# Hawke's Bay Coastal Hazards

## Ecological effects of mitigation measures: Phase 1, Gap Analysis

July 2021
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# HAWKES BAY COASTAL HAZARDS

## ECOLOGICAL EFFECTS OF MITIGATION MEASURES: PHASE 1, GAP ANALYSIS

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July 2021

Client report for Hawkes Bay Regional Council

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# 1 EXECUTIVE SUMMARY

A desktop study was carried out to identify potential ecological issues associated with the Clifton to Tangoio Coastal Hazards Strategy 2120 (Strategy), and available information on coastal ecology was gathered to inform its implementation. The Strategy covers area between Clifton and Tangoio, and proposed interventions potentially affect around 52% (~ 21 km), of the approximately 40 km of exposed sand/gravel beaches in that area. It is also anticipated that the length and height of physical interventions may need to be increased over time to offset actual effects of sea-level rise and climate change. The areas potentially affected are likely to be confined to the foreshore and shallow (< 15 m depth) nearshore subtidal and intertidal habitats including the water column, reefs, surf zone and intertidal and subtidal sediments. The key ecological issues arising from the proposed interventions are likely to be related to positive and negative effects of/on:

- benthic communities that are smothered by deposited or redistributed sand and gravel;
- invasive pests, which can be spread by sediment dredging and disposal of sediment containing viable pests;
- water quality through sediment suspension and redispersal;
- benthic communities buried beneath control structures;
- sessile shoreline species due to the hardening of the shoreline by artificial structures (this may also increase susceptibility to the colonisation and proliferation of invasive, marine pests);
- habitat characteristics and quality caused by sudden, localised changes in coastal processes through the construction of coastal structures;
- physical disturbance of the Coastal Marine Area (CMA) by machinery involved in the construction of structures or beach renourishment;
- birds that either favour or are adversely affected by interventions and associated construction activities;
- fish that either favour or are adversely affected by interventions and associated construction activities;
- coastal wetlands through physical disturbance and occupation.
- dune planting.

While individual actions may have little ecological impact, the progressive cumulative impact of multiple actions over the 50-100 year timeframe considered by the Strategy could be significant. The ability of the current planning framework to manage progressive, large-scale cumulative impacts on the coast should therefore be considered, as resource consenting processes are not particularly good at addressing such matters.

A significant body of existing ecological data and information was identified that could be used to inform the preparation of Strategy-related consent applications. Much of this has been generated through assessments and monitoring commissioned by local and regional councils, Napier Port, and Pan Pac Forest Products. Additional information has been generated by various research organisations, government agencies and iwi. However, in many cases additional site and activity specific information is likely to be required for consenting. Two broader issues that have not been considered in detail are:

- The provision of marine sand for renourishment. Sourcing that material could substantially increase the extent of ecological impacts.
- The potentially beneficial impacts of reducing coastal erosion. Such works could reduce the release of eroded sediment and associated adverse effects on water quality and benthic habitats.

Those are general matters that could be addressed through Strategy-scale assessments.

