulf Marine Spatial Plan. Inset labels as per Figure 3-7 and Section 3.8.5 for description of rocky reef layer.

3.3.6 Macroalgae

In keeping with the protocol adopted for diadromous fish (see section 3.3.3), macroalgae data extraction from Te Papa's algal database was limited to the period 2000 to 2012 (the most recent year for which records of macroalgae have been inputted to the database) to minimise the likelihood of relatively old records being included that may no longer be accurate. The sites included through this data extraction process may underestimate the full extent of threatened or at-risk macroalgae occurrence in the Waikato region, as records were not collected comprehensively across all rocky reefs and soft sediments in the region, and are rather haphazard collections based on various museum databases. A total of six at-risk macroalgae taxa were identified as occurring within the Waikato CMA (Figure 3-9); all have been classified as at-risk – naturally uncommon: *Aeodes*

nitidissima, *Carpophyllum angustifolium*, *Cladostephus spongiosus*, *Lessonia* sp. A, *Pachymenia lusoria* and *Pleurostichidium falkenbergii*.

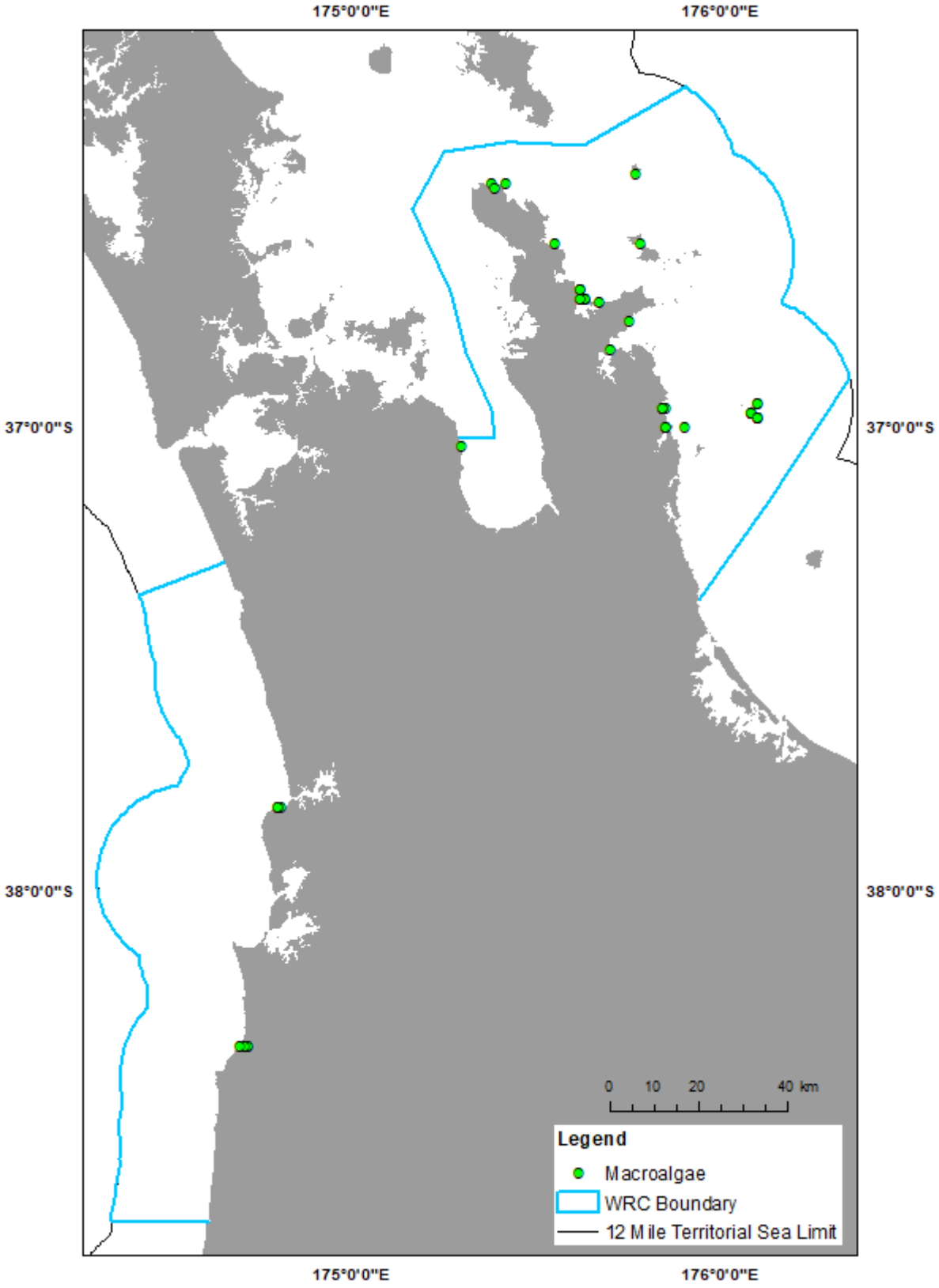

Figure 3-9: Point records of threatened macroalgal species listed in the NZTCS for the Waikato CMA.

3.4 Criterion 4 – Reduced historical extent

Criterion 4 covers vegetation types, habitats or ecosystems that are under-represented and which currently occupy 20% or less of the known or likely original spatial extent. Due to a paucity of quantitative information regarding the original extent of vegetation, habitats or ecosystems it is difficult to say whether current extents represent 20% or less of the original present. Nevertheless, the available evidence, taken as a whole, strongly suggests that four habitats are currently close to or at the 20% level: active dune systems, saltmarsh habitat, seagrass habitat and green-lipped mussel habitat. It should be noted that all four habitat types included as triggering Criterion 4 have additionally been included as 'significant habitats' triggering either Criterion 6 (saltmarsh – see section 3.6.2) or Criterion 8 (dune, seagrass and green-lipped mussels – see sections 3.8.10, 3.8.3, and 3.8.7, respectively).

3.4.1 Active dune systems

The area occupied by active sand dunes in New Zealand generally and the Waikato region more specifically declined by approximately 70% from the 1950s to the 1990s (Hilton et al. 2000). Furthermore, Hilton et al. (2000) noted that the decline in area of active dune systems has probably continued since the 1990s. Hilton et al. (2000) identify Waikawau Beach, Otama Beach and Hot Water Beach as priorities for national sand dune and beach vegetation conservation, although geospatial maps of all Waikato (or national) dune systems were not found to be available. On this basis, it would seem likely that active dune habitat is now approaching 20% of its likely original extent, the value required to trigger Criterion 4.

3.4.2 Saltmarsh habitat

There is perhaps even less quantitative information on the extent of saltmarsh habitat in New Zealand, and how this has changed over time, compared to that for dune and seagrass habitats. Nevertheless, data available from the Ministry for the Environment's website (see https://data.mfe.govt.nz) indicate that the area of 'swamp' and 'marsh' wetland has declined from over 1.871 million ha in pre-human New Zealand to a contemporary extent of approximately 113,000 ha, a reduction of 92%. Similarly, within the Waikato region wetland habitats have declined from 356,516 ha to 28,226 ha (a reduction of 93%) over the same timescale. It is very likely that embedded within these marked reductions are losses in terrestrial (non-saltmarsh) wetland habitats, and in the absence of a specific 'saltmarsh' wetland category it is impossible to draw firm conclusions about the extent of saltmarsh habitat loss. However, it seems reasonable to conclude that saltmarsh habitat loss following human settlement of New Zealand would have been significant and adopting a precautionary approach, we have included saltmarsh habitat as triggering Criterion 4. A coastal vegetation layer was available from WRC's Estuarine Vegetation and Harbours - GIS Layer (refer Figure 3-7, Figure 3-8).

3.4.3 Seagrass habitat

While qualitative evidence suggests that seagrass habitat may be at 20% or less of its original extent in New Zealand, there is little quantitative evidence of historic extent of both intertidal and subtidal seagrass. Inglis (2003) provided a summary of available evidence to suggest that seagrass extent in many New Zealand estuaries and harbours has decreased over time. These decreases were both substantial in magnitude and widespread at many sites throughout New Zealand (Inglis 2003). Similarly, Matheson et al. (2011) concluded that there has been substantial loss of seagrass habitat, particularly so for subtidal seagrass habitat, within the last 50-80 years and Lundquist et al. (2018) described major decreases in seagrass area during the last century, particularly in highly impacted

harbours such as Tauranga Harbour, Waitemata Harbour and Porirua Harbour. Turner and Schwarz (2006) suggested that overall losses of seagrass habitat are probably much greater than have been estimated to date. There appears, therefore, to be strong support for the notion that seagrass habitat has declined substantially across coastal sites throughout New Zealand, particularly over the last 100 years or so. On this basis, and adopting a precautionary approach, we have included seagrass habitat as triggering Criterion 4. Bouma (2016) identify two subtidal seagrass meadows in the Waikato, at Great Mercury Island, and at Slipper Island off the Coromandel coast, whereas intertidal seagrass meadows are found throughout most Waikato estuaries (Figure 3-7, Figure 3-8).

3.4.4 Green-lipped mussel habitat

Green-lipped mussels (*Perna canaliculus*) are found throughout the country and historically formed extensive beds in shallow coastal waters (Jeffs et al. 1999). In the Hauraki Gulf, including areas with the Waikato region, green-lipped mussels once covered more than 1300 km2 of soft-sediment sea floor, with the most productive beds between Orere and Miranda (Greenway 1969). Extensive commercial dredge fishing nearly eliminated these beds by the late 1960s (Wilcox et al. 2018) and despite the cessation of fishing in 1969, the mussel beds have not recovered. Only a few small remnant green-lipped mussel beds remain totalling around 0.64 km2 (McLeod et al. 2014). The decline in extent of green-lipped mussel beds in Hauraki Gulf has been substantial with the current extent representing approximately 0.05% of the historical range.

3.5 Criterion 5 – Nationally uncommon habitats

This criterion covers nationally uncommon habitat types, including for example geothermal chenier plain or karst ecosystems, hydrothermal vents or cold seeps. In the Waikato region, this criterion was triggered by the chenier plain at Miranda in the Firth of Thames. National datasets representing naturally uncommon ecosystems in New Zealand (terrestrial environments but noting proximity to marine features such as chenier banks) were available from Wiser et al. (2013). Of interest in the CMA are shell barrier beaches (chenier plains), shingle beaches, stony beach ridges, basic cliffs, scarps and tors, calcareous coastal cliffs, seabird guano deposits, and seabird-burrowed soils (Figure 3-10, Figure 3-11). We interpret that the 'shell barrier beach' category likely also includes a number of other features such as dunes that were merged within this category based on locations of these features (Lundquist, Jones, personal communication, 30 September 2019). The naturally uncommon ecosystems dataset contains spatial information for both coastal and terrestrial ecosystems, and confidence in the data will vary between different ecosystems. Wiser et al. (2013) are unclear how each individual ecosystem was created and lack detailed information on the origins of the data used. Nevertheless, this national dataset has been noted as the best available information by Stephenson et al. (2018), and has been defined and mapped by an inter-agency working group.

Chenier plains are both a nationally and globally rare land formation, with a particularly notable occurrence in New Zealand on the coastal plain between Kaiaua and Miranda (Woodroffe et al. 1983). Chenier banks are made up of a series of stranded ridge systems (cheniers) running parallel to the shore. The banks are composed principally of fossilised shells of the cockle (*Austrovenus stutchburyi*), of varying ages (dated to 3650 years B.P.). Cheniers form when narrow ridges of coarse material such as sand or shell hash are deposited over relatively flat layers of finer grained marine/ littoral sediments. Finer grain sediments accumulate in the lee of the ridges and are eventually colonised by saltmarsh or mangrove communities. The resulting area is a heterogenous habitat which may support higher benthic diversity in comparison to surrounding sediments (though no data are available to test this hypothesis). The Firth of Thames chenier system comprises a succession of

13 shell ridges on the 2 km-wide coastal plain that has built out from the old cliff-line around Miranda. The cheniers range from less than 1 m to a little over 2 m in height, from 20 to more than 100 m wide, and 0.5 to 4 km in length. These banks, along with the associated saltmarsh habitat, are nationally and internationally important roosting and feeding area for shorebirds within the Firth of Thames (Lundquist et al. 2004).

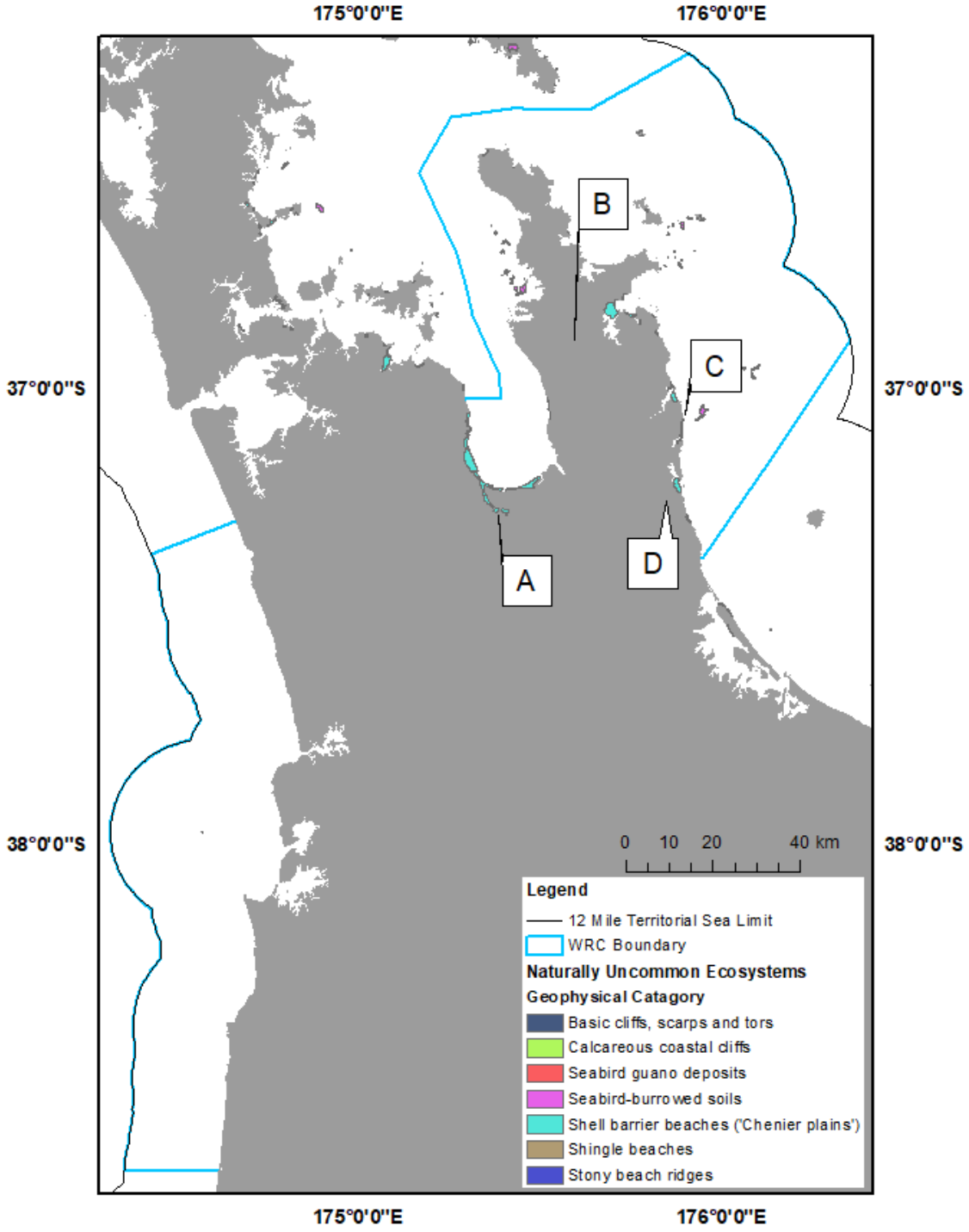

Figure 3-10: Nationally uncommon habitats (terrestrial) neighbouring the Waikato CMA. See Figure 3-11 for insets A to D.

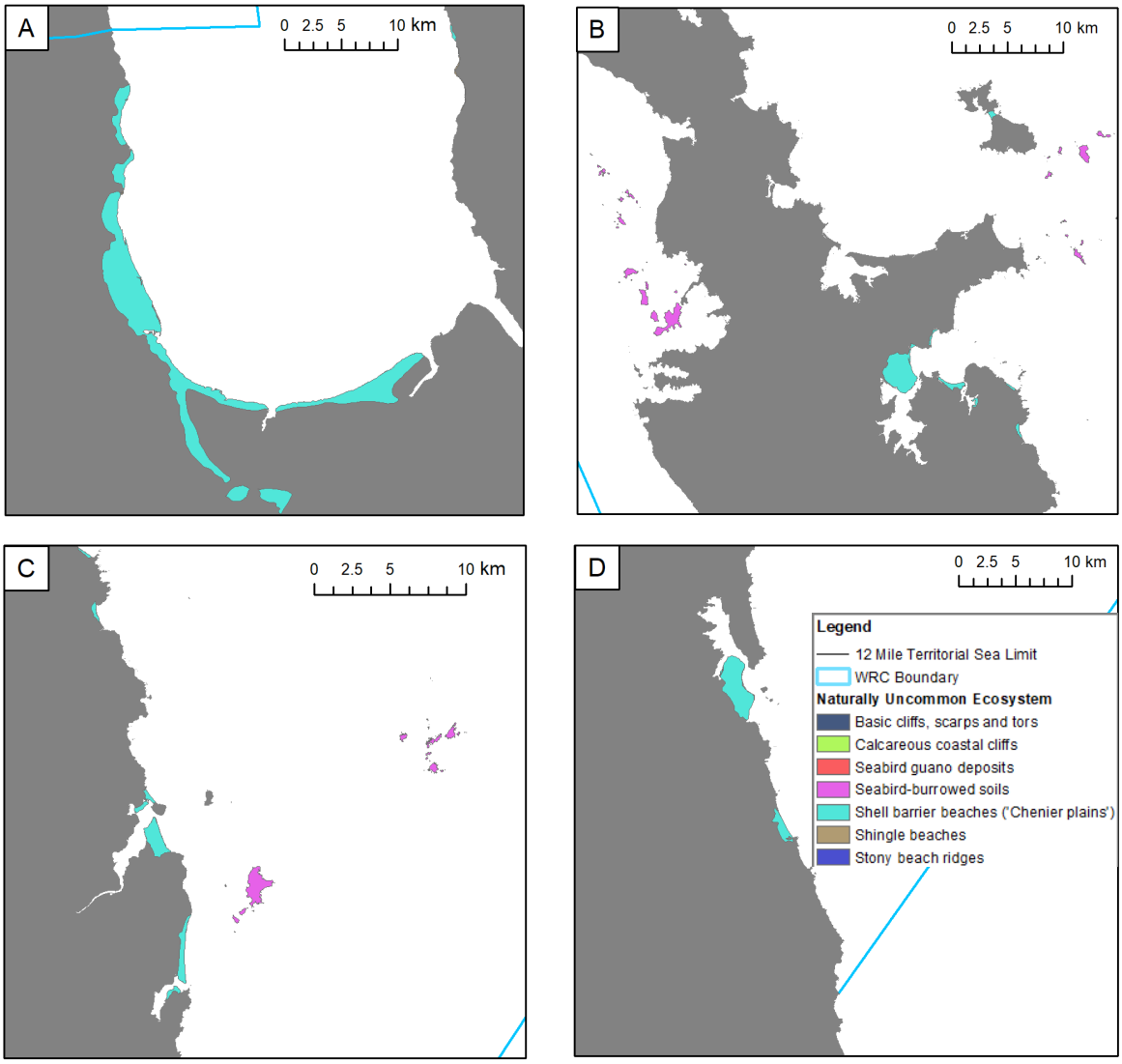

Figure 3-11: Inset maps of nationally uncommon habitats (terrestrial) neighbouring the Waikato CMA. Inset labels as per Figure 3-10.

3.6 Criterion 6 – Wetland habitats

This criterion covers wetland habitats that support indigenous flora and fauna. In this assessment we have included two wetland habitats that, if present at a site, would confer significance: mangrove habitat and saltmarsh habitat (refer Figure 3-7, Figure 3-8).

3.6.1 Mangrove

New Zealand has only one species of mangrove, which is present in all estuaries on the west coast of the North Island (except the Waikato River mouth) from Kawhia in the south to Herekino in the north, and on the east coast of the North Island from Parengarenga in the north to west of Ohiwa Harbour in the south. The subspecies of mangrove in New Zealand also occurs in temperate Australia. Mangroves provide a range of ecosystem services including the production of large volumes of organic matter, habitat for benthic invertebrate assemblages, enhancement of sediment accretion by dampening currents, attenuating waves and altering patterns of water flow, and

reduction of coastal erosion (Lundquist et al. 2018). Mangroves in New Zealand do not support unique benthic macrofaunal communities compared to other estuarine habitats, although benthic community composition and diversity differ with age of mangrove stands and proximity to both neighbouring estuarine habitats and terrestrial habitats, and sediment loading (Morrisey et al. 2003). Short-finned eels *(Anguilla australis)* have been found transiting through mangrove forests (both east and west coasts), and there are some reports of mangrove use by parore *(Girella tricuspidata)* (east coast only) and grey mullet *(Mugil cephalus)* (west coast only) (Anderson et al. 2019); however, mangrove use by fish is likely limited to areas with adequate water depths during tidal emersion, and low density forests with sparse pneumatophores to allow fish to penetrate into the forest. In Australia, the proportion of total mangrove forests utilised by fish has been shown to be small, with the majority of fish use being within 10 m of deep channels adjacent to mangrove forests (Sheaves 2017). The macroalgae found associated with mangroves are distinct assemblages but the species are not restricted to this habitat. Mangroves also support terrestrial fauna, including lichens, insects, various geckos (particularly in northern harbours), and birds – including for roosting colonies. Although no New Zealand birds are exclusively found in mangroves many species make extensive use of them for roosting, feeding or breeding.

Mangroves in northern New Zealand have been experiencing ongoing expansion since the 1940s, driven by sediment inputs from land-based conversion of native forests to develop urban, agricultural and commercial forestry areas (Lundquist et al. 2014). A recent study of the Auckland region suggested rates of increase of over 3% per annum (Suyadi 2019), and similar patterns of expansion have been observed in the Coromandel.

The Firth of Thames mangroves are one of the southernmost significant stands of mangrove in New Zealand and constitute the largest single mangrove habitat in New Zealand (Swales et al. 2008); the majority of this forest area has been colonised since the 1940s and provides a substantial natural stop bank for the Hauraki plains. Mangroves are present in most larger Waikato estuaries (refer Figure 3-7, Figure 3-8, Table 3-1) and mangrove expansion has resulted in inclusion of mangrove management through both adult and seedling removal in some Waikato estuaries (e.g., Bulmer et al. 2016a).

3.6.2 Saltmarsh

Saltmarsh habitat has been described in several WRC technical reports on vegetation surveys of the Waikato region's estuaries (e.g., Graeme 2014b), and a summarised GIS layer was compiled for the Hauraki Gulf Marine Spatial Plan (refer Figure 3-7, Figure 3-8). Graeme (2014b) described saltmarsh as a multi-species community in which three sub-communities are distinguishable:

1. 'Rush/sedge community' – typified by sea rush *(Juncus krausii)*, oioi *(Apodasmia similis),* and generally only common on the west coast of the region, three-square sedge *(Schoenoplectus pungens).* Marsh clubrush *(Bolboschoenus fluviatilis)* is also part of this community but is commonly found at the upper estuarine limit and is a species of brackish-freshwater;

2. 'Saltmarsh ribbonwood community' – typified by saltmarsh ribbonwood *(Plagianthus divaricatus),* which dominates this zone, although rushes are often common. Small areas of sea primrose *(Samolus repens)*, remuremu *(Selliera radicans)*, the coast spear grass *(Austrostipa stipoides)* and glasswort *(Sarcocornia quinqueflora* can also be present; and

3. ‘Sea meadow community’ – typically this community is devoid of tall plants except for coast spear grass. The sea meadow community can include sea primrose, remuremu, glasswort, slender clubrush *(Isolepis cernua)*, and arrow grass *(Triglochin striata)*.In more brackish areas bachelor’s button *(Cotula coronopifolia)*, leptinella *(Leptinella doica)* and sharp spike-sedge *(Eleocharis acuta) may also be present*.

Saltmarsh communities tend to fringe the upper reaches of harbours and estuaries and form the first habitats in an ecological sequence extending from fully marine through freshwater to fully terrestrial ecosystems. Saltmarsh habitat is found in many of the estuaries, harbours and embayments throughout the Waikato region, as noted in Appendix A.

3.7 Criterion 7 – Comparably large in habitat extent

Criterion 7 covers naturally occurring habitat that is relatively large in extent compared to other examples regionally, and that contains all or almost all indigenous taxa typically found in that habitat type. Here we have included two sites/habitats under this criterion:

- mangrove habitat along the southern coast of the Firth of Thames; and
- seagrass habitat in Whangapoua Harbour.

It is likely that there are examples of comparably large subtidal habitats in the Waikato CMA, however the lack of subtidal habitat maps, or defined subtidal habitat classifications for the Waikato region (or nationally) make it difficult to identify these subtidal features.

3.8 Criterion 8 – Critical for life history stages of indigenous biodiversity

Criterion 8 addresses aquatic habitat within an intertidal mudflat, estuary or any other part of the CMA that is critical to the self-sustainability of an indigenous species. This criterion proved challenging and could potentially cover virtually all habitats found within the CMA, since indigenous biota are dependent upon the habitats they occupy for their existence. Critical life-history stages of indigenous taxa will be supported in all habitats within the CMA. For example, sandy beaches are critical habitat for a range of bivalve molluscs and marine worms occupying the substrate, the pelagic marine environment is critical for pelagic fish and invertebrate taxa, and so on. Rather than simply classify all habitat types as significant on this basis we have taken a pragmatic approach and included habitats as significant that generally support elevated levels of biodiversity (they can be considered as ‘biodiversity hotspots’ compared to other, neighbouring habitat types), that are biogenic and/or sensitive. Highlighting habitats with relatively high levels of biodiversity tends to conform with the application of the 11 WRC criteria (Table 2-1) that confer significance on the basis of indigienous biodiversity. We stress that applying Criterion 8 literally would confer significance to all habitats within the Waikato CMA and note that the omission of a habitat type either under Criterion 8 here, or under Criterion 6 (wetland habitats, see section 3.6) does not imply that such habitats should be considered ‘insignificant’. For example, sandy beaches and spits are important habitats for breeding shorebirds. Indeed, many beaches and sandspits have been classified as significant on this basis alone (see Section 3.3.2 and Appendix A).

Biogenic habitats can be living taxa that form three-dimensional complex structure, which is emergent relative to surrounding habitats, or can be non-living structural habitat ‘built’ by living organisms, such as tubes or burrows in soft sediments (see Morrison et al. 2014). Biogenic habitats are relatively susceptible to deleterious anthropogenic effects, and some (e.g., shellfish beds) can be targeted for commercial harvest. In general, biogenic habitats are considered ‘sensitive’, and include

beds of large bivalve molluscs, bryozoan beds, rhodolith beds and sponge gardens (MacDiarmid et al. 2013, Lundquist et al. 2017), all considered here. Stephenson et al. (2018) mapped all point records of biogenic habitats from national datasets using data from Anderson et al. (2019) (Figure 3-12). Additional records have been collected for a further biogenic habitat detailed in Anderson et al. (2019), that of calcareous tubeworm mounds such as *Galeolaria hystrix*, the largest and most significant aggregating serpulid polychaete found in New Zealand. This species can grow as individuals or in colonies that can form complex three-dimensional mounds (or raised reef-like structures) that can become more than a metre high and several metres in diameter (MacDiarmid et al. 2013). Recent surveys (in February 2020) as part of the MBIE Project No. CO1X1618 (Juvenile Fish Habitat Bottlenecks) have observed a number of dense fields of *Galeolaria hystrix* in the Hauraki Gulf, including multiple small fields centred around Motumorirau Island north of Coromandel Harbour (Mark Morrison, Ian Tuck, unpublished data). However, while the available dataset of biogenic habitats includes all available robust, empirical data of where biogenic habitats have been observed, it is neither a systematic or comprehensive datasets; i.e., a majority of the seafloor of New Zealand has not been sampled, and thus these records are presence only, and an absence of a biogenic habitat record implies only lack of sampling effort, rather than lack of presence of biogenic habitat at that location. It is also worth noting that Policy 11 (part (b)(iii)) of the NZCPS specifically identifies ‘estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass (seagrass) and saltmarsh’ as coastal habitats that are particularly vulnerable to modification. The majority of these habitats are also included in this assessment.

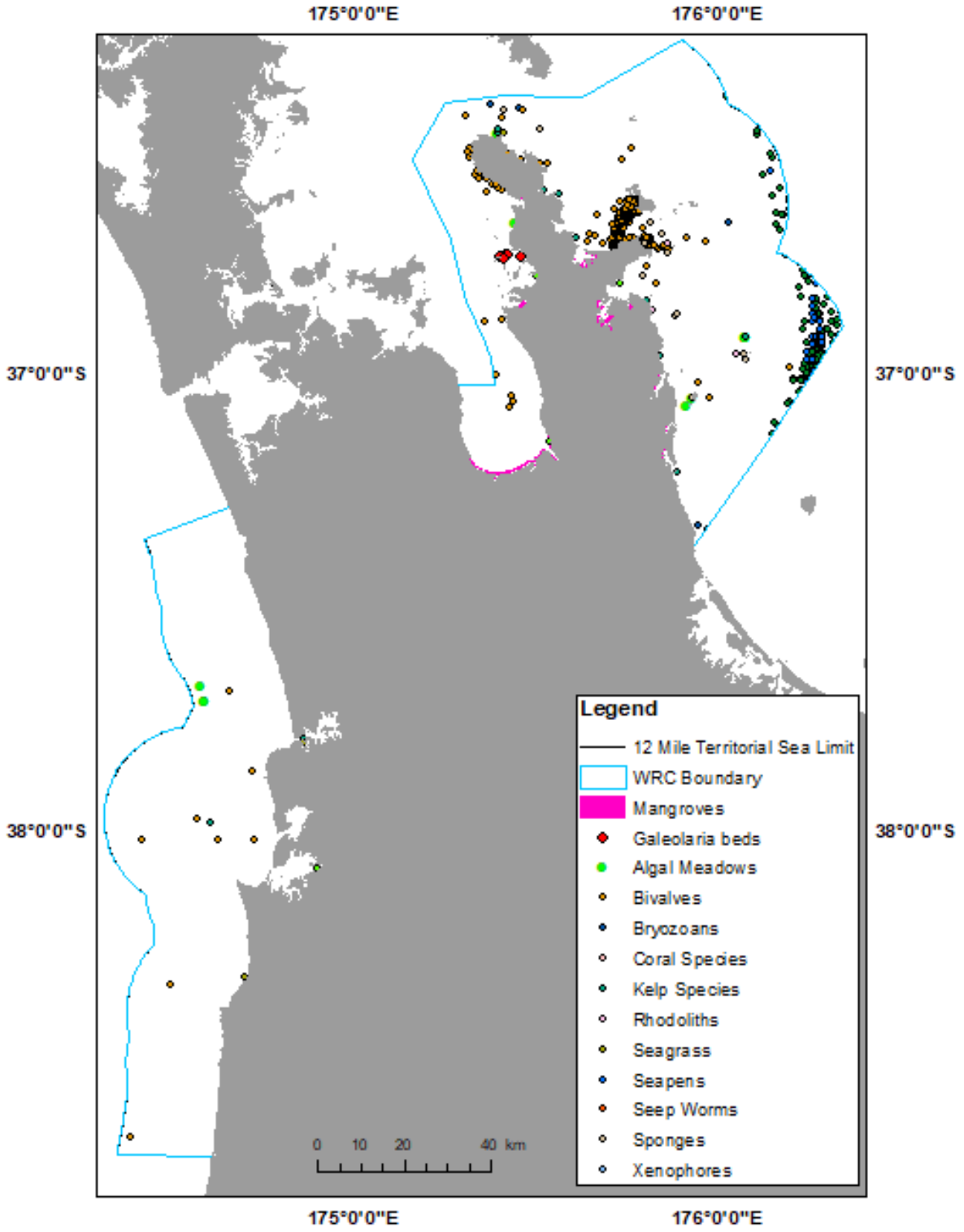

Figure 3-12: Biogenic habitats (point records) for the Waikato CMA from national Key Ecological Areas data (DOC, Stephenson et al. 2018). Note that regional datasets for seagrass are represented by point records within this national dataset, whereas more accurate polygon distributions were available from WRC for this habitat type as presented in Figure 3-7. *Galeolaria* fields include observations from field surveys in February 2020 as part of MBIE Project No. CO1X1618 (Juvenile Fish Habitat Bottlenecks) (Mark Morrison, Ian Tuck, unpublished data).

3.8.1 Finfish spawning areas

Morrison et al. (2014) summarised knowledge on links between fisheries and biogenic habitats and found that biogenic habitats, particularly subtidal seagrass meadows, support high densities of juvenile snapper (*Pagrus auratus*), with evidence of very recent settlement of juveniles (about 10 mm length) directly from the plankton at Great Mercury Island and Whangapoua Harbour. Stephenson et al. (2018) compiled national finfish spawning areas from NABIS (www.nabis.gov.nz); layers were intersected in ArcGIS (v. 10.6) and summed to provide estimates of the spatial distribution of hotspots for finfish spawning (Figure 3-13).

More generally, continental shelf waters off both the west and east coasts of the Waikato region are important habitats for many marine fish species, including valuable commercial and recreationally fished species (e.g., snapper (Figure 3-14), trevally *(Pseudocaranx georgianus)*, red gurnard *(Chelidonichthys kumu)* (Figure 3-15), john dory *(Zeus faber)* (Figure 3-16), tarakihi *(Nemadactylus macropterus)*, rig *(Mustelus lenticulatus)* and school shark *(Galeorhinus galeus)* (Morrison et al. 2001a, 2001b)). The Firth of Thames is an important habitat and breeding area for yellow-belly flounder *(Rhombosolea leporine),* sand flounder *(R. plebeian)*, hammerhead sharks *(Sphyrna zygaena)* and probably also rig (Colman 1973, Francis 2016). Hammerhead sharks and bronze whaler sharks *(Carcharhinus brachyurus)* also use shallow inshore waters and harbours and estuaries of the eastern Coromandel coast. Snapper spawn throughout the inner Hauraki Gulf and outer Firth of Thames, including all along the western Coromandel coast (Zeldis and Francis 1998).

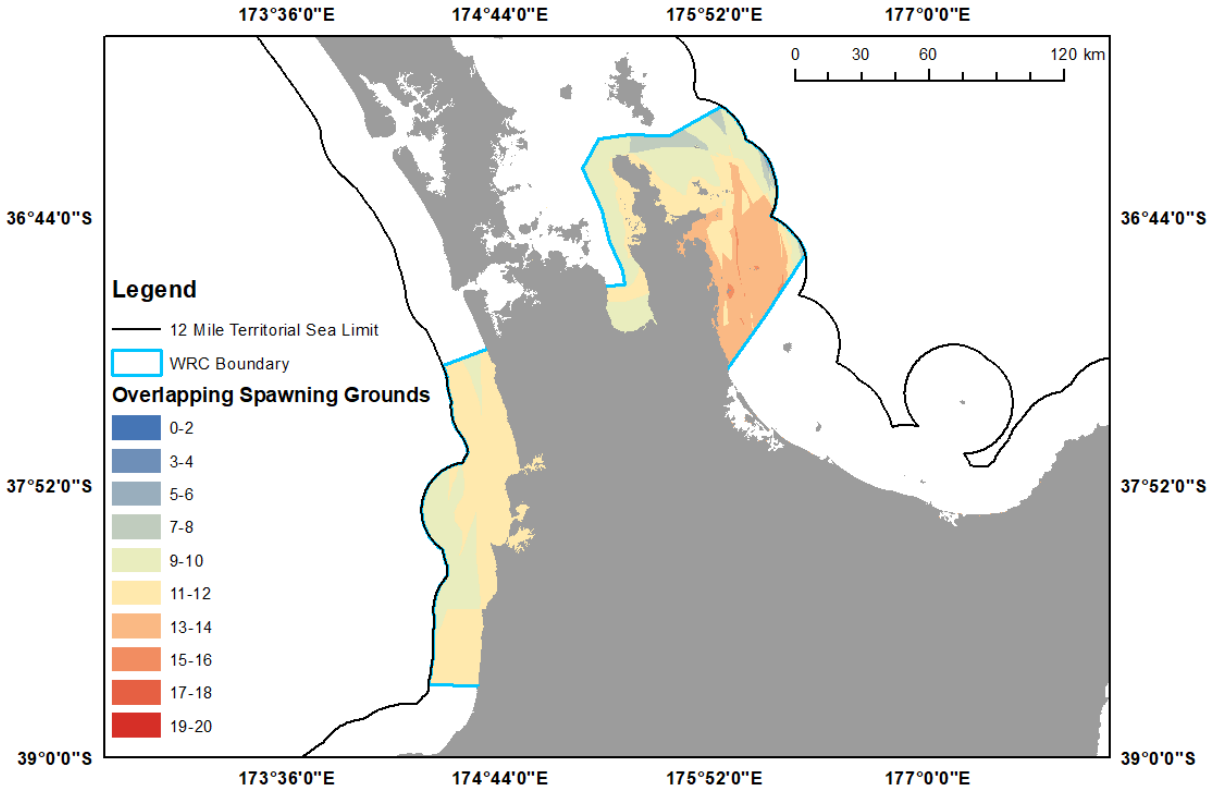

Figure 3-13: Finfish spawning hotspots in the Waikato CMA from Stephenson et al. (2018). Hotspots indicate the number of species spawning at a location within the Waikato CMA.