# 2 BACKGROUND

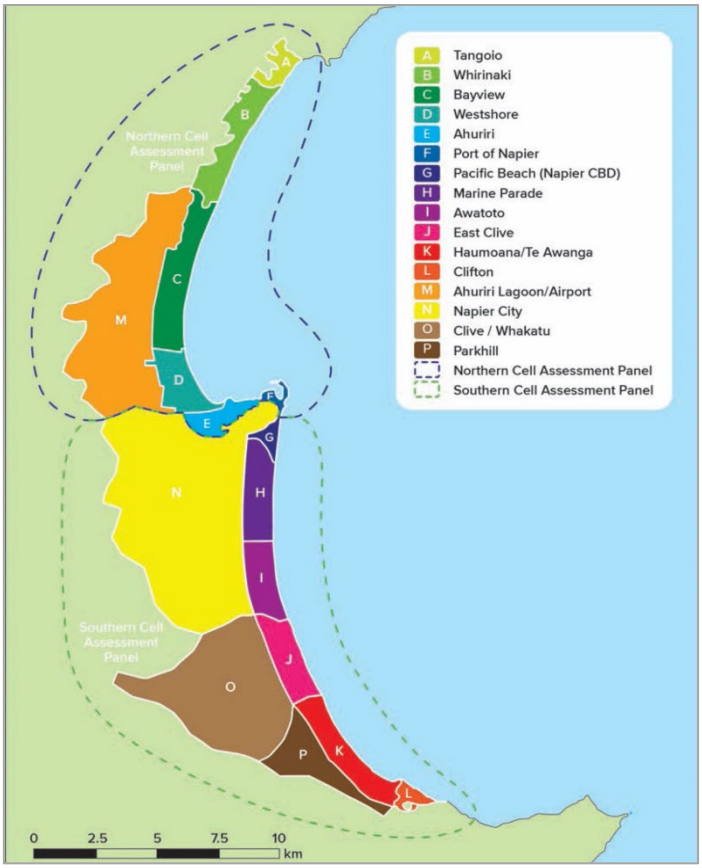
Napier City Council (NCC), Hastings District Council (HDC) and Hawkes Bay Regional Council (HBRC) require information on coastal ecology to support the Clifton to Tangoio Coastal Hazards Strategy 2120. (The Strategy covers the coastal areas between Clifton and Tangoio (Figure 1). The Councils are seeking to ensure that proposed measures for managing coastal hazards have been tested from a coastal ecological perspective, and to determine whether sufficient baseline data is available to inform future assessments of environmental effects, for resource consenting purposes. It is anticipated that the overall project is to be carried out over six phases covering:

1. An initial analysis of information gaps.
2. Mana whenua and community engagement.
3. Development of a proposed monitoring plan to fill key gaps.
4. Implementation of the monitoring plan.
5. Preliminary ecological input on Assessment of Ecological Effects (AEE) requirements to support any consent application(s).
6. Provision of detailed ecological input on AEE(s).

Coast and Catchment were commissioned to undertake Phase 1 of the project, which includes:

- the identification of information/data/resources currently available for coastal ecology within the project area;
- a high-level and initial assessment key ecological considerations to inform an AEE on coastal ecology from the works proposed under the Strategy;
- the identification of information and data gaps that would need to be addressed in order to undertake a comprehensive assessment of the actual and potential effects on coastal ecology from the works proposed under the Strategy (recognising that the second phase of this work will also contribute to the assessment of information and data gaps).

Figure 1: Map of Clifton to Tangoio Coastal Hazard Strategy Project Area. Note that the spatial units shown in this figure differ from those used for the final preferred pathways (Table 1).




# 3 APPROACH TAKEN

The analysis of information gaps was conducted in two stages:

1. *Identification of key ecological issues in the Strategy*—in order to provide a focussed approach to the gap analysis, our starting point was an initial review of the Strategy to identify what the key ecological issues arising from its implementation are likely to be.
2. *Review of available information and identification of information and gaps on key ecological issues*—a desktop review of relevant, publicly available, ecological information was conducted that included information from:
    - Hawkes Bay regional and local councils, identified and obtained through online searches of technical reports and open data;
    - open data from crown research organisations and government departments;
    - online scientific databases such as Google Scholar and Aquatic Science and Fisheries Abstracts; and,
    - reports we have produced or already hold that are relevant to the area.

    A succinct, high-level overview is provided of relevant material, general habitats and communities of relevance. The information gathered was "mapped" against each of these habitat categories. The outputs from that exercise were used to assess whether the scope and coverage of available data coincides with the habitats and ecological communities potentially

affected by the proposed interventions in the Strategy. The consolidated data was then assessed to determine whether the information is sufficient to inform an assessment of environmental effects (AEE), and if not, to identify key information gaps.

# 4 PROPOSED INTERVENTIONS AND KEY ECOLOGICAL ISSUES

The Northern and Southern Cell Assessment Panels undertook a detailed process of identifying and assessing potential options for managing coastal hazards over a 50–100-year planning timeframe. That process culminated in the selection of preferred short, mid and long-term interventions along nine developed, coastal areas (Table 1, Bendall 2018; Beya & Asmat 2020, 2021). Overall, the proposed interventions potentially affect around 52% (~ 21 km), of the approximately 40 km of exposed sand/gravel beaches between Clifton and Tangoio. The strategy also anticipates that the length and height of physical interventions may need to be increased over time to offset actual effects of sea-level rise and climate change. It is noted that the Strategy will be regularly reviewed in order to respond to new information on changing climate and coastal hazards, so these interventions will be reviewed and may change over time.

Based on the information provided in Bendall (2018) and Beya and Asmat (2020, 2021), the proposed interventions include:

- around 6 km of coastal seawalls, 20 km of coastal beach renourishment, with sand and gravel, including the (re)creation of gravel banks and barriers on beaches, and sand deposition in subtidal areas to create offshore sandbars that migrate shoreward and raise foreshore levels;
- dune planting;
- control structures placed along 18 km of coastal beach, including groynes and breakwaters that curb or constrain coastal erosion and the construction of seawalls that act as a physical barrier to coastal erosion and inundation;
- the potential construction of an inflatable storm surge barrier to protect people and property around Ahurihri Estuary during significant events; and,
- retreating back from the coast.

The source(s) of material to be used for beach renourishment have not been confirmed[1], but the provision of marine sand could substantially increase the extent of impact. Due to the lack of information on sand provision, any effects associated with sand supply are not considered further in this assessment, but this is identified as a knowledge gap.

The areas potentially affected by the proposed interventions are likely to be confined to the coastal foreshore and shallow (< 15 m depth) nearshore subtidal and intertidal habitats. Key subtidal habitats potentially affected include:

- reef habitat and communities;
- sediment dwelling benthic communities in the surf zone;
- nearshore sediment dwelling benthic communities beyond the surf zone.

[1] It is assumed that sand will be made available as part of Port dredging, but available quantities, the suitability of material and other aspects need to be confirmed. It is also assumed that gravel may be available from the upper Tukituki River, subject to potential needle grass issues.

The intertidal communities affected will be highly dependent on wave exposure and the nature of substrates present. Water quality (suspended sediment concentrations and turbidity) is also likely to be affected during sediment deposition, and depending on the characteristics of the deposited sediment, for a period following deposition (it is assumed that only "clean" sediments would be used so contaminant effects are not anticipated). As such, effects on the water column will also need to be considered.

The key ecological issues arising from the proposed interventions are likely to be related to positive and negative effects of/on:

- benthic communities that are smothered by deposited or redistributed sand and gravel;
- invasive pests, which can be spread by sediment dredging and disposal of sediment containing viable pests;
- water quality through sediment suspension and redispersal;
- benthic communities buried beneath control structures;
- sessile shoreline species due to the hardening of the shoreline by artificial structures (this may also increase susceptibility to the colonisation and proliferation of invasive, marine pests);
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- fish that either favour or are adversely affected by interventions and their construction;
- coastal wetlands through physical disturbance and occupation.
- dune planting.

It is assumed that effects are likely to be confined to within 1 km of the shore (Figure 2), but sites further afield may have to be considered if longer distance sediment dispersal is predicted. In some cases, the proposed interventions could potentially affect the Moremore Mātaitai Reserves and areas designated as Significant Conservation Areas. In those situations, it would be reasonable to expect more stringent requirements for ecological assessments and controls.

Conversely, if left unchecked, coastal erosion is also likely to have adverse ecological effects. For instance, the release of eroded sediment will add to loads discharged to the coast with adverse effects on water quality and benthic habitats. However, those effects have not been considered in this report.

The large scale and long timeframes involved in implementing the interventions creates the potential for adverse ecological effects to compound over time. While individual actions may have little ecological impact, the progressive cumulative impact of multiple actions over the timeframes considered could be significant. Consideration should therefore be given to whether the current planning framework contains sufficient direction on how progressive, large-scale cumulative impacts on the coast are to be managed, as resource consenting processes are not particularly good at addressing such matters.