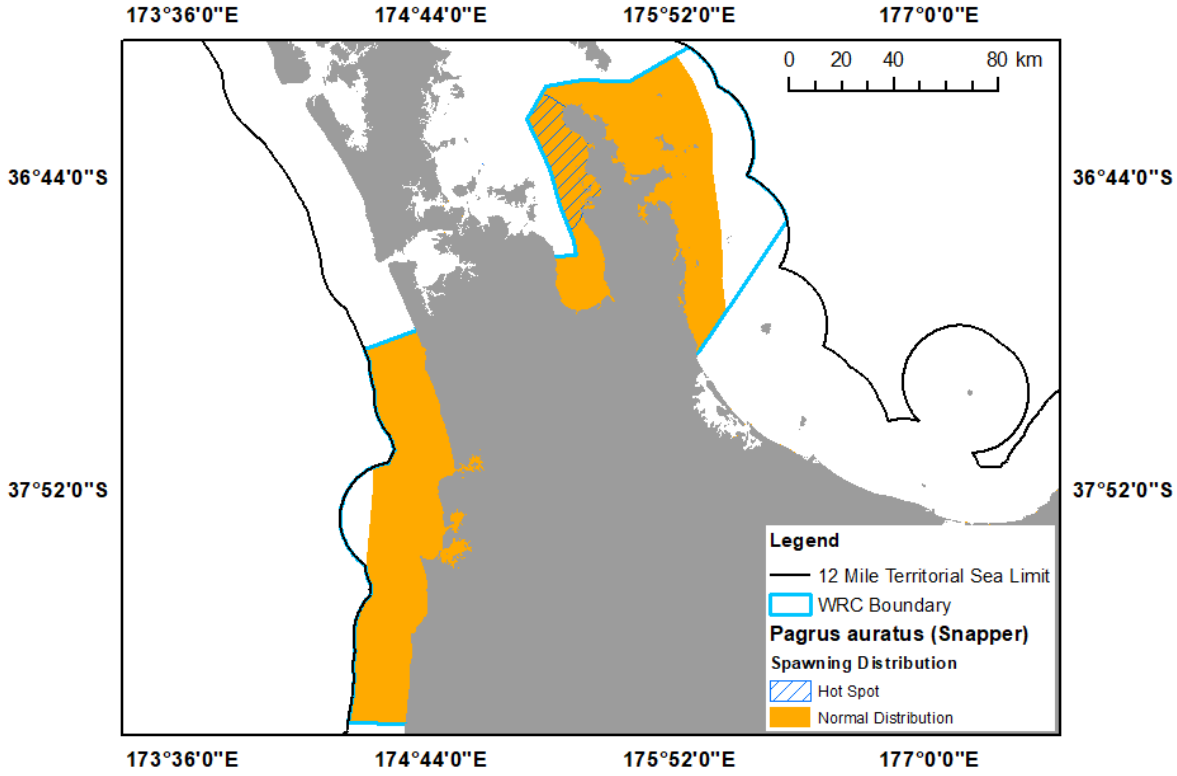

Figure 3-14: Individual finfish spawning distributions and expert identified hotspots for snapper in the Waikato CMA, as compiled by Stephenson et al. (2018).

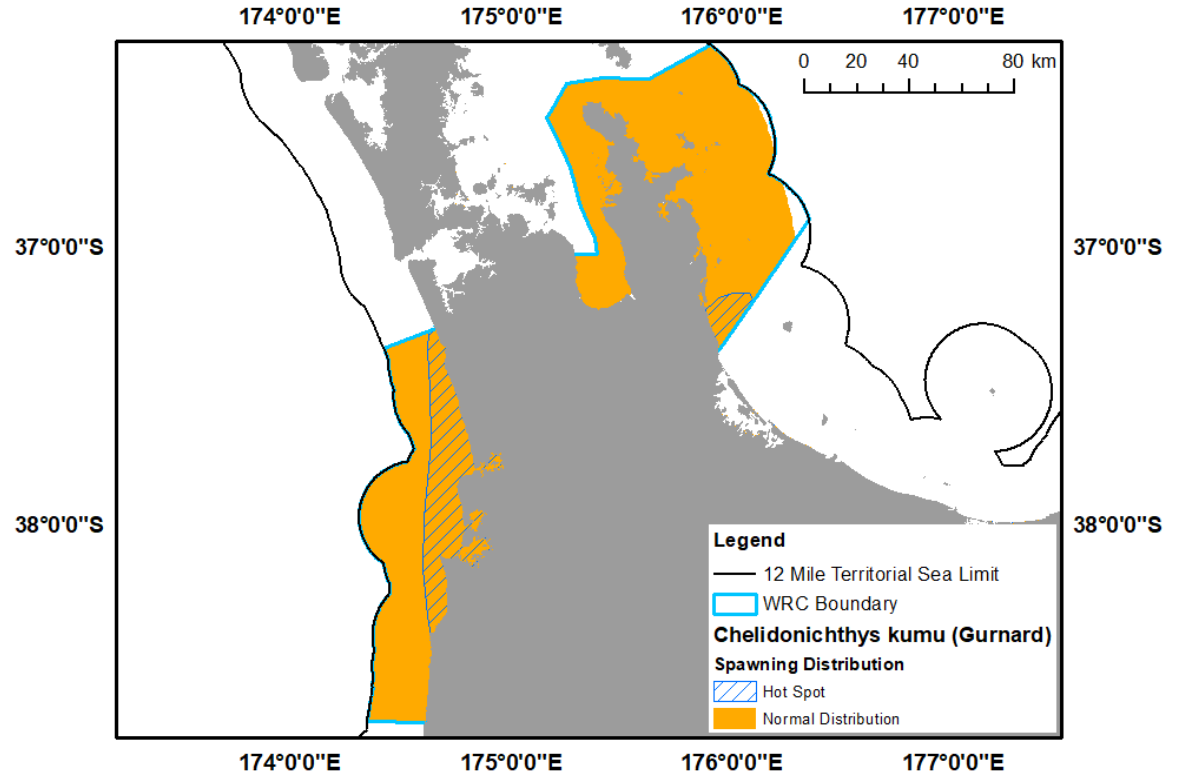

Figure 3-15: Individual finfish spawning distributions and expert identified hotspots for gurnard in the Waikato CMA, as compiled by Stephenson et al. (2018).

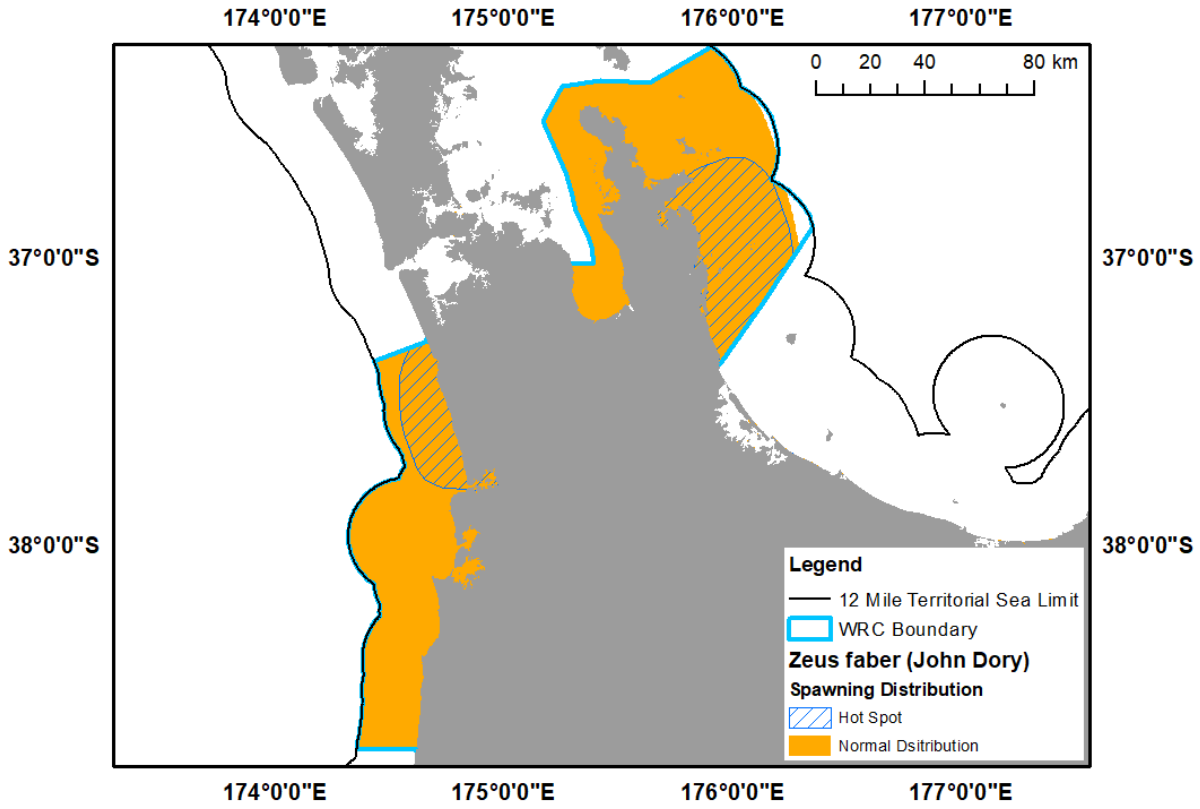

Figure 3-16: Individual finfish spawning distributions and expert identified hotspots for John Dory in the Waikato CMA, as compiled by Stephenson et al. (2018).

3.8.2 Rhodolith beds

Rhodoliths are free-living, unattached, non-geniculate (unjointed) coralline algae that can passively move on the seafloor through the action of water motion. Rhodoliths tend to be found subtidally in areas without reefs but in rather coarse sand, gravel or shell debris, often in areas with strong currents (Farr et al. 2009). Aggregations of rhodoliths form beds which provide three-dimensional structures that are a complex, intricate and stable habitat for invertebrates, fishes and other algae (Lundquist et al. 2017). That rhodolith beds support increased levels of biodiversity has been confirmed in studies overseas and in New Zealand. For example, in a study in the Gulf of California, Mexico, rhodolith beds supported 52 unique taxa compared to 30 unique taxa in neighbouring sandy habitats (Steller et al. 2003), and in the Bay of Islands, New Zealand, Nelson et al. (2012) reported more than double the number of invertebrate taxa in rhodolith beds compared to in neighbouring habitats.

No systematic surveys of rhodolith beds have been undertaken in the Waikato region, with only three-point records included in the national Key Ecological Areas biogenic habitat dataset within the Waikato region (Stephenson et al. 2018, Anderson et al. 2019). Therefore, the occurrence and extent of this habitat type in the Waikato CMA remain unclear (Figure 3-12).

3.8.3 Seagrass

Seagrass beds comprise a unique group of flowering plants found from equatorial to sub-polar seas and are a major component of estuarine and coastal ecosystems. Globally, seagrass meadows provide important ecosystem services, including coastal stabilisation, nutrient and carbon cycling and

storage, high primary productivity, and contribution to detrital and grazing food webs, and refugia from predation of some fish and macrofauna (Constanza et al. 1997, Lundquist et al. 2017, Anderson et al. 2019).

In New Zealand seagrass meadows play an important role in structuring physical and biological aspects of intertidal and subtidal areas, serving as a biogenic habitat for both epifaunal and infaunal invertebrates, and more mobile species such as crabs, shrimps, and small/juvenile fish (Morrison et al. 2014; Anderson et al. 2019). In some locations, they provide important structural habitat for juvenile fish, although this role is likely limited as most remaining seagrass is intertidal (see Parsons et al. 2019)[2]. Similarly, carbon and nutrient storage investigations in one Waikato estuary (Tairua) suggest the contributions of New Zealand seagrass to carbon and nutrient budgets is lower than mangrove and saltmarsh habitats and is similar to that of unvegetated habitats (Bulmer et al. 2016b).

There is a single species of seagrass found in New Zealand, which occurs both intertidally and subtidally (Turner & Schwarz 2006). Seagrass meadows in New Zealand can be found in small patches of a few metres in diameter through to large meadows (e.g., a ~40 ha meadow at Meola Reef in the Waitemata Harbour, Auckland, Lundquist et al. 2018). Matheson et al. (2011) noted significant historical declines in New Zealand seagrass meadows and their current conservation status is 'at risk – declining' (de Lange et al. 2018). In recent years, observations of dozens of sites nationally have shown substantial increases in seagrass abundance (e.g., Whangarei (Matheson et al. 2017); Waitemata (Lundquist et al. 2018).

Seagrass meadows do show inter- and intra-annual fluctuations in abundance, although there have been very few regular surveys or monitoring to document the level of natural variability. Recent monitoring in Whangamata Harbour (as part of an RMA consent process) has documented seasonal variability, likely associated with summer temperature fluctuations (Bulmer et al. 2016a). The contribution of individual seagrass meadows to biodiversity is likely associated with their degree of fragmentation, associated with ecological health (de Juan and Hewitt 2011).

Within the Waikato region, the locations of subtidal seagrass beds, which have substantially reduced in distribution since pre-European colonisation (Schwarz et al. 2006), have been collated by Bouma (2016) and include Slipper Island, Huruhi Bay at Great Mercury Island and subtidal channels in Whangapoua Harbour. Extensive intertidal seagrass meadows are present in estuaries throughout the Waikato region, with the largest contiguous seagrass meadows found in Coromandel estuaries (e.g., Whangapoua, Tairua, Whangamata, Wharekawa) and in Kawhia on the west coast (Lundquist et al. 2004) (refer Figure 3-7, Figure 3-8).

3.8.4 Sponge gardens

The term sponge 'garden' is used where sponges grow in sufficient abundance and extent to form the dominant cover, typically 25% or greater cover of one or more sponge species in a uniform or clumped distribution over an area of 100 m^2 or more (MacDiarmid et al. 2013). Sponges are a principal component of many rocky reef assemblages, especially occurring below the depths of kelp forests, as well as being found in a range of soft sediment systems, where sufficient hard surfaces are available for initial attachment. While sponge gardens can contain a diversity of species, there are generally some dominant species that form three-dimensional habitat, with a range of different shapes and sizes displayed such as tubes, mounds and bowls (Anderson et al. 2019).

[2] Although anecdotal evidence suggests widespread historical subtidal seagrass meadows prior to European colonisation.

No systematic surveys of sponge beds have been undertaken in the Waikato region, with approximately one dozen point records available in the national KEA dataset (Stephenson et al. 2018, Anderson et al. 2019) (Figure 3-12). Observations of sponge gardens have been reported at Opito Bay (Thrush et al. 1998) and at an unspecified site within the Firth of Thames associated with biogenic horse mussel *(Atrina zelandica)* habitat in water of 20-35 m depth (MacDiarmid et al. 2013). The unspecified sponge garden site in the Firth of Thames has not been included in Appendix A.

3.8.5 Rocky reefs

Intertidal and subtidal rocky reefs generally support relatively high levels of biodiversity and species richness. This is primarily because of the large number of microhabitats that occur on reefs, which are often augmented by biogenic, three-dimensional habitats created by a range of reef species, and because of the relatively high levels of biotic interactions – including grazing, predation and competition (Gamfeldt & Bracken 2009). An updated rocky reef layer was provided by Waikato Regional Council, based on primarily high resolution bathymetry, including multibeam surveys, to map deep and shallow rocky reefs using a slope analysis method within a geographic information system (Gardiner & Jones 2020). Maps were supplemented by sounding sheets, existing habitat maps and local interviews where high resolution data was not available.

Rocky reefs provide critical substrates for settlement of a wide variety of species. Of particular importance in marine coastal ecosystems are kelp forests, made up of large brown algae in the orders Fucales and Laminariales (true kelps). Kelp beds have been recognised as being both the largest biogenic structures and also the most productive coastal ecosystems. Species in the order Laminariales have two alternate life history phases whereas members of the Fucales have direct life histories. Thirteen genera of large brown algae occur in New Zealand, four Laminariales, (including the introduced Asian kelp, *Undaria*) and nine Fucales, and the species vary in size, morphology and spatial distributions. In New Zealand these large brown algae dominate rocky reefs, from the low intertidal to subtidal zones – 0-25 m water depths – forming lush forests that provide habitats for fish and invertebrates. These forests also provide an under-storey microclimate for a diverse array of other macroalgae and benthic invertebrates. Most kelp forests grow on rocky reefs, although some species can also attach to cobbles and gravel (D'Archino et al. 2019).

In addition to canopy-forming brown macroalgae, coastal rocky reefs from the low tide mark down to approximately 10-20 m are dominated by calcified coralline algae species that cover the majority of rock surfaces. The coralline algae (both geniculate and non-geniculate species) are known to play critical roles in the life histories of a number of invertebrate species, as well as contributing habitat for a range of associated species (Nelson 2009, McCoy & Kamenos 2015). Geniculate coralline algae in coastal reef systems have been shown to harbour a high density, biomass and productivity of small (0.5-8.0 mm) mobile invertebrates, providing shelter from predation and environmental stresses, and these invertebrates in turn support high densities of juvenile carangid, mullid and sparid fishes (Cowles et al. 2009).

The occurrence of subtropical and tropical reef fishes along the northeast coast of the North Island, particularly around offshore islands, is well known (Francis 1996, 2012, Francis et al. 1999, Brook 2002) and reef fish occurrence and abundance have been modelled throughout coastal waters, based on diver survey fish counts (Smith et al. 2013). Reef fish diversity is lower on the west coast of the Waikato region than on the east coast, and is highest around the offshore islands, particularly the Aldermen and Mercury islands. The rare and protected giant grouper *(Epinephelus lanceolatus)* has been observed at the Aldermen Islands (Francis et al. 1999).

Rocky reef habitats are well represented in the Waikato region, and WRC provided data of predicted rocky reef distribution compiled for the Hauraki Gulf Marine Spatial Plan (refer Figure 3-7). Rocky habitats include intertidal reef platforms, mixed algal zones, subtidal reef platforms often dominated by urchin barrens, kelp (*Ecklonia*) forests and mixed forests, and deeper reef slope habitats and offshore pinnacles dominated by suspension feeders (sponges, bryozoans, ascidians) (Lundquist et al. 2004). Rocky reef habitats differ in topographic complexity, with hard, volcanic substrates often supporting smooth, overgrazed communities, and softer sedimentary rocks often showing pitted formations, crevices and higher diversity of sessile and mobile invertebrates. The Waikato region's west coast contains both volcanic and sedimentary rocky substrates (Lundquist et al. 2004), with noticeable differences between the east and west coasts due to wave exposure, such that west coast reefs more typically are dominated in shallow waters by bryozoans, mussels, crustose coralline algae, and turfing and foliose red algae, with limited large brown algae (Lundquist et al. 2004). Notably high diversity rocky reef communities have been observed in the Waikato region to the east of Cape Colville between Fletcher Bay and Port Charles, and on the offshore islands of Cuvier Island, Ohinau Islands the Mercury Islands (refer Figure 3-7, Figure 3-8).

3.8.6 Horse mussel beds

Horse mussels (*Atrina zelandica*) are epibenthic and provide three-dimensional structure in soft sediment habitats. The hard substrates they provide are colonised by a wide range of associated species – both invertebrates and macroalgae. Horse mussel beds support much higher diversity than neighbouring soft sediments without horse mussels. Horse mussels also modify their surroundings by producing organically enriched bio-deposits and contributing hard structure (calcium carbonate shell material) that provides habitat for a variety of encrusting organisms, and by changing hydrodynamic boundary flows (Norkko et al. 2006).

Horse mussel beds are known to occur around New Zealand. Extensive and dense beds were previously reported from the northwestern Hauraki Gulf (review in Morrison 2014), although ongoing monitoring in Mahurangi Harbour and experimental research in Kawau Bay suggests substantial declines in recent decades. In the Marlborough Sounds, horse mussel beds have been identified as being an important habitat for juvenile blue cod *(Parapercis colias)*, especially where bryozoan and sponge communities co-occur (from data cited in Anderson et al. 2019).

There have been no systematic surveys of horse mussels in the Waikato region (or nationally), although observations of beds have been made at the Mercury Islands (Lundquist unpublished data). The point records included in the national Key Ecological Areas biogenic habitat dataset for the Waikato region include large bivalve biogenic habitat which indicates a number of likely horse mussel habitats on the Coromandel east coast (Figure 3-12) (Stephenson et al. 2018, Anderson et al. 2019).

3.8.7 Green-lipped mussel beds

The green-lipped mussel is endemic to New Zealand where it is found throughout the country, historically forming extensive beds in shallow coastal waters (Jeffs et al. 1999). These mussels once covered more than 1,300 km^2 of soft-sediment sea floor in the Hauraki Gulf, with the most productive beds between Orere and Miranda (Greenway 1969), although extensive commercial dredge fishing nearly eliminated these beds by the late 1960s (Wilcox et al. 2018). Despite the cessation of fishing in 1969, the mussel beds have not recovered and only a few small remnant mussel beds remain totalling around 0.64 km^2 (McLeod et al. 2014), including some patches in the northeastern Firth of Thames near Wilson Bay (Craig Norrie, University of Auckland, personal observation). Side scan surveys have shown additional remnants of these mussel beds within the

Firth of Thames (Morrison et al. 2002a; D. Imenga (University of Waikato), unpublished data), two of which are located northeast of Kaiaua in subtidal waters closer to the centre of the Firth, as reported in Lundquist et al. (2004). These once extensive beds likely modified the Firth through production of bio-deposits, suspension feeding, and modification of benthic boundary flows and sediment deposition due to their biogenic structures protruding above the sediment-water interface (Norkko et al. 2006).

Extensive populations of farmed mussels are currently present in the Firth of Thames, comprising approximately 30% of New Zealand's green lipped mussel production (Hauraki Gulf Forum (2011), and potentially contributing as larval sources to small remnant populations (Craig Norrie, University of Auckland, unpublished data). Substantial restoration efforts are in place to restore these mussel beds in the Hauraki Gulf, although to date there has been limited success at restoring small patches of mussel habitat primarily focussed in the northwestern Hauraki Gulf (Hauraki Gulf Forum. (2011)). The point records included in the national Key Ecological Areas biogenic habitat dataset for the Waikato region include bivalve biogenic habitat which likely include some remnant green lipped mussel beds in the southern Firth of Thames (Figure 3-12) (Stephenson et al. 2018, Anderson et al. 2019).

3.8.8 Bryozoan beds

Bryozoans form colonies made up of tiny individuals, each of which can capture microscopic food particles. Colonies range in size from 0.2 mm to 2 m. Bryozoan beds (or thickets) are defined as habitats where rigid, erect frame-building bryozoan species dominate square metres to kilometres of seafloor (Wood et al. 2012; MacDiarmid et al. 2013). Frame-building bryozoans are defined as heavily-calcified species that regularly attain sizes over 50 mm in three-dimensions (Wood et al. 2012). There are approximately 1,000 species of marine bryozoans in New Zealand's Exclusive Economic Zone (EEZ), not all yet formally named or described (Gordon et al. 2009). About 50 coastal/shelf species form colonies large or robust enough (5–30 cm height or width) to be considered as providing biogenic habitat.

No systematic surveys of bryozoan beds have been undertaken in the Waikato region. Observations of bryozoans and other biogenic structure have been reported in Fantail Bay and Cape Colville at the top of the Coromandel Peninsula, associated with strong tidal currents and gravelly sediments (reviewed in Lundquist et al. (2004)) and at Opito Bay (Thrush et al. 1998).

The national Key Ecological Areas biogenic habitat dataset for the Waikato region includes five bryozoan point records, one on the west coast, and four on the east coast – with two in the Colville Channel (refer Figure 3-12) (Stephenson et al. 2018, Anderson et al. 2019). Stephenson et al. (2018) also compiled modelled bryozoan species distribution models for 11 bryozoan species, most of which are predicted to be likely present in the Waikato CMA; a summed distribution of these 11 species GIS layers indicates hotspots of likely biogenic habitat, noting that this mapping procedure used a coarser resolution grid and thus does not approach within a few hundred m of the coastline (Figure 3-17). These layers give moderate agreement for the east coast, and the northern portion of the Waikato west coast, with another modelled layer, of biogenic habitats, derived using the Ecosystem Principles Approach (Figure 3-18), but are in poor agreement for the west coast south of Raglan (Townsend et al. 2014).

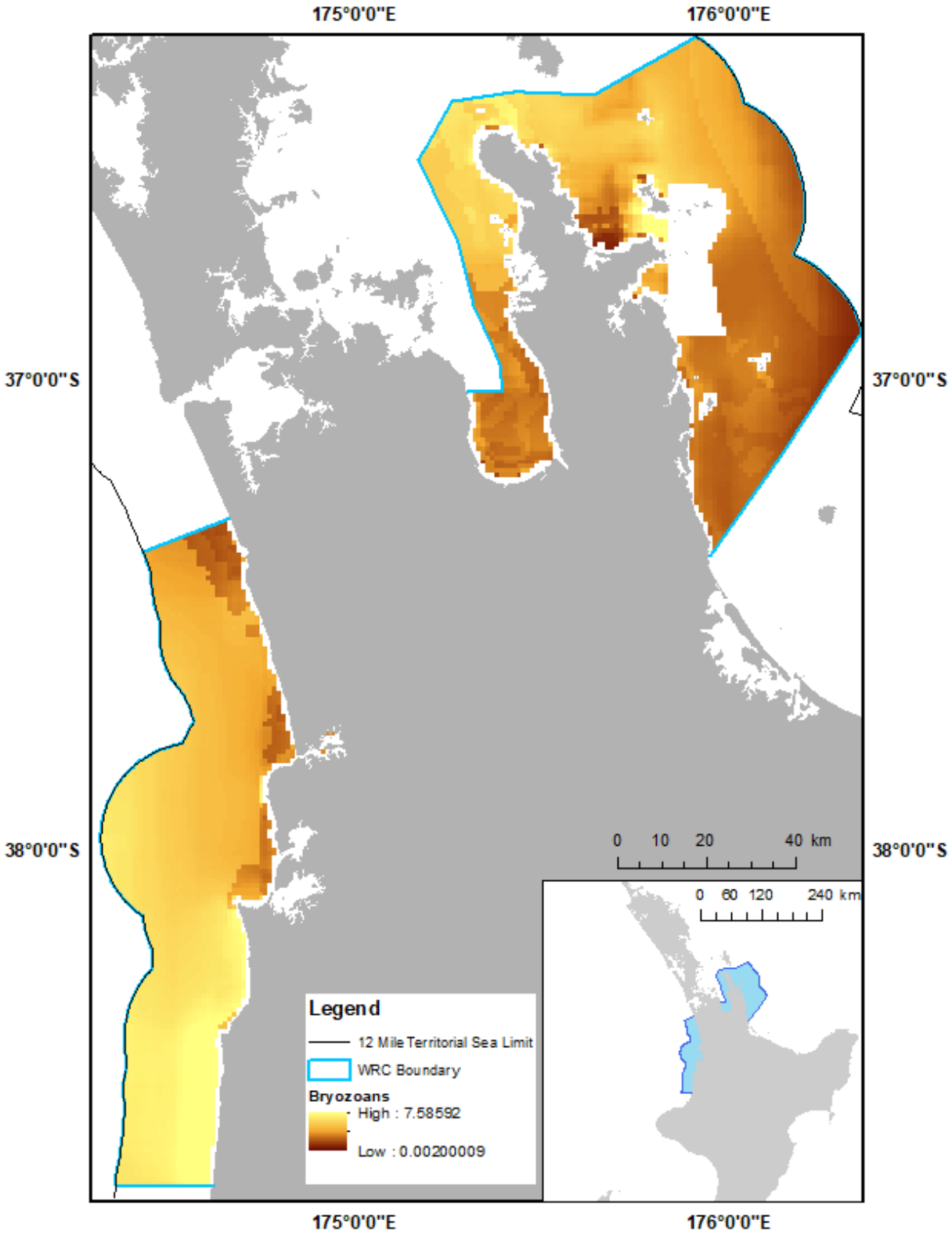

Figure 3-17: Summed distribution map of 11 national bryozoan modelled species distribution layers, illustrating predicted hotspots of bryozoan abundance in the Waikato CMA. Note all bryozoan model layers contained a number of inshore spatial gaps, including most estuaries and the region offshore of Mercury Bay and adjacent to the Mercury Islands.

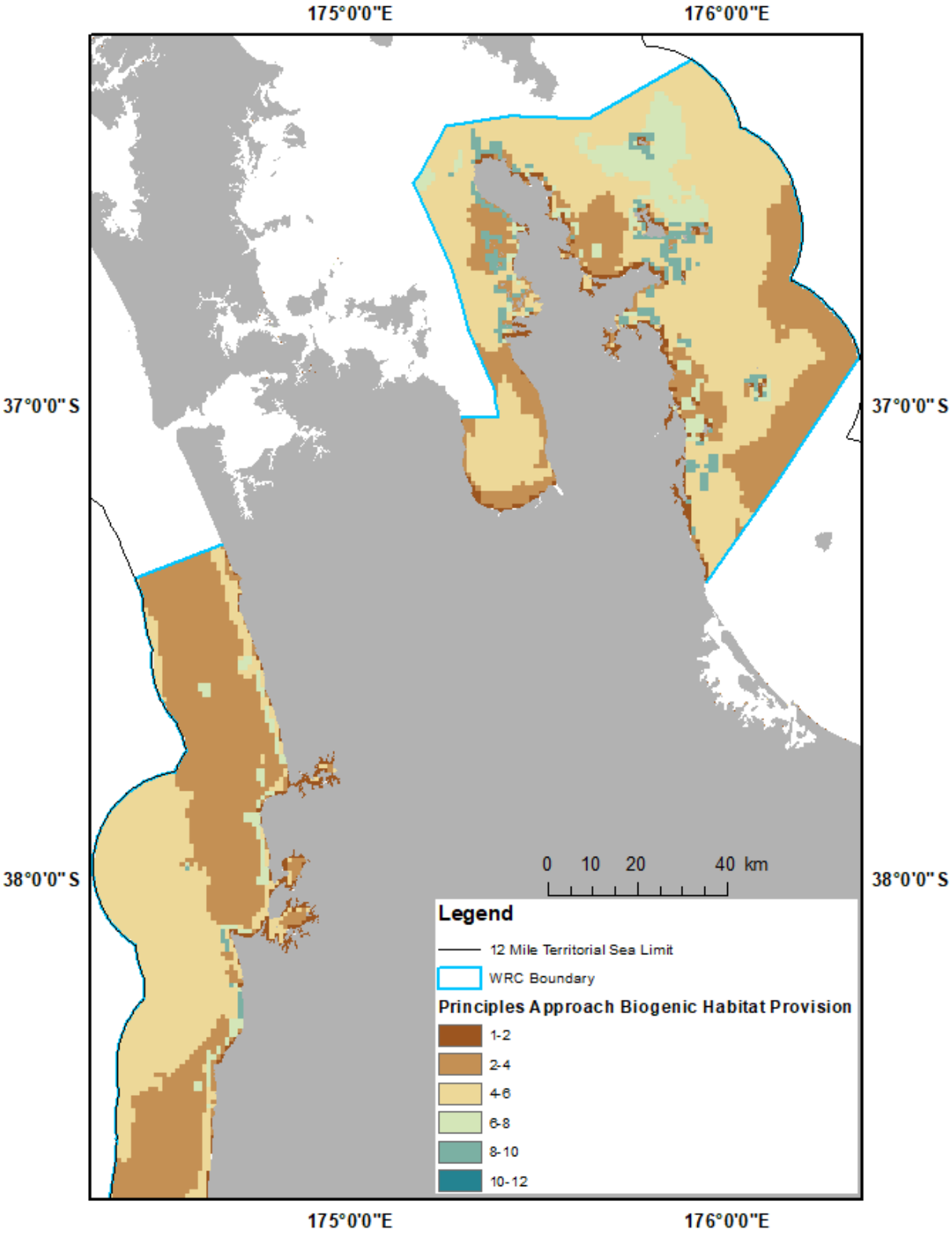

Figure 3-18: Biogenic habitat GIS layer modelled using the ecosystem principles approach to approximate areas of likely biogenic habitat in the Waikato CMA. Categorical labels represent predicted biogenic habitat provision (unitless scale: 1 (low provision) to 12 (high provision) using rule-based mapping (methods based on Townsend et al. (2014), based on national biogenic habitat map prepared for Stephenson et al. (2018).

3.8.9 Estuaries

Estuaries are defined as water bodies largely enclosed by land in which there is a measurable dilution of seawater due to freshwater inputs from rivers and runoff. Most of New Zealand's estuaries are well-mixed due to the steep terrain and medium-to high tidal range, with salinity approximating the coastal ocean, and the majority of species being 'marine' species (Thrush et al. 2012). Estuaries are often composed of a heterogeneous mix of habitat types, many of which are dominated by epifaunal or infaunal structuring fauna (e.g., cockle/shellfish beds, seagrass, tubeworms); these structured habitats typically hold higher diversity than purely sedimentary habitat such as sandflats and mudflats (de Juan and Hewitt 2011). Estuaries have also been identified as important fish habitat. Whāingaroa (Raglan) Harbour has been identified as a major nursery ground for rig under 1-year old, and also an important habitat for snapper aged 2–4 years old and grey mullet (Francis et al. 2012). This harbour may also be important for younger snapper and grey mullet, which were not sampled well by the setnet mesh size used in the survey. It is also likely that the adjacent Kawhia and Aotea harbours, which were not surveyed by Francis et al. (2012), are similarly important for these species.

There are many estuaries and other coastal environs in the Waikato region, ranging in size from small creeks and estuaries e.g., Te Kouma Harbour (2.7 km^2) to the substantial intertidal area in the upper Firth of Thames (729 km^2). Types include drowned river valleys (Raglan Harbour, Aotea Harbour), semi-enclosed lagoons (Whangapoua Harbour, Whitianga Harbour), compound/coastal embayments (upper Firth of Thames, Coromandel Harbour), and river mouths (Waikato River), which differ in oceanic and riverine influences, and catchment conditions that can influence the physical characteristics and biological communities present (Hume et al. 2003). The catchments associated with the coastal environment comprise a variety of land-uses and proportions of urban development. Soft-sediment intertidal habitats are diverse, including mangroves, saltmarsh, seagrass, sandflats, mudflats, shell banks, cobble, gravel, and sandy beach habitats.

Table 3-1 provides summary information for the major estuary systems in the Waikato region: water area at mean high water springs, the percentage of the system that is intertidal, the percentage of the system comprising mangrove habitat, the mean tidal range and the catchment area. Many of these estuaries, tidal rivers, tidal creeks, tidal lagoons, coastal embayments, inlets and drowned valleys have been included in Table 4-1, but all should be considered significant given they all comprise at least some estuarine habitat.

Table 3-1: Major estuaries in the Waikato region derived from NIWA's estuarine classification system (Hume et al. 2003).

Name	Type	Water area (MHWS, km^2)	% Intertidal	% Mangrove	Mean tidal range (m)	Catchment Area (km^2)
Firth of Thames System	Coastal Embayment	729.1	15	1	2.45	4194.2
Miranda Stream	Tidal Lagoon	0.1	95	0	2.82	0.6
Waitakaruru River	Tidal River	0.5	64	34	2.85	167.1
Piako River	Tidal River	1.7	26	26	2.84	1461.2
Waihou River	Tidal River	9.9	7	6	2.83	1980.1
Kauranga River	Tidal River	0.3	55	50	2.83	132.3
Kirita Bay	Coastal Embayment	0.3	9	0	2.46	4.4
Manaia Harbour	Coastal Embayment	6.3	76	16	2.42	59.2
Te Kouma Harbour	Coastal Embayment	2.7	46	4	2.40	5.9
Coromandel Harbour	Coastal Embayment	25.4	21	1	2.38	60.3
Colville Bay	Coastal Embayment	4.6	5	0	2.23	42.9
Waiaro Estuary	Tidal Lagoon	0.1	0	0	2.21	13.8
Stony Bay	Coastal Embayment	1.2	1	0	1.78	16.5
Port Charles	Coastal Embayment	5.0	2	0	1.76	31.0
Waikawau Estuary	Tidal Lagoon	0.2	0	0	1.67	27.8
Kennedy Bay System	Drowned Valley	4.9	15	0	1.65	56.1
Kennedy Bay Estuary	Tidal Lagoon	0.5	91	0	1.65	51.4
Whangapoua Harbour	Tidal Lagoon	13.0	80	14	1.65	107.1
Mercury Bay System	Drowned Valley	35.7	36	15	1.51	510.0
Whitianga Harbour	Tidal Lagoon	15.5	72	33	1.51	450.4
Purangi River	Tidal Lagoon	1.3	95	15	1.51	18.4
Tairua Harbour	Tidal Lagoon	6.0	51	0	1.49	281.7
Wharekawa Harbour	Tidal Lagoon	1.9	86	0	1.49	83.1

Name	Type	Water area (MHWS, km^2)	% Intertidal	% Mangrove	Mean tidal range (m)	Catchment Area (km^2)
Whangamata Harbour	Tidal Lagoon	4.4	78	6	1.49	49.6
Otahu River	Tidal Lagoon	1.0	60	25	1.49	70.1
Huruhi Harbour	Coastal Embayment	0.5	10	0	1.64	1.5
Coralie Bay	Coastal Embayment	0.3	18	0	1.56	1.3
Mokau River	Tidal River	1.1	0	0	2.41	1452.4
Awakino River	Tidal River	0.3	0	0	2.40	382.0
Waikawau River	Tidal Lagoon	0.0	0	0	2.37	16.2
Waikato River	Tidal River	18.2	8	0	2.23	14481.1
Raglan Harbour System	Drowned Valley	31.9	69	0	2.28	522.7
Raglan Inlet	Inlet	9.4	46	0	2.28	52.6
Ponganui/Paihere Creeks	Tidal Creek	1.0	100	0	2.28	11.4
Kerikeri/Waingaro Arm	Tidal Creek	14.6	76	0	2.28	223.9
Waitetuna Creek	Tidal Creek	5.1	79	0	2.28	176.0
Opotoru River	Tidal Creek	1.8	84	0	2.28	58.7
Kawhia Harbour System	Drowned Valley	67.6	74	0	2.31	498.6
Kawhia Inlet	Inlet	52.6	69	0	2.31	53.7
Te Wharu Bay	Tidal Creek	1.9	100	0	2.31	3.8
Mangora Inlet	Tidal Creek	0.6	100	0	2.31	255.7
Oparau River	Tidal Creek	1.7	85	0	2.31	131.4
Awaroa River	Tidal Creek	2.3	81	0	2.31	162.4
Kaitawa Inlet	Tidal Creek	0.6	100	0	2.31	3.5
Waiharakeke Stream	Tidal Creek	6.2	93	0	2.31	88.8
Aotea Harbour System	Drowned Valley	31.9	74	0	2.30	185.3
Rakanui Inlet	Tidal Creek	1.9	87	0	2.31	43.1

Name	Type	Water area (MHWS, km^2)	% Intertidal	% Mangrove	Mean tidal range (m)	Catchment Area (km^2)
Marokopa River	Tidal River	0.7	14	0	2.34	366.9

3.8.10 Dunes

Active sand dunes are dune systems whose physical landscape and ecological character results from continuously moving wind-blown sand. They are predominantly coastal, geomorphically unstable, mobile and bare to relatively sparsely vegetated (Hilton et al. 2000). Dunes are regarded as active if exposed, dry (usually unvegetated) sand will be susceptible to further wind action (Hesp 2000). In contrast, stable sand dunes originate from active sand dunes comprising coastal sands. Through coastal aggradation, sand dune migration, or uplift of marine terraces stable dunes are sufficiently distant from the sea to no longer be impacted by coastal disturbances and can be completely covered in woody vegetation, including mature podocarp forest.

Active sand dune systems can support a range of specialist indigenous flora, including pingao *(Ficinia spiralis)* (at risk – declining), spinifex *(Spinifex sericeus)* (not threatened), crystalwort *(Atriplex billardierei)* (threatened – nationally endangered), shore purge (*Euphorbia glauca)* (at risk – declining) and kokihi *(Tetragonia tetragonioides)* (at risk – naturally uncommon). Site assessments would be required to confirm the presence of threatened or at-risk plant species on particular dunes but should one or more threatened or at-risk dune plant species be present then Criterion 3 would additionally be triggered.

In the Waikato region, sites with examples of active coastal dunes systems include Kawhia Harbour, Aotea Harbour, Waikawau Beach, Otama Beach and Hot Water Beach.