Table 1: Final preferred pathways (provided by Simon Bendell).

| | Unit | Short term | Medium term | Long term |
|---|---|---|---|---|
| Southern Cell | Clifton | Status quo | Sea wall | Managed Retreat |
| | Te Awanga | Renourishment + Groynes | Renourishment + Groynes | Renourishment + Groynes |
| | Haumoana | Renourishment + Groynes | Renourishment + Groynes | Managed Retreat |
| | Clive / East Clive | Status quo | Renourishment + Groynes | Retreat the Line / Managed Retreat |
| Northern Cell | Ahuriri | Status quo | Sea wall | Sea wall |
| | Pandora | Status quo | Storm surge barrier | Storm surge barrier |
| | Westshore | Renourishment | Renourishment + Control Structures | Renourishment + Control Structures |
| | Bay View | Status Quo / Renourishment | Renourishment + Control Structures | Renourishment + Control Structures |
| | Whirinaki | Status Quo / Renourishment | Renourishment + Control Structures | Sea wall |

Figure 2: Key physical interventions proposed for managing coastal hazards (adapted from figures and information in Bendall 2018).


Figure 3: Locations of Significant Conservation Areas and Moremore Mātaitai Reserves.

# 5 REVIEW OF AVAILABLE INFORMATION ON HABITATS POTENTIALLY AFFECTED

# 6 OPEN COAST

## 6.1 DUNES AND COASTAL VEGETATION

Duneland systems once existed along a significant proportion of the Hawke Bay coastline, though many have now been lost through reclamation, development, grazing, damage and encroachment by weeds.

North of Napier, herbfields are the predominant vegetative feature inland from the beach. These nationally significant and threatened habitats contain a mixture of native and exotic species including African daisy *Oesteoseprmum fruiticosum*, yellow daisy *Arctotis stoechadifolia*, marigolds *Taretes* spp., tree lupin *Lupinus aboreus*, and boneseed *Chrysantemoides monilifera*. Herbfields are less extensive south of Napier, but wetlands are common behind the frontal dune system and in river estuaries (Haggitt & Wade 2016). Maps and descriptions of these coastal features are presented in Stevens and Robertson (2005) and digital data is available through HBRC. That information should provide guidance on whether impacts on coastal vegetation are likely to be a key issue during project planning phases. However, up to date, local assessments are likely to be required for interventions with the potential to disturb wetlands and herbfields (e.g., coastal armouring and stopbanks).

## 6.2 BEACHES AND ADJACENT SURF ZONES

Much of the shoreline between Clifton and Tangoio consists of exposed, steep and narrow beaches with coarse sand and gravel substrates. Scientific information on the ecological characteristics of those beaches and their shallow surf zones is limited, but they appear to be fairly depauperate. For instance, in an assessment of the pebble/gravel beach at Clifton, Smith (2017b) states:

*"Downshore of the pebble/gravel habitat is the gravel/sand field habitat (sediment grain size ranging 250µm – 4mm). This habitat is subject to twice daily tidal inundation and though the beach gradient is less steep (approximately 1 in 8) than the pebble and gravel field habitat bed shear velocities remain high with a short, fast swash climate. Few infaunal inhabitants are able to tolerate such extreme conditions.*

*The gravel/sand habitat was approximately 30m at its widest point and around 15m at its narrowest i.e. immediately in front of existing coastal protection structures. There was a high level of along shore variability in sediment texture with some areas more sandy and others more gravelly. In the across shore direction sand content increased with distance downshore. It is likely that in sand dominated zones there is a higher probability of encountering infauna such as microgastropods, polychaete worms, or small bivalves, especially at the extreme low tide level. The overall abundance of fauna however is likely to be very low given the highly abrasive nature, and swash climate of this site. Indeed there were no infauna encountered during exploratory sampling."*

Smith (2017b) went on to note that beach cast seaweed on the upper shore is likely to support detrital specialists such as the common beach hopper (*Talorchestia quoyana*) and the sand beetle (*Chaerodes trachyscelides*), but neither species were observed during his survey.

However, little information appears to be available on intertidal beaches in other areas, and no information on shallow, subtidal, surf zone communities was identified.

## 6.3 SUBTIDAL SOFT SEDIMENTS BEYOND THE SURF ZONE

Much more information exists about the characteristics of deeper subtidal sediments and their macrofaunal communities (Figure 4). Most (if not all) of this has been collected in relation assessments and monitoring associated with consents for:

- port development, dredging and disposal (e.g., Sneddon & Keeley 2004; Sneddon 2011; Sneddon et al. 2017; Sneddon 2019a, 2021);
- industrial and municipal wastewater discharges (e.g., Kingett Mitchell and Associates Limited 1995; Golder Associates (NZ) 2007, 2013; Smith 2015; Smith 2017a; Apex Environmental Limited 2020; Carter et al. 2021); and
- sediment disposal and dispersal associated with beach renourishment (e.g., Smith 2008, 2013a; Sim-Smith & Kelly 2019; Sneddon 2021).