3.9 Criterion 9 – Healthy and representative example of a habitat

This criterion covers habitats (and sites) that are healthy and representative with largely intact physical structure, composition and ecological processes, protected from the effects of pests and which can maintain ecological sustainability. Many near-shore coastal habitats and sites have been subjected to varying degrees of modification, and further offshore many islands have been modifiesd through the introduction of alien mammals. We included only one site under this criterion:

- Gannet Island is a rare example of an offshore west coast island that supports breeding populations of Australasian gannet and New Zealand fur seal, which is likely to have relatively unmodified intertidal and subtidal habitats.

3.10 Criterion 10 – Ecological sequence

This criterion identifies habitats that form an ecological sequence that is either uncommon regionally or which is an exceptional representative example of its type. We have included several sites under this criterion. The coastal strip extending from Fantail Bay on the western side of Coromandel Peninsula to Waikawau Bay on the eastern coast of the Peninsula represents a fine example of a relatively large-scale ecological sequence that reflects relatively sheltered conditions in the west with increasingly exposed conditions heading north and then east around Cape Colville to the eastern side of the Peninsula. Other sequences identified include those that transition from fully marine to fully terrestrial habitats (e.g., Mercury Islands and adjacent marine habitats) and those that transition from estuarine and swamp habitats to fully terrestrial habitats (e.g., Otama Estuary).

3.11 Criterion 11 – Ecological buffer

In part, this criterion covers habitats that form an ecological buffer that protects a significant site from external adverse effects. We have identified one site under this criterion: the mangrove habitat around the southern fringes of the Firth of Thames. This habitat likely traps terrestrially-derived

sediment that would otherwise negatively affect other habitats. Ecological buffering habitats are uncommon in a marine context, being more prominent in coastal forest and other coastal vegetation habitats, and terrestrial systems more generally.

4 Assessment findings

In this section we summarise the findings of the assessment of sites, including habitats within sites, against the 11 significance criteria outlined in Section 3.

4.1 Sites

A total of 80 sites across the Waikato region's CMA (Table 4-1) have been classified as significant according to the WRC criteria in Table 2-2, of which 28 were located on the region's west coast. Appendix A includes location information (latitude and longitude), the triggering criteria, biodiversity value information and supporting references. This compilation includes sites that comprise or contain significant habitats (see Sections 3.6 and 3.8), but because not all locations of significant habitats are known (see section 4.3), the actual number of significant sites is likely to be greater than 80 (Appendix A).

Several sites comprise relatively large stretches of coastline (e.g., the southern Firth of Thames around Miranda) or whole island groups (e.g., Mercury Islands). Stretches of coastline have often been included as a result of the presence of threatened or at-risk breeding shorebirds, which can shift breeding site from year to year. These coastline sites generally follow those identified by Dowding (2013, 2019), and usually include additional biodiversity values that trigger one or more of the significance criteria. In addition to these relatively large sites, many relatively small sites were also classified as significant. For example, some very small streams and creeks (e.g., Mangangu Stream on the region's west coast) were included on the basis of occurrence of threatened or at-risk diadromous fish.

It is noteworthy that Criterion 3 was the most commonly used criterion to confer significance to sites. This reflected the relatively good levels of information on breeding sites for threatened or at-risk birds, and for the occurrence of threatened or at-risk diadromous fish in freshwater catchments.

All sites, including the two relatively large sites encompassing all of the west and east coast marine areas, have been included as polygons in an accompanying GIS layer. The GIS layer can be interrogated by criterion and by sub-criterion. Sub-criteria are all the biodiversity values that confer significance to a site, for each criterion. For example, Criterion 3 has 47 sub-criteria that span all threatened or at-risk taxa that confer significance to sites (45 taxa), plus taxa (not necessarily threatened or at risk) that are at the limit of their range (two taxa). Similarly, Criterion 8 has nine sub-criteria representing significant non-wetland habitats.

Table 4-1: Alignment of individual areas in the Waikato CMA with ecological significance criteria outlined in Section 3.

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
1 Entire west coast marine area	Marine Mammal Sanctuary		Cetaceans: Maui's dolphin								
2 Entire east coast marine area, including the Firth of Thames and waters around the Coromandel Peninsula	Hauraki Gulf Marine Park		Cetaceans: Bryde's whale, Killer whale, bottlenose dolphin								
West Coast											
3 Mōkau River			Birds: Caspian tern, variable oystercatcher; fish: Shortjaw kokopu, lamprey, longfin eel, torrentfish, giant kokopu, koaro, inanga, bluegill bully					Estuary			

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
4 Awakino River			Birds: variable oystercatcher; fish: Shortjaw kokopu, longfin eel, torrentfish, giant kokopu, koaro, inanga					Estuary			
5 Ounutae Stream			Fish: longfin eel, koaro, inanga								
6 Waioroko Stream			Fish: longfin eel, torrentfish, koaro, inanga								
7 Paparahia Stream			Fish: Shortjaw kokopu, lamprey, longfin eel, torrentfish, giant kokopu, inanga, bluegill bully								
8 Waikawau River			Fish: longfin eel, torrentfish, koaro, inanga, bluegill bully					Estuary			
9 Mangangu Stream			Fish: longfin eel								

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
10 Ngararahae Stream			Fish: koaro, inanga								
11 Nukuhakari Stream			Fish: longfin eel, torrentfish, giant kokopu, inanga								
12 Kiritehere Stream and beach			Fish: Shortjaw kokopu, lamprey, longfin eel, torrentfish, koaro, bluegill bully	Dune				Dune			
13 Marokopa River			Fish: longfin eel, inanga					Estuary			
14 Turiakina Stream			Fish: longfin eel, koaro								
15 Waihekuri Stream			Fish: inanga								
16 Taharoa Beach			Birds: Northern New Zealand dotterel, variable oystercatcher								

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
17 Kawhia Harbour including Ocean Beach			Birds: black stilt, banded dotterel, bar-tailed godwit, South Island pied oystercatcher, Northern New Zealand dotterel, variable oystercatcher; Fish: shortjaw kokopu, longfin eel, koaro, inanga, bluegill bully; Seagrass; mangrove southern limit	Dune, saltmarsh, seagrass		Mangrove, saltmarsh		Seagrass, estuary, dune			

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
18 Aotea Harbour including Potahi Point			Birds: banded dotterel, bar-tailed godwit, South Island pied oystercatcher, Northern New Zealand dotterel, variable oystercatcher; Fish: longfin eel; Seagrass; mangrove southern limit	Dune, saltmarsh, seagrass		Mangrove, saltmarsh		Seagrass, estuary, dune		Present	
19 Karewa/Gannet Island	Wildlife Sanctuary		Northern limit breeding New Zealand fur seal						Yes		
20 Te Rekereke Stream			Fish: shortjaw kokopu, longfin eel								
21 Manu Bay			Macroalgae								

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
22 Whāingaroā/Raglan Harbour			Birds: bar-tailed godwit, South Island pied oystercatcher, Northern New Zealand dotterel, variable oystercatcher; fish: Shortjaw kokopu, lamprey, longfin eel, giant kokopu, koaro, inanga, bluegill bully; Seagrass	Dune, saltmarsh, seagrass		Mangrove, saltmarsh		Seagrass, estuary, dune		Present	
23 Waimai Stream			Fish: longfin eel								
24 Waimai Stream to Waikorea Stream			Birds: Northern New Zealand dotterel, variable oystercatcher								
25 Waikaretu Stream			Fish: longfin eel, inanga								

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
26 Kaawa Stream			Birds: Northern New Zealand dotterel; Fish: longfin eel, inanga								
27 Waikawau Stream			Fish: longfin eel, lamprey, inanga								
28 Huriwai River			Fish: longfin eel								
29 Waikato River, Port Waikato		Inanga spawning habitat	Birds: Northern New Zealand dotterel, pied shag, variable oystercatcher; fish: Shortjaw kokopu, lamprey, longfin eel, torrentfish, giant kokopu, koaro, inanga, bluegill bully; seagrass	Dune, saltmarsh, seagrass		Saltmarsh		Seagrass, estuary, dune			
East Coast											
30 Waharau Stream			Fish: longfin eel								

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
31 Waihihi Stream			Fish: longfin eel, torrentfish, inanga								
32 Waihopuhopu Stream			Fish: longfin eel, torrentfish								
33 Whakatiwai Stream			Fish: longfin eel, torrentfish, inanga								
34 Kaiaua				Green-lipped mussel habitat				Green-lipped mussel bed			
35 Hauarahi Stream			Fish: longfin eel, torrentfish, inanga								

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
36 Miranda and surrounding area	Ramsar site		Birds: Black-billed gull; Black stilt; Banded dotterel; Caspian tern; Lesser knot; Wrybill; Banded rail; Bar-tailed godwit; South Island pied oystercatcher; Northern New Zealand dotterel; Pied shag; Variable oystercatcher; Fish: Shortjaw kokopu, longfin eel, torrentfish, giant kokopu, koaro, inanga, bluegill bully	Saltmarsh	Chenier plain	Mangrove, saltmarsh	Mangrove	Estuary			Yes
37 Te Puru to Matariki Bay			Birds: Northern New Zealand dotterel; Pied shag; Variable oystercatcher; Fish: longfin eel, torrentfish, koaro, inanga	Green-lipped mussel habitat				Green-lipped mussel bed, estuary			

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
38 Manaia Harbour			Birds: bar-tailed godwit, South Island pied oystercatcher, Northern New Zealand dotterel, variable oystercatcher; fish: longfin eel, torrentfish; seagrass	Saltmarsh, seagrass		Mangrove, saltmarsh		Seagrass, estuary			
39 Te Kouma Harbour			Seagrass	Saltmarsh, seagrass		Mangrove, saltmarsh		Seagrass, estuary			

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
40 Coromandel Harbour			Birds: banded dotterel, bar-tailed godwit, South Island pied oystercatcher, Northern New Zealand dotterel, variable oystercatcher; fish: longfin eel, torrentfish, koaro, inanga, bluegill bully, giant bully; seagrass	Saltmarsh, seagrass		Mangrove, saltmarsh		Seagrass, estuary			
41 Cow Island			Birds: New Zealand white-faced storm petrel								
42 Motuokino/Shag Rock			Birds: New Zealand white-faced storm petrel								

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
43 Koputauaki Bay to Tukituki Bay			Birds: Northern New Zealand dotterel, variable oystercatcher;								
44 Colville Bay			Birds: banded rail, bar-tailed godwit, South Island pied oystercatcher, Northern New Zealand dotterel, variable oystercatcher; fish: shortjaw kokopu, longfin eel, torrentfish, inanga, bluegill bully	Saltmarsh		Mangrove, saltmarsh		Estuary			
45 Waiaro Bay			Birds: Northern New Zealand dotterel, variable oystercatcher;					Estuary			
46 Ongohi Stream			Birds: pied shag								

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
47 Fantail Bay to Waikawau Bay			Birds: Australasian bittern, banded rail, spotless crake, Northern New Zealand dotterel, variable oystercatcher; fish: lamprey; longfin eel; torrentfish; giant kokopu; inanga; bluegill bully; giant bully; seagrass	Dune, saltmarsh, seagrass		Mangrove, saltmarsh		Seagrass, rocky reef, bryozoan bed, estuary, dune		yes	
48 Little Bay			Macroalgae								
49 Channel Island			Birds: Fluttering shearwater; Northern diving petrel								
50 Repanga/Cuvier Island			Birds: Pycroft's petrel					Rocky reef			

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
51 Mercury Islands			Birds: Flesh-footed shearwater; Northern blue penguin; Red-billed gull; Sooty shearwater; White-fronted tern; North Island little shearwater; Pied shag; Pycroft's petrel; Fluttering shearwater; Northern diving petrel; seagrass	Seagrass (subtidal)		Rocky reef, subtidal seagrass, rhodolith bed, horse mussel bed, estuary				Yes	
52 Kennedy Bay and estuary			Birds: Northern New Zealand dotterel; Variable oystercatcher; fish: lamprey, longfin eel, torrentfish, giant kokopu, koaro, inanga, giant bully; seagrass	Saltmarsh, seagrass		Mangrove, saltmarsh		Seagrass, estuary			

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
53 Whangapoua Harbour including ocean beaches from New Chums Beach to Kuaotunu Beach			Birds: banded dotterel, bar-tailed godwit, South Island pied oystercatcher, Northern New Zealand dotterel, variable oystercatcher; fish: longfish eel, torrentfish, inanga, giant bully; seagrass	Saltmarsh, seagrass		Mangrove, saltmarsh	Yes	Seagrass, estuary			
54 Otama Beach and Estuary to Opito Bay			Birds: Northern New Zealand dotterel, variable oystercatcher; seagrass	Dune, saltmarsh		Saltmarsh		Seagrass, sponge garden, bryozoan bed, estuary, dune		Yes	
55 Black Rocks			Birds: Northern diving petrel								
56 Flat Island								Rhodolith bed, rocky reef			

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
57 Ohinauiti Island			Birds: Flesh-footed shearwater, Northern blue penguin, North Island little shearwater, Fluttering shearwater, Northern diving petrel, New Zealand white-faced storm petrel					Rocky reef			
58 Ohinau Island			Birds: Flesh-footed shearwater, Northern blue penguin, North Island little shearwater					Rocky reef			
59 Needle Rock			Birds: Fluttering shearwater, Northern diving petrel								

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
60 Matapaua Bay to Whauwhau Beach			Birds: Northern New Zealand dotterel, Variable oystercatcher								
61 Wharekaho Beach			Birds: Northern New Zealand dotterel, Variable oystercatcher								
62 Whitianga Harbour and Buffalo Beach			Birds: Australasian bittern, banded rail, Northern New Zealand dotterel, Variable oystercatcher; fish: shortjaw kokopu, lamprey, longfin eel, torrentfish, koaro, inanga, giant bully; seagrass	Saltmarsh, seagrass		Mangrove, saltmarsh		Seagrass, Estuary			

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
63 Cooks Beach and Purangi Estuary			Birds: Northern New Zealand dotterel, fish: giant kokopu, longfin eel, inanga, giant bully; seagrass	Saltmarsh, seagrass		Mangrove, saltmarsh		Seagrass, Estuary			
64 Whanganui A Hei	Marine reserve		Birds: Northern New Zealand dotterel					Rocky reef			
65 Wigmore Stream			Fish: longfin eel, inanga, giant bully								
66 Motokurure/Centre Island			Birds: fluttering shearwater								
67 Poikeke Island			Birds: sooty shearwater								
68 Hot Water Beach			Birds: Northern New Zealand dotterel, Variable oystercatcher;	Dune				Dune			

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
69 Sailor's Grave – Te Karo Bay			Macroalgae								
70 Tairua Harbour, including Tairua Ocean Beach and Pauanui Beach			Birds: Banded rail, South Island pied oystercatcher, Northern New Zealand dotterel, Variable oystercatcher; fish: longfin eel, torrentfish, giant kokopu, koaro, inanga, giant bully; seagrass	Saltmarsh, seagrass		Mangrove, saltmarsh		Seagrass, Estuary			

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
71 Aldermen Islands			Birds: Northern blue penguin, red-billed gull, sooty shearwater, North Island little shearwater, Pied shag, Variable oystercatcher, Fluttering shearwater, Northern diving petrel, New Zealand white-faced storm petrel					Rhodolith bed			
72 Whakahau/Slipper Island			Birds: Northern New Zealand dotterel, Pied shag, Fluttering shearwater; seagrass (subtidal)	seagrass (subtidal)				Rhodolith bed, seagrass (subtidal)			

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
73 Pauanui/Penguin Island			Birds: northern blue penguin, North Island little shearwater, Fluttering shearwater								
74 Rabbit Island			Birds: Australasian bittern, North Island little shearwater, pied shag								

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
75 Ohui/North end of Opoutere Beach south to Wharekawa Harbour			Birds: reef heron, banded dotterel, banded rail, bar-tailed godwit, red-billed gull, White-fronted tern, Northern New Zealand dotterel, Variable oystercatcher; fish: lamprey, longfin eel, torrentfish, inanga, giant bully; seagrass	Saltmarsh, seagrass		Mangrove, saltmarsh		Seagrass			
76 Onemana Beach south to beach opposite Tokakahakaha Island			Northern New Zealand dotterel, Variable oystercatcher								

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
77 Whangamata Harbour, including Whangamata Beach south to Otahu River			Birds: Australasian bittern, banded rail, bar-tailed godwit, Northern New Zealand dotterel, Variable oystercatcher; fish: shortjaw kokopu, lamprey, longfin eel, torrentfish, koaro, inanga, giant bully; seagrass	Saltmarsh, seagrass		Mangrove, saltmarsh		Seagrass			
78 Hauturu/Clark Island group			Birds: northern blue penguin,								
79 Whiritoa Beach			Northern New Zealand dotterel, Variable oystercatcher								

Proposed site	1 Existing biodiversity protection	2 Reduced or degraded habitat	3 Threatened, at risk, endemic, range limits	4 Reduced historical extent	5 Nationally uncommon habitats	6 Wetland habitats	7 Large in extent	8 Critical for life history stages	9 Healthy representative example	10 Ecological sequence	11 Ecological buffer
80 Mataora Bay			Northern New Zealand dotterel, Variable oystercatcher								
81 Motumorirau Island								*Galeolaria hystrix* calcareous tube worm mounds			

4.2 The significance criteria and the CMA

Unlike the terrestrial environment, which has seen extensive and, in some areas, complete removal of indigenous habitats since human arrival, marine environments around New Zealand retain most pre-human habitats. This is particularly the case for many inter-tidal marine habitats and even more so for sub-tidal marine habitats. This is not to say that marine ecosystems that operate across marine habitats have not undergone modification since human arrival. For example, modelling of human exploitation of fish resources in the greater Hauraki Gulf since human arrival estimates reductions in biomass of 86% for sharks, 83% for snapper and 76% for rock lobster *(Jasus edwardsii)* (MacDiarmid et al. 2016). Additionally, New Zealand fur seals and sea lions *(Phocarctos hookeri)* were eliminated from the Hauraki Gulf by 1790 and the abundance of cetaceans and seabirds was estimated to have declined by 97% and 69%, respectively, since the year 1000 (MacDiarmid et al. 2016). Nevertheless, the marine habitats that these animals occupy remain, albeit with modified flora and fauna, and are vital for the existence of indigenous biota. In this sense, Criteria 6 and 8 (Table 2-1) would confer significance to all marine habitats within the CMA since indigenous marine biota rely on these habitats.

For many marine taxa, and for many biogenic habitats, there was insufficient information to accurately identify significant sites (see also section 4.3). Limited information was available on subtidal benthic and pelagic habitats. For example, marine fish are very much under-represented in the report, yet constitute a significant, conspicuous and important component of the region's marine biota. Furthermore, there was only limited information on seabird and finfish spawning sites or feeding sites that could be assigned under Criterion 8.

However, within this very broad, whole-region spatial scale, many smaller sites and areas of habitat can be identified and classified as significant based on the 11 criteria presented in Table 2-1. Two sites have been classified as significant, primarily under Criterion 3, that are relatively large, reflecting the highly mobile nature of the threatened cetacean species they support. Firstly, the entire west coast CMA from mean high water springs to the 12 nm limit has been classified as significant on the basis that this site (and specifically the pelagic marine habitat) is critical for Māui dolphin and is part of the West Coast North Island Marine Mammal Sanctuary established in 2008 as part of the Hector's *(Cephalorhynchus hectori hectori)* and Māui dolphin Threat Management Plan. Secondly, the coastal waters of the eastern Waikato region, comprising the Firth of Thames and coastal waters around the Coromandel Peninsula out to the 12 nm limit, are important for Bryde's whale, killer whale and bottlenose dolphin. For both of these sites, the threatened species can occur throughout the two areas.