Benthic ecological and sediment samples have been collected using diver cores, grab sampling, and dredge tows, with a reasonably high level of consistency in the methods used, and the parameters analysed. This should allow results obtained from the various studies to be consolidated and combined to provide broader insights into variation in sediment-dwelling communities and sediment characteristics. However, most of sampling effort has been targeted towards the Napier Port, Westshore, and offshore areas where port development, dredging and spoil disposal occurs. Sampling in the southern zone is related to assessing and monitoring the effects of discharges from the Napier and Hastings wastewater treatment plants, while sampling in the northern zone has been carried out to assess and monitor the effects of industrial discharges from Pan Pac Forest Products' pulp mill. As such, most discharge related sampling is unlikely to have been carried out in areas directly affected by proposed interventions for coastal hazard management, but the broader information would help inform and contextualise ecological impact assessments.

The parameters assessed in the existing assessments typically include counts of taxa living in seafloor sediments; and measurements of sediment grain size and other indicators of sediment quality (e.g., organic matter (volatile solids) and/or organic carbon, and heavy metal concentrations). Other, parameters that are specific to the activities being assessed may also be measured, such as water quality (e.g., Apex Environmental Limited 2020; Napier City Council 2020), discharge toxicity (e.g., Hickey 2017; Apex Environmental Limited 2020), and activity specific indicators such pulp fibres (e.g., Smith 2015; Smith 2017a). In some cases, dredge sampling has also been carried out to characterise the benthic epifaunal communities.

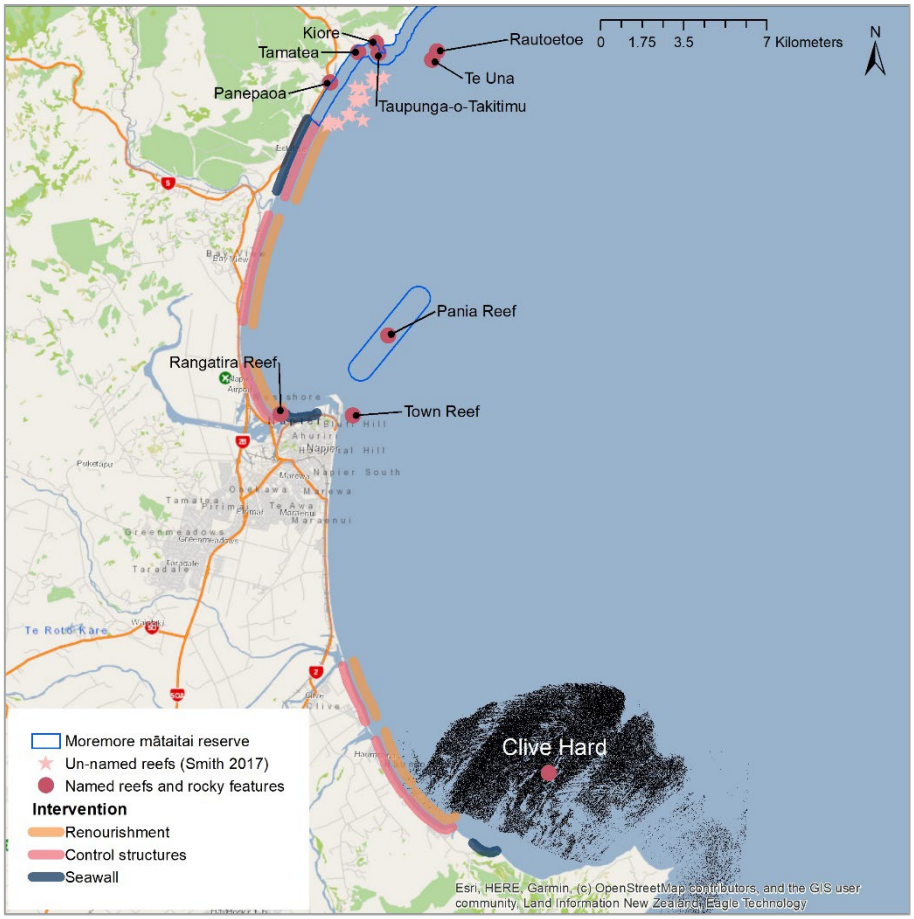
Overall, a significant amount of information is available on subtidal, soft sediment habitats and communities, but gaps remain for the areas likely to be directly affected by some interventions. The available information will provide a good foundation for assessing ecological effects, but additional information may be required once the physical effects of the proposed interventions are better defined.