Effectively, within the Waikato region's CMA, significant sites form two or more 'layers' at increasingly smaller spatial scales. For example, as noted above, the entire west coast CMA is classified as significant on the basis of being critical for Māui dolphin. Within this relatively large 'site' many smaller sites and habitats have been separately classified as significant, including estuaries. Within estuaries, significance could be further designated on the basis of threatened or at-risk breeding shorebirds or the presence of other, smaller areas of significant habitat such as saltmarsh. Furthermore, the presence of particular species and habitats can confer significance to a site by triggering more than one of the 11 criteria. For example, the presence of seagrass at a site will trigger Criterion 3 (because seagrass is classified as at risk), Criterion 4 (because seagrass habitat is considered to be substantially depleted in extent compared to its original extent) and Criterion 8 (because seagrass is one of several significant habitats supporting indigenous biota).

4.3 Indicative locations of significant habitats

Among the significant habitats identified in Section 3, comprehensive location information for several sub-tidal biogenic habitats is lacking, with only a limited number of point records available for most biogenic habitat types. This is particularly the case for rhodolith beds, sponge gardens, horse mussel beds, green-lipped mussel beds and bryozoan beds (Anderson et al. 2019). This lack of comprehensive information has almost certainly resulted in these five habitat types being under-represented in the compilation of significant sites (Appendix A). Here we summarise typical environmental characteristics of these five habitat types, where known or quantified, and suggest locations where these habitats may potentially be located (Figure 4-1). These 'potential locations' have been included as polygons in an accompanying GIS layer.

4.3.1 Rhodolith beds

Typically, rhodolith beds occur in relatively clear (low turbidity) subtidal waters, with relatively strong currents. Beds are confined to the photic zone, which can extend down to approximately 200 m depth depending on water clarity, and are found on sediments comprising coarse sand, gravel or shell debris (Farr et al. 2009, Nelson et al. 2012, Anderson et al. 2019). In addition to the known locations of rhodolith beds noted in Appendix A (Mercury Islands, Flat Island, Aldermen Islands and Whakahau Island), and based upon the habitat characteristics favoured by rhodoliths, we suggest that the following sites could potentially support rhodolith beds: channels between rock stacks and islets and the mainland (e.g., Opito Bay, north of Fletcher Bay, Waikawau Bay); around Mercury Island and islets more generally (Figure 4-1).

4.3.2 Sponge gardens

Sponges generally are a principal component of rocky reefs but can also occur on soft substrates that contain sufficient hard substrate for initial attachment. On reefs, sponges tend to predominate at depths below which large algae become scarce or are unable to grow (Morrison et al. 2014, Anderson et al. 2019), typically deeper than 25-30m depth. In addition to the single sponge garden noted in Table 4-1 and Appendix A, at Opito Bay (Thrush et al. 1998), sponge gardens could potentially occur at any rocky reef location. All subtidal rocky reefs, and particularly those below 25 m depth, should be considered as potentially supporting sponge gardens. Additionally, sponge gardens are likely to occur in the Waikato region through the Colville Channel area (Townsend & Lohrer 2019).

4.3.3 Horse mussel beds

Horse mussel beds occur from the extreme low water mark down to depths of at least 45-70 m, with shells anchoring in soft sediments using sub-surface byssal threads (Warwick et al. 1997, Morrison et al. 2014). Furthermore, horse mussels are likely to favour low-turbidity waters as they are sensitive to waters with relatively high sediment loads (Morrison et al. 2014). We have noted two locations where horse mussel beds occur (to the northeast of Kaiaua in the Firth of Thames and at the Mercury Islands: Table 2-2, Appendix A), but horse mussel beds could additionally occur where there is soft sediment and water turbidity is low. Jones et al. (2016) and Anderson et al. (2019) identified two relatively large areas in the Waikato region where horse mussel beds are likely to occur: an area extending northwest from Colville Bay to off Cape Colville, and an area extending from the Mercury Islands westwards towards Whangapoua Harbour and Wainuiototo Bay. These areas have been included as areas in which horse mussel habitat could potentially occur (Figure 4-1).

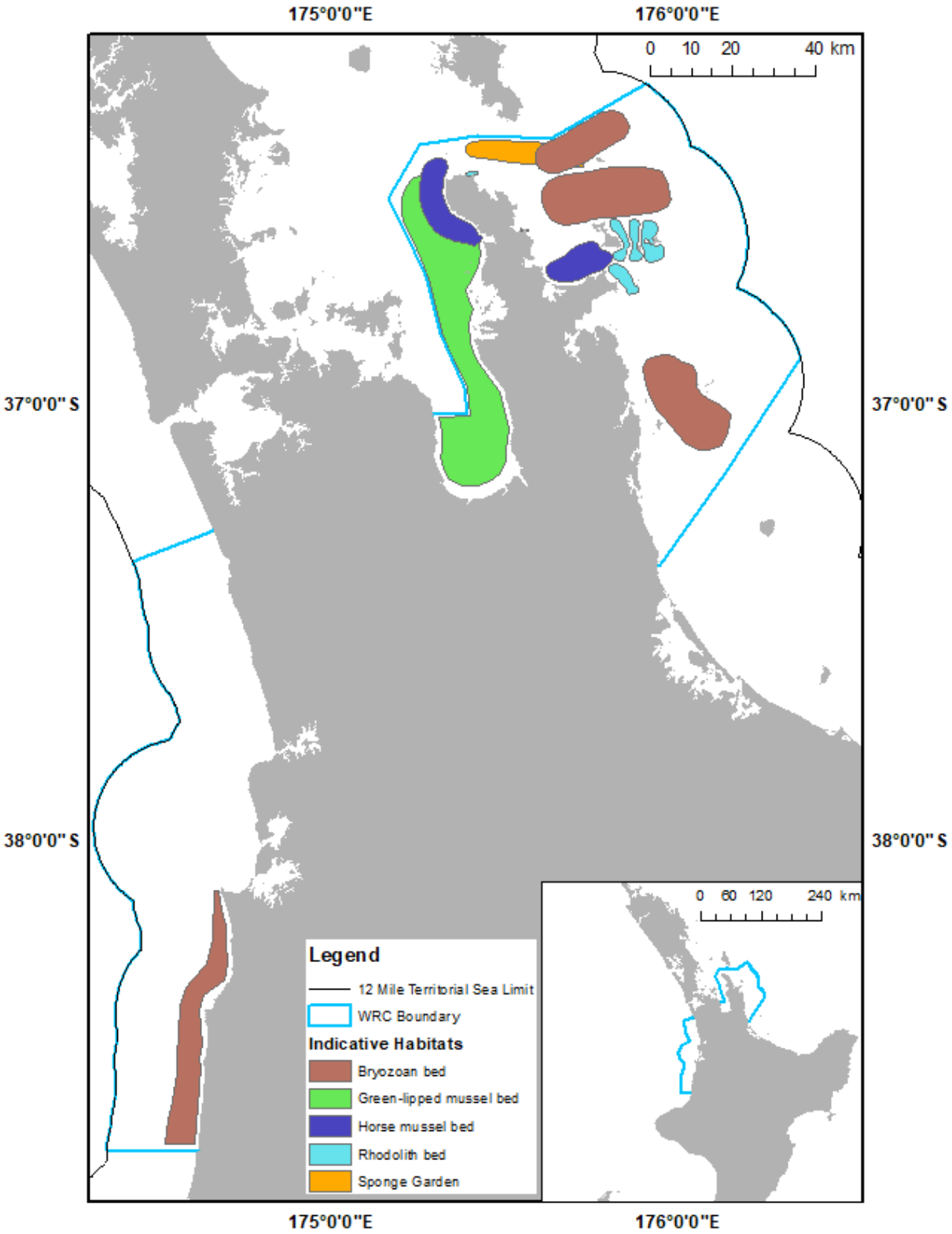

Figure 4-1: Indicative habitats in the Waikato CMA based on expert assessment of likely environmental conditions favouring particular habitat types.

4.3.4 Green-lipped mussel beds

Green-lipped mussels occur in a variety of habitats from the low intertidal zone down to about 60 m depth. They can be found on exposed rocky shores but also subtidally in sheltered embayments characterised by relatively firm seafloor substrate with some hard objects providing attachment surfaces. In such habitats dense mussel beds may develop over time, with the mussels themselves providing substrate for additional 'layers' of mussels to grow (Paul 2012). Historically there were extensive and dense green-lipped mussel beds across the Firth of Thames and inner Hauraki Gulf (Paul 2012), but green-lipped mussel beds are now considered to be ecologically and functionally extinct in these areas (Morrison et al. 2014). Anderson et al. (2019) concluded that green-lipped mussel beds on soft-sediments are now a rare habitat in New Zealand. Existing beds maybe sourced from vagrants from nearby commercial mussel farms, for example at Waimangu Point, Firth of Thames (McLeod 2009).

This assessment noted relatively small areas of green-lipped mussels, near to Wilson Bay on the western side of the Coromandel Peninsula and northeast of Kaiaua (refer Figure 3-12), but it is possible further beds may exist throughout the Firth of Thames, as indicated in Figure 4-1.

4.3.5 Bryozoan beds

Based on information presented in Batson and Probert (2000) for seven locations throughout New Zealand, and summarised by Morrison et al. (2014), bryozoan beds or thickets are typically found in waters of 25-100 m depth (with some exceptions found in shallower water, e.g. at Separation Point, and in deeper water, e.g. on the Snares Platform), in relatively high energy regimes with strong tidal or current flows and on gravel or coarse sand substrates rich in calcium carbonate (shell).

In addition to bryozoan beds located at Fantail Bay, Cape Colville and Opito Bay (refer Figure 3-12), bryozoan beds could additionally occur to the north of Cuvier Island, between Cuvier Island and the Mercury Islands, to the west of the Aldermen Islands, and based on modelling of the distributuions of 11 bryozoan species (Figure 3-16) inshore areas along sections of coast towards the south of the region's west coast (Figure 4-1).

4.4 Threats to biodiversity values

Table 4 summarises the potential threats faced by threatened and at-risk taxa and by the significant habitats noted in sections 3.6 and 3.8. In addition to the threats noted in Table 4 are those threats resulting from human-induced climate change, including changes to sea temperature, sea levels and pH. Control or management of these global-scale effects at a local, regional or national scale will be extremely difficult if not impossible. However, many of the threats identified in Table 4 will potentially act over much smaller scales and management of these more localised threats will be tractable. It should also be further noted that many of the threats facing taxa and habitats will be species and site specific. For example, while seabirds generally are exposed to the threat of commercial fishing activity, for rare species that are attracted to fishing vessels the risk is much greater. Likewise, terrestrially derived sediment input to coastal marine environments is a threat to these systems generally, but will vary in intensity from site to site, depending on the particular land-use characteristics in the catchment. For a more extensive assessment of threats to marine habitats see MacDiarmid et al. (2012).

Table 4-2: Potential threats faced by threatened and at-risk taxa and by a range of habitats.

Biodiversity value	Threats
Threatened/At-risk taxa	
Cetaceans	Disturbance through cetacean-based tourism activity, underwater noise associated with a range of sources including vessel traffic, mineral exploration and extraction and coastal development, vessel strike, disease, small population effects for some species notably Māui dolphin.
Seabirds	Loss of eggs and chicks by mammalian predators, particularly for relatively small seabird species and for islands that are currently pest-free, direct impacts of commercial fishing and recreational fishing (generally increased mortality for some species), ingestion of plastic and acquisition of other pollutants, attraction to artificial nocturnal light sources, both land-based and at-sea, causing disorientation and potentially increased mortality, increased turbidity in coastal waters potentially impacting foraging efficiency.
Shorebirds	Loss of eggs and chicks by mammalian predators, human disturbance including through dogs and other pets and vehicle use on nesting beaches, increased likelihood of extreme weather events potentially washing out nesting attempts.
Diadromous fish	Decreased water quality including increased sedimentation linked to land-use, farming practices including stock damage to river and stream banks and vegetation, habitat loss, barriers to movements between freshwater and the sea, introduced non-native fish.
Vascular plants	Increased sedimentation linked to land-use, water turbidity, loss of habitat through land reclamation and coastal engineering.
Macroalgae	Increased sedimentation linked to land-use, increased water turbidity, loss of habitat through and reclamation and coastal engineering and invasive species.
Habitats	
Rhodolith beds	Physical disturbance including dredging, trawling and anchoring, decreased water quality through increased land-based sedimentation and through at-sea dumping, aquaculture installations, decreased seawater pH and increased seawater temperatures.
Seagrass, including subtidal seagrass	Physical disturbance including dredging, trawling and anchoring, decreased water quality through increased land-based sedimentation and through at-sea dumping, land reclamation and coastal engineering.
Sponge gardens	Physical disturbance including dredging, trawling and anchoring, decreased water quality through increased land-based sedimentation and through at-sea dumping, decreased seawater pH and increased seawater temperatures.
Rocky reefs	Physical disturbance including dredging, trawling and anchoring, decreased water quality through increased land-based sedimentation and through at-sea dumping, decreased seawater pH and increased seawater temperatures.
Horse mussel beds	Physical disturbance including dredging, trawling and anchoring, decreased water quality through increased land-based sedimentation and through at-sea dumping, decreased seawater pH and increased seawater temperatures.

Biodiversity value	Threats
Green-lipped mussel beds	Physical disturbance including dredging, trawling and anchoring, decreased water quality through increased land-based sedimentation and through at-sea dumping, decreased seawater pH and increased seawater temperatures.
Bryozoan beds	Physical disturbance including dredging, trawling and anchoring, decreased water quality through increased land-based sedimentation and through at-sea dumping, decreased seawater pH and increased seawater temperatures.
Estuaries	Decreased water quality through increased land-based sedimentation, pollutant and storm-water runoff, invasive non-native plants including saltwater paspalum (*Paspalum vaginatum*) and Spartina (*Spartina* spp.), damage from uncontrolled stock, land reclamation and coastal engineering, marina development, aquaculture impacts, overfishing, habitat destruction from trawling and dredging impacts, urbanisation.
Mangroves	Physical removal, land reclamation and coastal engineering.
Saltmarsh	Invasive non-native plants including saltwater paspalum and Spartina, damage from uncontrolled stock, increased land-based sedimentation, land reclamation and coastal engineering.
Dunes	Loss of native vegetation cover, sometimes deliberately to maintain coastal views of property owners, stock access and subsequent wind erosion of exposed sand, sand mining, coastal subdivision, introduced exotic plants, damage through vehicle access to dune systems.

5 Conclusions

The 11 significance criteria defined in WRC's RPS have been used to identify indicative significant sites and habitats within the Waikato region's CMA. Overall, significance was conferred to a site most commonly based on the presence of threatened or at-risk taxa. Sites that were identified as significant on this basis were biased towards birds (seabirds and shorebirds) and diadromous fish for which good information is available. Identifying significant sites on the basis that they are critical for other marine taxa (with the exception of intertidal seagrass), or because they support significant habitats, proved more difficult due to a paucity of quantitative information. It is inevitable that as more information is acquired in the future, the number of significant sites will increase from the total of 80 identified here.

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Appendix A Sites

Sites included in this appendix have additionaly been digitised as polygons in a GIS that has been provided to WRC. The GIS application can be queried to allow the user to explore significant sites by criterion and further by particular biodiversity values within each criterion. For example, significant sites under criterion 3 can be queried to display sites that are significant due to particular threatened or at-risk taxa.

Site ID	Site	Latitude Longitude	Relevant criteria	Biodiversity values	References
1	Entire west coast marine area	NA	1	The entire west coast marine area of the Waikato region falls within the West Coast North Island marine mammal sanctuary. The sanctuary's boundaries extend from mean high water springs out to the 12 nm territorial sea limit. The total area of the sanctuary is approximately 1 200 086 ha bordering 2 164 km of coastline. The sanctuary was established in 2008 as part of the Hector's *Cephalorhynchus hectori hectori* and Māui dolphin *Cephalorhynchus hectori māui* Threat Management Plan. Within the sanctuary boundaries restrictions were placed on seabed mining activities and acoustic seismic survey work. The 2008 New Zealand Gazette notice for this marine mammal sanctuary specifies the areas in which these restrictions apply.	
			3	This region is critical to Māui dolphin (Threatened – Nationally Critical). Māui dolphin has a relatively restricted range and is only found on the west coast of the northern North Island. The current range of Māui dolphin extends from Maunganui Bluff in the north to Whanganui in the south.	Du Fresne (2010); Currey et al. (2012), MPI & DOC (2012).
2	Entire east coast marine area, including the Firth of Thames and waters around the Coromandel Peninsula	NA	1	The Firth of Thames, waters around the Coromandel Peninsula and the eastern marine area of the Auckland region form part of the Hauraki Gulf Marine Park, statutorally designated for its nationally significant marine ecosystem. The total area of the Park is 1 388 786 ha.	
			3	This area is critical for calving and feeding of Bryde's whale *Balaenoptera edeni brydei* (Threatened – Nationally Critical), killer whale *Orcinus orca* (Threatened – Nationally Critical) and bottlenose dolphin *Tursiops truncatus* (Threatened – Nationally Endangered). Within the Waikato region, the CMA extending from the top of the Coromandel Peninsula and along the western coast	Visser (2000); Baker & Madon (2007); Dwyer et al. (2014); Hupman et al. (2014); Dwyer et

				of the Peninsula southwards to approximately Tapu is an important area for Bryde's whales, bottlenose dolphins and killer whales with year-round occurrence, feeding and the presence of calves. The inner Firth of Thames is not highly used by Bryde's whales or bottlenose dolphins and is considered of less importance to these species (when compared with other areas to the north within the Hauraki Gulf i.e. the western coastline of the Coromandel Peninsula), but the inner Firth of Thames is of similar importance for killer whales as other areas within the greater Hauraki Gulf.	al. (2016); Tezanos-Pinto et al. (2017).
	West Coast				
3	Mōkau River	38°42.30'S 174°36.94'E	3	Occurrence of shortjaw kokopu *Galaxias postvectis* (Threatened - Nationally Vulnerable), lamprey *Geotria australis* (Threatened – Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), giant kokopu *Galaxias argenteus* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and bluegill bully *Gobiopmorphus hubbsi* (At Risk – Declining).	Crow (2017).
			3	Breeding populations of Caspian tern *Hydropogne caspia* (Threatened – Nationally Vulnerable) and variable oystercatcher *Haematopus unicolor* (At Risk – Recovering).	Dowding (2019).
			8	Estuarine habitat	Hume et al. (2003).
4	Awakino River	38°39.87'S 174°37.23'E	3	Occurrence of shortjaw kokopu *Galaxias postvectis* (Threatened - Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), giant kokopu *Galaxias argenteus* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).
			3		Dowding (2019).

				Breeding population of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering).	
			8	Estuarine habitat.	Hume et al. (2003).
5	Ounutae Stream	38°34.31'S 174°37.84'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).
6	Waioroko Stream	38°33.34'S 174°37.90'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).
7	Paparahia Stream	38°31.89'S 174°38.11'E	3	Occurrence of shortjaw kokopu *Galaxias postvectis* (Threatened - Nationally Vulnerable), lamprey *Geotria australis* (Threatened – Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), giant kokopu *Galaxias argenteus* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and bluegill bully *Gobiopmorphus hubbsi* (At Risk – Declining).	Crow (2017).
8	Waikawau River	38°28.70'S 174°38.21'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and bluegill bully *Gobiopmorphus hubbsi* (At Risk – Declining).	Crow (2017).
			8	Estuarine habitat.	Hume et al. (2003).
9	Mangangu Stream	38°25.43'S 174°38.45'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining).	Crow (2017).
10	Ngararahae Stream	38°24.40'S 174°38.38'E	3	Occurrence of koaro *Galaxias brevipinnis* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).
11	Nukuhakari Stream	38°22.61'S 174°39.63'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), giant kokopu *Galaxias argenteus* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).