Figure 4: Distribution of open coast sampling stations identified from a selection of relevant assessment and monitoring reports (Barter & Keeley 2002; Sneddon & Keeley 2004; Golder Associates (NZ) 2007; Smith 2008; Sneddon 2011; Smith 2013b, 2015; Smith 2017a; Sneddon et al. 2017; Sim-Smith & Kelly 2019; Sneddon 2019a, b; Apex Environmental Limited 2020; Sneddon 2020; Carter et al. 2021; Sneddon 2021; Sneddon & Dunmore 2021).


## 6.4 REEFS

Reef habitats are particularly important as mahinga kai (Aramanu Ropiha 2017), and for their high diversity values. The Clifton and Tangoio coast is "bookended" by the Clive Hard to the south and Tangoio reef complex in the north, with Pania, Town and Rangatira Reefs in the centre (Figure 5). Most reef habitat is subtidal.

Figure 5: Key reefs and rocks identified in the area of interest, during the desktop review. Note that the area shown for Clive Hard is based on multibeam data provided by HBRC and should be treated as indicative.




### 6.4.1 INTERTIDAL REEFS

Intertidal reefs are relatively sparse in the area of interest. Natural intertidal reef is present on the Te Areare shore and Whakaai headland, around 4 km north of the Whirinaki hazard unit. Small patches of natural intertidal-shallow subtidal reef are scattered along the coast (e.g., offshore of Te Ngaru and Pākuratahi stream mouths). However, the largest area of intertidal "reef" consists of man-made structures such as seawalls, breakwaters, wharfs, and groins around Napier Bluff (Stevens & Robertson 2005). That area also contains Rangitira Reef, a cobbly hard-shore feature with shallow sections that are exposed on low tides (Anderson 1997, 1998).

Given the paucity of intertidal hard-shore habitats, it is unsurprising that little information was identified on their characteristics and associated benthic communities. The general characteristics of intertidal habitats and communities between the Port and Westshore Beach were assessed in 2002 and 2004 (Barter & Keeley 2002, and Sneddon & Keeley 2004, referenced in Sneddon et al. 2017). The 2004 assessment had a particular focus on a representative section of breakwater rock wall, the embayment immediately west of the Port and shoreline towards the Ahuriri Inlet. The information gathered included observations of the physical habitats present and relative abundance of conspicuous fauna and flora. Data on the taxa observed and abundance rankings are provided in Appendix 6 of Sneddon et al. (2017). The authors indicate that hard-shore habitat in that area supported relatively diverse assemblages of macroalgae, ascidians, barnacles, decapod crustaceans, gastropods and chitons. Surveys of the Rangitira Reef intertidal habitat were also conducted by Anderson (1997) and Anderson

(1998) who provided counts of intertidal fauna prior to, and after, disposal of dredge spoil onto the southern end of Westshore Beach.

The information produced by Barter and Keeley (2002) and Sneddon and Keeley (2004) (supplemented by subtidal studies of Rangitira Reef - see Smith (2013b), and Sim-Smith and Kelly (2019)) would inform an assessment of the ecological impacts associated with the proposed intervention for Ahuriri (Unit E1) (construction of a seawall between the port and Ahuriri entrance). However, it is now approaching 20 years since the last intertidal studies were carried out, so more recent, activity-specific ecological information is likely to be required to support a consent application.

### 6.4.2 SUBTIDAL REEFS

A variety of subtidal reefs and hard structure are scattered along the coast, ranging from cobbles and pebbles, patchy reef complexes, and discrete reef features. Summary information on some of the key structures are provided below.