12	Kiritehere Stream and beach	38°19.40'S 174°42.62'E	3	Occurrence of shortjaw kokopu *Galaxias postvectis* (Threatened - Nationally Vulnerable), lamprey *Geotria australis* (Threatened – Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining) and bluegill bully *Gobiopmorphus hubbsi* (At Risk – Declining).	Crow (2017).
			3	Macroalga *Cladostephus spongiosus* (At Risk – Naturally Uncommon).	Te Papa database.
			4	Dune habitat.	Hilton et al. (2000).
			8	Dune habitat.	Anonymous (2011).
13	Marokopa River	38°18.43'S 174°42.88'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).
			3	Breeding population of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering).	Dowding (2019).
			8	Estuarine habitat.	Hume et al. (2003).
14	Turiakina Stream	38°17.44'S 174°42.87'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining) and koaro *Galaxias brevipinnis* (At Risk – Declining).	Crow (2017).
15	Waihekuri Stream	38°13.34'S 174°42.94'E	3	Occurrence of inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).
16	Taharoa Beach	38°10.41'S 174°42.25'E	3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering), northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
17	Kawhia Harbour including Ocean Beach	38°5.20'S 174°46.68'E	3	Occurrence of shortjaw kokopu *Galaxias postvectis* (Threatened - Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and bluegill bully *Gobiopmorphus hubbsi* (At Risk – Declining).	Crow (2017).

			3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering), northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering) plus important wintering (non-breeding) populations of black stilt *Himantopus novaezelandiae* (Threatened – Nationally Critical), banded dotterel *Charadrius bicinctus bicinctus* (Threatened – Nationally Vulnerable), South Island pied oystercatcher *Haematopus finschi* (At Risk – Declining) and bar-tailed godwit *Limosa lapponica baueri* (At Risk – Declining).	Dowding (2019)
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds.	Graeme (2005a).
			3	Mangrove reaches its southern limit at Kawhia.	Graeme (2005a).
			4	Dune habitat.	Hilton et al. (2000).
			4	Saltmarsh habitat.	MfE data.
			4	Seagrass habitat.	Inglis (2003).
			6	Mangrove habitat.	Graeme (2005a).
			6	Saltmarsh habitat.	Graeme (2005a).
			8	Seagrass habitat.	Graeme (2005a).
			8	Estuarine habitat.	Hume et al. (2003).
			8	Dune habitat.	Bouma (2016).
18	Aotea Harbour including Potahi Point	38°0.77'S 174°47.93'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining).	Crow (2017).
			3		Dowding (2019).

				Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering), northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering) plus important wintering (non-breeding) populations of banded dotterel *Charadrius bicinctus bicinctus* (Threatened – Nationally Vulnerable), South Island pied oystercatcher *Haematopus finschi* (At Risk – Declining) and bar-tailed godwit *Limosa lapponica baueri* (At Risk – Declining).	
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds.	Graeme (2005b).
			4	Dune habitat.	Hilton et al. (2000).
			4	Saltmarsh habitat.	MfE data.
			4	Seagrass habitat.	Inglis (2003).
			6	Saltmarsh habitat.	Graeme (2005b).
			8	Seagrass habitat.	Graeme (2005b).
			8	Estuarine habitat.	Hume et al. (2003).
			8	Dune habitat.	Bouma (2016).
			10	Southwest of Pakoka Landing features intact estuarine-freshwater wetland-freshwater swamp forest-coastal forest sequences.	Graeme (2005b).
19	Karewa/Gannet Island	37°58.37'S 174°33.93'E	1	Designated a Wildlife Sanctaury under the Wildlife Act, in part due to the presence of New Zealand's largest Australasian gannet *Morus serrator* colony. All biota on the island is protected.	
			3	Northernmost breeding site for New Zealand fur seal *Arctocephalus forsteri*.	Bouma et al. (2008).

			9	A rare example of a largely unmodified offshore island off the region's west coast.	Ryder et al. (2016).
20	Te Rekereke Stream	37°51.95'S 174°45.45'E	3	Occurrence of shortjaw kokopu *Galaxias postvectis* (Threatened - Nationally Vulnerable) and longfin eel *Anguilla dieffenbachia* (At Risk – Declining).	Crow (2017).
21	Manu Bay	37*o*49.32'S 174*o*49.04'E	3	Macroalga *Pachymenia lusoria* (At Risk – Naturally Uncommon).	Te Papa database.
22	Whaingaroā/Raglan Harbour	37°48.03'S 174°50.58'E	3	Occurrence of shortjaw kokopu *Galaxias postvectis* (Threatened - Nationally Vulnerable), lamprey *Geotria australis* (Threatened – Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), giant kokopu *Galaxias argenteus* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and bluegill bully *Gobiopmorphus hubbsi* (At Risk – Declining).	Crow (2017).
			3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering), northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering) plus important wintering (non-breeding) populations of South Island pied oystercatcher *Haematopus finschi* (At Risk – Declining) and bar-tailed godwit *Limosa lapponica baueri* (At Risk – Declining).	Dowding (2019).
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds.	Graeme (2005c).
			4	Dune habitat.	Hilton et al. (2000).
			4	Saltmarsh habitat.	MfE data.
			4	Seagrass habitat.	Inglis (2003).
			6	Mangrove habitat.	Graeme (2000c).

			6	Saltmarsh habitat.	Graeme (2005c).
			8	Seagrass habitat.	Graeme (2005c).
			8	Estuarine habitat.	Hume et al. (2003).
			8	Dune habitat.	Anonymous (2011).
			10	The extreme southwest extent of Raglan Harbour and coastline running to the west then south forms an ecological sequence encompassing marine and terrestrial ecosystems culminating in the summit of Mt Karioi – from the mountain to the sea.	https://www.karioimaunga.co.nz/
23	Waimai Stream	37°38.00'S 174°47.44'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining).	Crow (2017).
24	Waimai Stream to Waikorea Stream	37°38.00'S 174°47.44'E to 37°37.09'S 174°46.99'E	3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering), northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
25	Waikaretu Stream	37°31.87'S 174°45.31'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).
26	Kaawa Stream	37°30.26'S 174°44.53'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).
			3	Breeding population of northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
27	Waikawau Stream	37°27.78'S 174°43.36'E	3	Occurrence of lamprey *Geotria australis* (Threatened – Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), and inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).
28	Huriwai River	37°26.75'S 174°42.76'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining).	Crow (2017).

29	Waikato River, Port Waikato	37°21.99'S 174°42.20'E	2	Spawning sites for inanga *Galaxias maculatus* exposed to habitat degradation, with evidence that some sites have been destroyed.	Taylor (2002)
			3	Occurrence of shortjaw kokopu *Galaxias postvectis* (Threatened - Nationally Vulnerable), lamprey *Geotria australis* (Threatened – Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), giant kokopu *Galaxias argenteus* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and bluegill bully *Gobiopmorphus hubbsi* (At Risk – Declining).	Crow (2017)
			3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering), northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering) and pied shag *Phalacrocorax varius varius* (At Risk – Recovering).	Graeme (2005d), Dowding (2019).
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds.	Graeme (2005d).
			4	Dune habitat.	Hilton et al. (2000).
			4	Saltmarsh habitat.	MfE data.
			4	Seagrass habitat.	Inglis (2003).
			6	Saltmarsh habitat.	Graeme (2005d).
			8	Seagrass habitat.	Graeme (2005d).
			8	Estuarine habitat.	Hume et al. (2003).
			8	Dune habitat.	Anonymous (2011).
	East Coast				

30	Waharau Stream	37°2.28'S 175°17.80'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining).	Crow (2017).
31	Waihihi Stream	37°2.60'S 175°17.90'E	3	Occurrence of longfin eel Anguilla dieffenbachia (At Risk – Declining), torrentfish Cheimarrichthys fosteri (At Risk – Declining) and inanga Galaxias maculatus (At Risk – Declining).	Crow (2017).
32	Waihopuhopu Stream	37°3.09'S 175°18.12'E	3	Occurrence of longfin eel Anguilla dieffenbachia (At Risk – Declining) and torrentfish Cheimarrichthys fosteri (At Risk – Declining).	Crow (2017).
33	Whakatiwai Stream	37°5.20'S 175°18.23'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).
34	Kaiaua	37°5.64'S 175°23.82'E	4	Green-lipped mussel habitat.	McLeod et al. (2014), Wilcox et al. (2018).
			8	Green-lipped mussel habitat located northeast of Kaiaua in subtidal waters close to the centre of the Firth of Thames.	Lundquist et al. (2004).
35	Hauarahi Stream	37°6.63'S 175°18.73'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).
36	Miranda and surrounding area	37°6.65'S 175°17.18'E to 37°5.99'S 175°30.96'E	1	An internationally important wetland under the Convention on Wetlands, otherwise known as the Ramsar Convention, hence a Ramsar site.	
			3	Breeding populations of black-billed gull *Larus bulleri* (Threatened – Nationally Critical), Caspian tern *Hydropogne caspia* (Threatened – Nationally Vulnerable), banded rail *Gallirallus philippensis assimilis* (At Risk – Declining), variable oystercatcher *Haematopus unicolor* (At Risk – Recovering), northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering) and pied shag *Phalacrocorax varius varius* (At Risk – Recovering), plus important wintering (non-breeding) populations of black stilt *Himantopus novaezelandiae* (Threatened – Nationally Critical), wrybill *Anarhynchus frontalis* (Threatened – Nationally Vulnerable),	Bell (2013), Dowding (2019).

	banded dotterel *Charadrius bicinctus bicinctus* (Threatened – Nationally Vulnerable), lesser knot *Calidris canutus rogersi* (Threatened – Nationally Vulnerable), South Island pied oystercatcher *Haematopus finschi* (At Risk – Declining) and bar-tailed godwit *Limosa lapponica baueri* (At Risk – Declining).	
3	Within this site Te Puaeharuri Stream supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining), Waitakaruru River supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining), Piako River supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), giant kokopu *Galaxias argenteus* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining), Waihou River supports shortjaw kokopu *Galaxias postvectis* (Threatened - Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and bluegill bully *Gobiopmorphus hubbsi* (At Risk – Declining), Kauaeranga River supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining) and Hape Stream supports shortjaw kokopu *Galaxias postvectis* (Threatened - Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).
4	Saltmarsh habitat.	MfE data.

			5	Aggrading chenier plain at Miranda.	Graeme (2007a).
			6	Mangrove habitat.	Graeme (2007a).
			6	Saltmarsh habitat.	Graeme (2007a).
			7	Particularly extensive area of mangrove habitat, extending from Miranda Stream in the west to Kauaeranga River in the east, providing roost sites for seabirds and, where mature, coexisting sea meadow communities.	Graeme (2007a).
			8	Estuarine habitat.	Hume et al. (2003).
			11	The extensive mangrove habitat around the southern coast of the Firth of Thames may play an important role as a sediment trap, effectively protecting other areas of the Firth from predominantly terrestrially-derived sediment build-up.	Swales et al. (2019).
37	Te Puru to Matariki Bay	37°2.71'S 175°30.99'E to 36°51.57'S 175°24.73'E	3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering), northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering) and pied shag *Phalacrocorax varius varius* (At Risk – Recovering).	Bell (2013), Dowding (2019).
			3	Within this site Waiomu Stream supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining), Tapu River supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining) and torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), Te Mata River supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining) and koaro *Galaxias brevipinnis* (At Risk – Declining), Waikawau River supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys*	Crow (2017).

				fosteri (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining) and Paraunahi Stream supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining).	
			4	Green-lipped mussel habitat near Wilson Bay.	McLeod et al. (2014), Wilcox et al. (2018).
			8	Green-lipped mussel habitat near Wilson Bay.	Craig Norrie (University of Auckland), pers. observation.
			8	Estuarine habitat at Kirita Bay.	Hume et al. (2003).
38	Manaia Harbour	36°50.77'S 175°25.83'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining) and torrentfish *Cheimarrichthys fosteri* (At Risk – Declining).	Crow (2017).
			3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering) and wintering site of South Island pied oystercatcher *Haematopus finschi* (At Risk – Declining) and regularly-occurring bar-tailed godwit *Limosa lapponica baueri* (At Risk – Declining).	Bouma (2016), Dowding (2019).
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds.	Graeme (2009a).
			4	Saltmarsh habitat.	MfE data.
			4	Seagrass habitat.	Inglis (2003).
			6	Mangrove habitat.	Graeme (2009a).

			6	Saltmarsh habitat.	Graeme (2009a).
			8	Seagrass habitat.	Graeme (2009a).
			8	Estuarine habitat with areas of high density pipi towards the outer edge of the harbour and areas of high density crustacean burrows, predominantly on the north side of the outer harbour.	Hume et al. (2003), Needham et al. (2013).
39	Te Kouma Harbour	36°49.58'S 175°25.62'E	3	Seagrass *Zostera muelleri* (At Risk – Declining) beds.	Graeme (2013a).
			4	Saltmarsh habitat.	MfE data.
			4	Seagrass habitat.	Inglis (2003).
			6	Mangrove habitat.	Graeme (2013a).
			6	Saltmarsh habitat.	Graeme (2013a).
			8	Seagrass habitat.	Graeme (2013a).
			8	Estuarine habitat with several areas of oysters around the smaller bays and areas of high density crustacean burrows towards the head of the bay.	Hume et al. (2003), Needham et al. (2013).
40	Coromandel Harbour	36°48.10'S 175°26.21'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining), bluegill bully *Gobiopmorphus hubbsi* (At Risk – Declining) and giant bully *Gobiopmorphus gobioides* (At Risk – Declining).	Crow (2017).
			3		

				Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering) and wintering site of banded dotterel *Charadrius bicinctus bicinctus* (Threatened – Nationally Vulnerable) and South Island pied oystercatcher *Haematopus finschi* (At Risk – Declining) and regularly-occurring bar-tailed godwit *Limosa lapponica baueri* (At Risk – Declining).	Bouma (2016). Dowding (2019).
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds.	Graeme (2013a).
			4	Saltmarsh habitat.	MfE data.
			4	Seagrass habitat.	Inglis (2003).
			6	Mangrove habitat.	Graeme (2013a).
			6	Saltmarsh habitat.	Graeme (2013a).
			8	Seagrass habitat.	Graeme (2013a).
			8	Estuarine habitat with a complex mosaic of sub-habitat types including areas of high density crustacean burrows, cockles, pipi and oysters.	Hume et al. (2003), Needham et al. (2013).
41	Cow Island	36°48.32'S 175°24.10'E	3	Breeding population of New Zealand white-faced storm petrel *Pelagodroma marina maoriana* (At Risk - Relict).	Gaskin & Rayner (2013), Taylor (2000b).
42	Motuokino/Shag Rock	36°45.02'S 175°23.49'E	3	Breeding population of New Zealand white-faced storm petrel *Pelagodroma marina maoriana* (At Risk - Relict).	Gaskin & Rayner (2013), Taylor (2000b).
43	Koputauaki Bay to Tukituki Bay	36°43.58'S 175°27.70'E to	3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).

		36°38.75’S 175°26.73’E			
44	Colville Bay	36°37.23’S 175°27.22’E	3	Occurrence of shortjaw kokopu *Galaxias postvectis* (Threatened - Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and bluegill bully *Gobiopmorphus hubbsi* (At Risk – Declining).	Crow (2017).
			3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering) and regularly-occurring South Island pied oystercatcher *Haematopus finschi* (At Risk – Declining), bar-tailed godwit *Limosa lapponica baueri* (At Risk – Declining) and banded rail *Gallirallus philippensis assimilis* (At Risk – Declining).	Dowding (2019).
			4	Saltmarsh habitat.	MfE data.
			6	Mangrove habitat.	Graeme (2013b).
			6	Saltmarsh habitat.	Graeme (2013b).
			8	Estuarine habitat with generally low fauna densities, but with several areas of high density pipi towards the outer reaches of the bay.	Hume et al. (2003), Needham et al. (2013).
45	Waiaro Bay	36°35.38’S 175°25.14’E	3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
			8	Estuarine habitat.	Hume et al. (2003).
46	Ongohi Stream	36°33.18’S 175°20.67’E	3	Breeding population of pied shag *Phalacrocorax varius varius* (At Risk – Recovering).	Bell (2013).

47	Fantail Bay to Waikawau Bay	36°31.46'S 175°19.66'E to 36°35.95'S 175°31.71'E	3	This site supports breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering) and resident populations of Australasian bittern *Botaurus poiciloptilus* (Threatened – Nationally Critical), banded rail *Gallirallus philippensis assimilis* (At Risk – Declining) and spotless crake *Porzana tabuensis tabuensis* (At Risk – Declining). See Dowding (2019) for specific locations.	Dowding (2019).
			3	Within this site Port Jackson supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and giant bully *Gobiopmorphus gobioides* (At Risk – Declining), Stony Bay supports lamprey *Geotria australis* (Threatened – Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and bluegill bully *Gobiopmorphus hubbsi* (At Risk – Declining), Tangiaro Stream supports torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), Parakete Stream supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining) and Waikawau River supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), giant kokopu *Galaxias argenteus* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and giant bully *Gobiopmorphus gobioides* (At Risk – Declining).	Crow (2017).
			3	Waikawau Estuary supports a relatively small extent of seagrass *Zostera muelleri* (At Risk – Declining).	Graeme (2013c).
			3	Macroalga *Lessonia* sp. A (At Risk – Naturally Uncommon) at Fletcher Bay	Te Papa database.
			4	Dune habitat.	Hilton et al. (2000).