## CLIVE HARD

The Clive Hard is an offshore area between Tukituki River and Cape Kidnappers characterised by complex cobble and pebble seabed habitat within an otherwise featureless rippled muddy-sand environment. It is reputedly an important habitat for juvenile fish, particularly snapper, and is particularly popular for recreational fishers. Smith (2017b) indicates that targeted species include various flatfish such as yellow-bellied flounder (*Rhombosolea leporina*), sole (*Peltorhamphus novaezelandiae*), red gurnard (*Chelidonichthys kumu*), kahawai (*Arripis trutta*), snapper (*Chrysophrys auratus*), trevally (*Pseudocaranx dentex*), tarakihi (*Nemadactylus macropterus*) and red cod (*Pseudophycis bachus*).

## CAPE KIDNAPPERS

Numerous, small subtidal reefs occur around Cape Kidnappers, and as far north as Clifton. Smith (2017b) describes two such reefs beside the Clifton Motor Camp, as exposed 'papa' rock consisting of mudstone/siltstone shelves partially overlaid by sand, and cobble/pebble, transitioning to rubble at the margins. Those reefs supported diverse clumps of sessile invertebrates, including mussels, sponges, and anemones, and beds of macroalgae.

## PANIA REEF

Pania Reef consists of an elongated series of reef structures scattered over a ~3 km band running in a north-east/south-west direction, with the inshore margin situated approximately 1.5 km northeast of the Napier Port. It is part of the Moremore mātaitai reserves, within which, commercial fishing is prohibited. However, the reef is still a popular destination for recreational and customary fishing with crayfish, green-lipped mussel, kina and paua harvesting occurring (Smith 2017a).

The reef has been mapped through a multibeam survey and its biota described through Port assessment and monitoring surveys (Sneddon et al. 2017; Sneddon 2019b, 2020; Sneddon & Dunmore 2021). These surveys indicate that reef community is relatively diverse and varies with depth, water motion and sedimentation. The reef appears to experience a flux of fine sediment, with deposition processes balanced by wave-driven resuspension and sediment dispersion. For reference, a list of species observed during a 2016 ecological survey of the reef is provided in Table 20 of Sneddon

et al. (2017), and a multibeam image with the coverage of that survey overlaid is provided in Figure 6 below.

## TOWN REEF

Town Reef is a reef complex located on the Napier shore, adjacent to the main Port breakwater at the northern end of Marine Parade Beach. Its biota has been described through Port monitoring surveys (Sneddon 2019b; Sneddon & Dunmore 2021). These surveys indicate that, in general, the benthic community of Town Reef is similar to that of Pania Reef (see Sneddon 2019b for a description).

## RANGATIRA REEF

Rangatira Reef is a shallow (< 5 m) rocky region at the south-eastern end of Westshore Beach. The substrate comprises a mixture of boulders and cobbles, interspersed with pebbles and sand. The reef is exposed to oceanic swells and typically has very low water clarity (Smith 2013b, Sim-Smith & Kelly 2019). Smith (2013b) classified reef areas into six habitat types:

1. Encrusting invertebrates—gravelly mud interspersed with cobbles, sessile invertebrates common.
2. Cobbles—cobbles with a lack of large brown macroalgae.
3. Turfing algae—pebbles interspersed with cobbles, covered with turfing algae.
4. Shallow *Carpophyllum*—cobbles and pebbles covered with large brown macroalgae, predominantly *Carpophyllum* spp.
5. Red foliose algae—boulders and cobbles covered in red foliose algae. Low abundance of brown algae.
6. Sand—coarse sand dominant with a general absence of hard reef substrate.

The first three habitats were the most common, with smaller areas of shallow *Carpophyllum* and red foliose algae.

Historically, green-lipped mussels (*Perna canaliculus*) used to be common in the intertidal parts of the reef, but by 2004 mussels appear to have disappeared from the reef. There is some evidence that intertidal mussels were smothered by sand that was discharged on the foreshore (Anderson 1998). No kina (*Evechinus chloroticus*) were found on the reef in the 1998 or 2004 surveys (Anderson 1998, EMS 2004).