4	Saltmarsh habitat.	MfE data.
4	Seagrass habitat.	Inglis (2003).
6	Mangrove habitat at Waikawau River and estuary.	Graeme (2013c).
6	Saltmarsh habitat at Waikawau River and estuary.	Graeme (2013c).
8	Rocky reef habitat between Fletcher Bay and Port Charles.	Lundquist et al. (2004).
8	Bryozoan bed habitat at Fantail Bay and Cape Colville.	Lundquist et al. (2004).
8	Seagrass habitat.	
8	Estuarine habitat at Waikawau River with a single area of high density cockles on the south side of the estuary.	Graeme (2013c).
8	Estuarine habitat at Port Charles predominantly low density of fauna but with several relatively large areas of oysters.	Hume et al. (2003), Needham et al. (2013).
8	Dune habitat at Waikawau Bay.	Needham et al. (2013).
10	The coastline between Fantail Bay and Waikawau Bay around the top of the Coromandel Peninsula comprises an ecological sequence that captures steep sea-cliffs, rocky reefs and shorelines, sandy beaches and dunes, gravel pocket beaches and shallow tidal embayments and streams. Offshore, muddy sands off Fantail Bay become more shelly and sandy due to strong currents in Colville Channel. Substantial areas of the hinterland are mantled in regenerating native forest (e.g., Mt. Moehau, the highest point on the Coromandel Peninsula), sometimes extending down to the	Bouma (2016).

				coast, with extensive farmland, especially around Fletcher Bay and Port Jackson.	
			10	Within Waikawau Estuary along the Waikawau River unmodified sequence from estuarine to freshwater communities, with freshwater swamp characterised by manuka *Leptospermum scoparium*, flax *Phormium tenax*, cabbage tree *Cordyline australis* and toetoe *Cortaderia fulvida*.	Graeme (2013c).
48	Little Bay	36°36.13'S 175°32.78'E	3	Macroalga *Aeodes nitidissima* (At Risk – Naturally Uncommon).	Te Papa database.
49	Channel Island	36°25.31'S 175°19.88'E	3	Breeding populations of fluttering shearwater *Puffinus gavia* (At Risk - Relict) and northern (common) diving petrel *Pelecanoides urinatrix urinatrix* (At Risk – Relict).	Gaskin & Rayner (2013).
50	Repanga/Cuvier Island	36°26.15'S 175°46.17'E	3	Breeding populations of northern blue penguin *Eudyptula minor iredalei* (At Risk – Declining), red-billed gull *Larus novaehollandiae scopulinus* (At Risk – Declining), white-fronted tern *Sterna striata striata* (At Risk – Declining), Pycroft's petrel *Pterodroma pycrofti* (At Risk – Recovering), pied shag *Phalacrocorax varius varius* (At Risk – Recovering), fluttering shearwater *Puffinus gavia* (At Risk - Relict) and northern (common) diving petrel *Pelecanoides urinatrix urinatrix* (At Risk – Relict).	Bell (2013), Dowding (2019), Forest & Bird (2015), Waugh et al. (2013).
			8	Rocky reef habitat.	Lundquist et al. (2004).
			10	Terrestrial to marine ecological sequence, from predator-free, seabird-rich island through the intertidal to subtidal, with notable rocky reef systems.	Taylor et al. (2000a, 2000b), Lundquist et al. (2004), Bassett et al. (2016).
51	Mercury Islands	36°37.44'S 175°48.52'E	3	Breeding populations of flesh-footed shearwater *Puffinus carneipes* (Nationally Vulnerable), sooty shearwater *Puffinus griseus* (At Risk – Declining), northern blue penguin *Eudyptula minor iredalei* (At Risk – Declining), red-billed gull *Larus*	Bell (2013), Forest & Bird (2015), Taylor (2000a,

				novaehollandiae scopulinus (At Risk – Declining), white-fronted tern *Sterna striata striata* (At Risk – Declining), North Island little shearwater *Puffinus assimilis haurakiensis* (At Risk – Recovering), Pycroft's petrel *Pterodroma pycrofti* (At Risk – Recovering), pied shag *Phalacrocorax varius varius* (At Risk – Recovering), fluttering shearwater *Puffinus gavia* (At Risk - Relict) and northern (common) diving petrel *Pelecanoides urinatrix urinatrix* (At Risk – Relict).	2000b), Waugh et al. (2013).
			3	Subtidal seagrass *Zostera muelleri* (At Risk – Declining) bed located at Hurihuri Bay, which decreased in extent substantially between 1974 and 2004.	Schwartz et al. (2006).
			4	Seagrass habitat.	Inglis (2003).
			8	Rhodolith bed habitat to the west of Great Mercury Island.	Bouma (2016).
			8	Rocky reef habitat.	Lundquist et al. (2004).
			8	Horse mussel habitat.	Lundquist (unpublished data).
			8	Seagrass habitat.	Schwartz et al. (2006).
			8	Estuarine habitat at Huruhi Harbour	Hume et al. (2003).
			10	Terrestrial to marine ecological sequence, from predator-free, seabird-rich islands through the intertidal to subtidal, with notable rocky reef systems.	Taylor et al. (2000a, 2000b), Lundquist et al. (2004), Bassett et al. (2016).
52	Kennedy Bay and estuary	36°40.61'S 175°33.35'E	3	Occurrence of lamprey *Geotria australis* (Threatened – Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), giant	Crow (2017).

				kokopu *Galaxias argenteus* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and giant bully *Gobiopmorphus gobioides* (At Risk – Declining).	
			3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds.	Graeme (2014a).
			4	Saltmarsh habitat.	MfE data.
			4	Seagrass habitat.	Inglis (2003).
			6	Mangrove habitat.	Graeme (2014a).
			6	Saltmarsh habitat.	Graeme (2014a).
			8	Seagrass habitat.	Graeme (2014a).
			8	Estuarine habitat with the bay dominated by an area of high density cockles, and with areas of high density burrows and a small area of oysters in the estuary.	Hume et al. (2003), Needham et al. (2013).
53	Whangapoua Harbour including ocean beaches from New Chums Beach to Kuaotunu Beach	36°43.37'S 175°37.87'E	3	Breeding and post-breeding flocking populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering), wintering site of banded dotterel *Charadrius bicinctus bicinctus* (Threatened – Nationally Vulnerable) and South Island pied oystercatcher *Haematopus finschi* (At Risk – Declining) and regularly-occurring bar-tailed godwit *Limosa lapponica baueri* (At Risk – Declining).	Dowding (2019).

			3	Within this site Whangapoua harbour supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and giant bully *Gobiopmorphus gobioides* (At Risk – Declining) and Kuaotunu River supports longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining) and inanga *Galaxias maculatus* (At Risk – Declining).	Crow (2017).
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds, including subtidal beds notably in the Mapauriki arm of the harbour.	Bouma (2016), Graeme (2013d).
			4	Saltmarsh habitat.	MfE data.
			4	Seagrass habitat.	Inglis (2003).
			6	Mangrove habitat.	Graeme (2013d).
			6	Saltmarsh habitat.	Graeme (2013d).
			7	Particularly extensive area of seagrass habitat	Graeme (2013d).
			8	Seagrass habitat.	Graeme (2013d).
			8	Estuarine habitat with high density pipi at the harbour mouth and with low density deposit feeders dominating large parts of the estuary.	Hume et al. (2003), Needham et al. (2013).
54	Otama Beach and Estuary to Opito Bay	36°42.44'S 175°46.65'E to 36°42.86'S 175°47.73'E	3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds at Otama Estuary.	Graeme (2010).

			4	Dune habitat.	Hilton et al. (2000).
			4	Saltmarsh habitat.	MfE data.
			6	Saltmarsh habitat at Otama Estuary.	Graeme (2010).
			8	Seagrass habitat at Otama Estuary.	Graeme (2010).
			8	Sponge garden habitat at Opito Bay	Thrush et al. (1998).
			8	Bryozoan habitat at Opito Bay.	Thrush et al. (1998).
			8	Estuarine habitat.	Graeme (2010).
			8	Dune habitat at Otama Beach.	Bouma (2016).
			10	Relatively intact coastal vegetation sequence at Otama Estuary: rush/sedge and saltmarsh ribbonwood *Plagianthus divaricatus* communities grade into freshwater swamp with manuka *Leptospermum scoparium*, pohuehue *Muehlenbeckia complexa* and blue-green sedge *Baumea juncea*, which in turn grades into regenerating coastal forest and open duneland.	Graeme (2010).
55	Black Rocks	36°41.87'S 175°51.94'E	3	Breeding population of northern (common) diving petrel *Pelecanoides urinatrix urinatrix* (At Risk - Relict).	Taylor (2000b).
56	Flat Island	36°42.62'S 175°52.05'E	8	Rhodolith bed habitat to the south of the island.	Bouma (2016).
			8	Rocky reef habitat	Lundquist et al. (2004).
57	Ohinauiti Island	36°43.01'S 175°53.05'E	3	Breeding populations of flesh-footed shearwater *Puffinus carneipes* (Threatened - Nationally Vulnerable), northern blue penguin *Eudyptula minor iredalei* (At Risk - Declining), North Island little shearwater *Puffinus assimilis haurakiensis* (At Risk -	Taylor (2000a, 2000b), Waugh et al. (2013).

				Recovering), fluttering shearwater *Puffinus gavia* (At Risk - Relict) and New Zealand white-faced storm petrel *Pelagodroma marina maoriana* (At Risk - Relict).	
			8	Rocky reef habitat.	Lundquist et al. (2004).
58	Ohinau Island	36°43.64'S 175°52.82'E	3	Breeding populations of flesh-footed shearwater *Puffinus carneipes* (Threatened - Nationally Vulnerable), northern blue penguin *Eudyptula minor iredalei* (At Risk - Declining) and North Island little shearwater *Puffinus assimilis haurakiensis* (At Risk - Recovering).	Buxton et al. (2013), Waugh et al. (2013).
			8	Rocky reef habitat.	Lundquist et al. (2004).
59	Needle Rock	36°44.02'S 175°50.69'E	3	Breeding populations of fluttering shearwater *Puffinus gavia* (At Risk - Relict) and northern (common) diving petrel *Pelecanoides urinatrix urinatrix* (At Risk - Relict).	Taylor (1995, 2000b).
60	Matapaua Bay to Whauwhau Beach	36°44.27'S 175°48.53'E to 36°46.09'S 175°44.97'E	3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
61	Wharekaho Beach	36°47.80'S 175°43.47'E	3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
62	Whitianga Harbour and Buffalo Beach	36°49.91'S 175°42.59'E	3	Occurrence of shortjaw kokopu *Galaxias postvectis* (Threatened - Nationally Vulnerable), lamprey *Geotria australis* (Threatened – Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and bluegill bully *Gobiopmorphus hubbsi* (At Risk – Declining).	Crow (2017).

			3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering) and resident populations of Australasian bittern *Botaurus poiciloptilus* (Threatened – Nationally Critical) and banded rail *Gallirallus philippensis assimilis* (At Risk – Declining).	Dowding (2019).
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds.	Graeme (2009b).
			4	Saltmarsh habitat.	MfE data.
			4	Seagrass habitat.	Inglis (2003).
			6	Mangrove habitat.	Graeme (2009b).
			6	Saltmarsh habitat.	Graeme (2009b).
			8	Seagrass habitat.	Graeme (2009b).
			8	Estuarine habitat with areas of high density cockles, crabs and crustacean burrows from the middle to upper reaches of the estuary.	Hume et al. (2003), Needham et al. (2013).
63	Cooks Beach and Purangi Estuary	36°50.22'S 175°44.71'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining), giant kokopu *Galaxias argenteus* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and giant bully *Gobiopmorphus gobioides* (At Risk – Declining).	Crow (2017).
			3	Breeding population of northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds.	Graeme (2014b).
			4	Saltmarsh habitat.	MfE data.

			4	Seagrass habitat.	Inglis (2003).
			6	Mangrove habitat.	Graeme (2014b).
			6	Saltmarsh habitat.	Graeme (2014b).
			8	Seagrass habitat.	Graeme (2014b).
			8	Estuarine habitat, with extensive areas of high density pipi, cockles and crustacean burrows, and a relatively small area of oysters towards the upper reaches of the estuary.	Hume et al. (2003), Needham et al. (2013).
64	Whanganui A Hei	36°49.25'S 175°45.86'E to 36°50.10'S 175°48.07'E	1	Marine Reserve extends from the coast at approximately Cook Bluff and offshore to Motukorure/Centre Island then south-eastwards to the northern end of Hahei Beach and offshore to the northern end of Mahurangi/Goat Island.	
			3	Breeding population of northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
65	Wigmore Stream	36°50.55'S 175°48.81'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and giant bully *Gobiopmorphus gobioides* (At Risk – Declining).	Crow (2017).
66	Motokurure/Centre Island	36°48.12'S 175°46.25'E	3	Breeding population of fluttering shearwater *Puffinus gavia* (At Risk – Relict).	Waugh et al. (2013).
67	Poikeke Island	36°49.22'S 175°47.84'E	3	Breeding population of sooty shearwater *Puffinus griseus* (At Risk – Declining).	Waugh et al. (2013).
68	Hot Water Beach	36°52.76'S 175°49.14'E	3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
			4	Dune habitat.	Hilton et al. (2000).
			8	Dune habitat.	Bouma (2016).

69	Sailor's Grave – Te Karo Bay	36°57.71'S 175°50.64'E	3	Macroalgae *Carpophyllum angustifolium*, *Lessonia* sp. A and *Pleurostichidium falkenbergii* (all At Risk – Naturally Uncommon)	Te Papa database.
70	Tairua Harbour, including Tairua Ocean Beach and Pauanui Beach	37°0.27'S 175°51.81'E	3	Occurrence of longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), giant kokopu *Galaxias argenteus* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and giant bully *Gobiopmorphus gobioides* (At Risk – Declining).	Crow (2017).
			3	Resident populations of reef heron *Egretta sacra sacra* (Threatened – Nationally Endangered) and banded rail *Gallirallus philippensis assimilis* (At Risk – Declining), breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering), wintering site of banded dotterel *Charadrius bicinctus bicinctus* (Threatened – Nationally Vulnerable) and South Island pied oystercatcher *Haematopus finschi* (At Risk – Declining) and regular occurrence of Caspian tern *Hydroprogne caspia* (Threatened – Nationally Vulnerable).	Dowding (2019).
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds.	Graeme (2008a).
			4	Saltmarsh habitat.	MfE data.
			4	Seagrass habitat.	Inglis (2003).
			6	Mangrove habitat.	Graeme (2008a).
			6	Saltmarsh habitat.	Graeme (2008a).
			8	Seagrass habitat.	Graeme (2008a).

			8	Estuarine habitat with high density wedge shell and crustacean burrows towards the estuary mouth.	Hume et al. (2003), Needham et al. (2014).
71	Aldermen Islands	36°57.50'S 176°4.81'E	3	Breeding populations of sooty shearwater *Puffinus griseus* (At Risk – Declining), northern blue penguin *Eudyptula minor iredalei* (At Risk – Declining), red-billed gull *Larus novaehollandiae scopulinus* (At Risk – Declining), North Island little shearwater *Puffinus assimilis haurakiensis* (At Risk – Recovering), variable oystercatcher *Haematopus unicolor* (At Risk – Recovering), pied shag *Phalacrocorax varius varius* (At Risk – Recovering), fluttering shearwater *Puffinus gavia* (At Risk – Relict), New Zealand white-faced storm petrel *Pelagodroma marina maoriana* (At Risk – Relict) and northern (common) diving petrel *Pelecanoides urinatrix urinatrix* (At Risk – Relict).	Bell (2013), Dowding (2019), Forest & Bird (2015), Taylor (2000a, 2000b), Waugh et al. (2013).
			8	Rhodolith bed habitat.	Bouma (2016).
72	Whakahau/Slipper Island	37°2.97'S 175°56.52'E	3	Breeding populations of pied shag *Phalacrocorax varius varius* (At Risk – Recovering), fluttering shearwater *Puffinus gavia* (At Risk – Relict) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019), Waugh et al. (2013).
			3	Subtidal seagrass *Zostera muelleri* (At Risk – Declining) bed located at South Bay.	Schwartz et al. (2006).
			4	Seagrass habitat.	MfE data.
			8	Seagrass habitat.	Schwartz et al. (2006).
			8	Rhodolith bed habitat.	Bouma (2016).
73	Pauanui/Penguin Island	37°3.88'S 175°55.91'E	3	Breeding populations of northern blue penguin *Eudyptula minor iredalei* (At Risk – Declining), North Island little shearwater *Puffinus*	Taylor (2000a), Waugh et al. (2013).

				assimilis haurakiensis (At Risk – Recovering) and fluttering shearwater *Puffinus gavia* (At Risk - Relict).	
74	Rabbit Island	37°4.19'S 175°55.58'E	3	Breeding populations of North Island little shearwater *Puffinus assimilis haurakiensis* (At Risk – Recovering) and pied shag *Phalacrocorax varius varius* (At Risk – Recovering).	Bell (2013), Taylor (2000a).
75	Ohui/North end of Opoutere Beach south to Wharekawa Harbour	37°4.20'S 175°53.38'E to 37°6.68'S 175°53.27'E	3	Occurrence of lamprey *Geotria australis* (Threatened – Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and giant bully *Gobiopmorphus gobioides* (At Risk – Declining).	Crow (2017).
			3	Intermittent breeding populations of reef heron *Egretta sacra sacra* (Threatened – Nationally Endangered), red-billed gull *Larus novaehollandiae scopulinus* (At Risk – Declining) and white-fronted tern *Sterna striata striata* (At Risk – Declining) at Hikunui Rock in the harbour mouth, breeding and post-breeding flocking populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering), resident populations of Australasian bittern *Botaurus poiciloptilus* (Threatened – Nationally Critical) and banded rail *Gallirallus philippensis assimilis* (At Risk – Declining), and regularly-occurring banded dotterel *Charadrius bicinctus bicinctus* (Threatened – Nationally Vulnerable) and bar-tailed godwit *Limosa lapponica baueri* (At Risk – Declining).	Dowding (2019).
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds.	Graeme (2008b).
			4	Saltmarsh habitat.	MfE data.
			4	Seagrass habitat.	Inglis (2003).
			6	Mangrove habitat.	Graeme (2008b).

			6	Saltmarsh habitat.	Graeme (2008b).
			8	Seagrass habitat.	Graeme (2008b).
			8	Wharekawa Harbour – estuarine habitat with areas of high density pipi, cockles and crustacean burrows towards the harbour entrance, and a relatively small area of oysters.	Hume et al. (2003), Needham et al. (2013).
76	Onemana Beach south to beach opposite Tokakahakaha Island	37°8.94'S 175°52.80'E to 37°10.26'S 175°52.96'E	3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
77	Whangamata Harbour, including Whangamata Beach south to Otahu River	37°12.17'S 175°52.82'E	3	Occurrence of shortjaw kokopu *Galaxias postvectis* (Threatened - Nationally Vulnerable), lamprey *Geotria australis* (Threatened – Nationally Vulnerable), longfin eel *Anguilla dieffenbachia* (At Risk – Declining), torrentfish *Cheimarrichthys fosteri* (At Risk – Declining), koaro *Galaxias brevipinnis* (At Risk – Declining), inanga *Galaxias maculatus* (At Risk – Declining) and giant bully *Gobiopmorphus gobioides* (At Risk – Declining).	Crow (2017).
			3	Resident populations of Australasian bittern *Botaurus poiciloptilus* (Threatened – Nationally Critical) and banded rail *Gallirallus philippensis assimilis* (At Risk – Declining), breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering) and regularly-occurring bar-tailed godwit *Limosa lapponica baueri* (At Risk – Declining).	Dowding (2019).
			3	Seagrass *Zostera muelleri* (At Risk – Declining) beds.	Graeme (2007a).
			4	Saltmarsh habitat.	MfE data.
			4	Seagrass habitat.	Inglis (2003).

			6	Mangrove habitat.	Graeme (2007a).
			6	Saltmarsh habitat.	Graeme (2007a).
			8	Seagrass habitat.	Graeme (2007a).
			8	Estuarine habitat. Whangamata Harbour – estuarine habitat with relatively small patches of high density cockles and crustacean burrows.	Hume et al. (2003), Needham et al. (2013).
			8	Estuarine habitat. Otahu River – estuarine habitat, generally with areas of low density invertebrate fauna, but some relatively small areas of high density cockles, pipi and crustacean burrows.	Hume et al. (2003), Needham et al. (2013).
			10	In the Otahu Estuary, an important estuarine-freshwater-coastal forest sequence displaying intactness, sequence continuity and diversity, with high habitat value for wetland birds.	Graeme (2007a).
78	Hauturu/Clark Island group	37°12.84'S 175°53.48'E	3	Breeding population northern blue penguin *Eudyptula minor iredalei* (At Risk – Declining).	Dowding (2019)
79	Whiritoa Beach	37°17.00'S 175°54.23'E	3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
80	Mataora Bay	37°18.30'S 175°55.02'E	3	Breeding populations of variable oystercatcher *Haematopus unicolor* (At Risk – Recovering) and northern New Zealand dotterel *Charadrius obscurus aquilonius* (At Risk – Recovering).	Dowding (2019).
81	Motumorirau Island	36°44.30'S 175°25.00'E	8	Recent surveys (in February 2020) have observed a number of dense fields of *Galeolaria hystrix* in the Hauraki Gulf, including multiple small fields centred around Motumorirau Island north of Coromandel Harbour.	Mark Morrison, Ian Tuck, , MBIE Project CO1X1618 (Juvenile Fish Habitat Bottlenecks)