## TANGOIO REEF COMPLEX

The northern-most section covered by the Coastal Hazards Strategy contains the extensive Tangoio reef complex, whose southern extent may overlap the areas where beach renourishment and coastal structures have been proposed for the Whirinaki coastal hazard unit (note that renourishment also has the potential to encroach on the Moremore Mātaitai Reserves). Smith (2017a) describes an unnamed section of reef habitat at the southern end of that complex:

*"Other hard substrate located offshore of the southern boundary of the Moremore mātaitai has also been noted by tangata whenua, and forms the southern extent of the Tangoio reef complex. This patchily distributed habitat extends north to Whakāri, where the habitat becomes more contiguous with intertidal rocky reef. The reef system is generally of low relief transitioning to rubble at the margins, and*

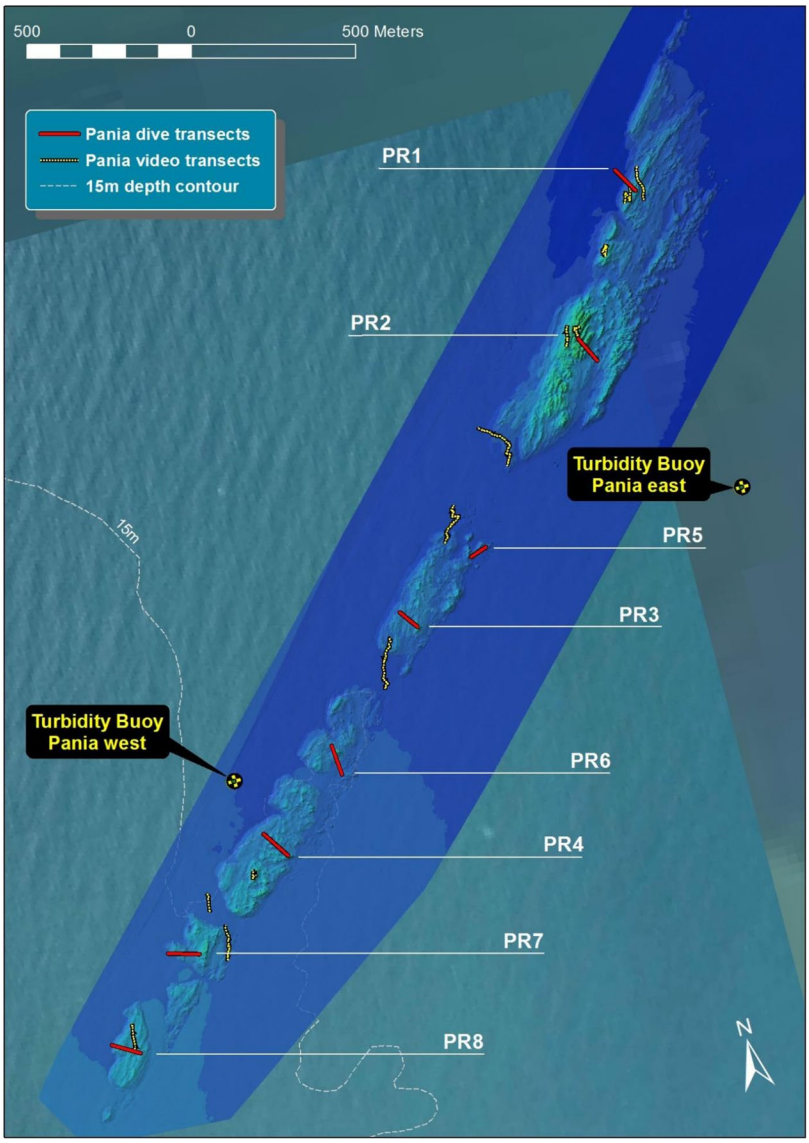
*provides habitat for an abundant rock lobster (Jasus edwardsii) population and towards Whakāri an abundant paua (Haliotis iris) population. The system also provides attachment substrate for 'biogenic clumps' (diverse clumps of sessile invertebrates, including mussels), sponge species, macroalgal beds, and anemones. Fish species associated with this system include kingfish (Seriola lalandi), moki (Latridopsis ciliaris and Cheilodactylus spectabilis) more resident snapper, tarakihi, and red cod, along with other typical demersal reef species, including various wrasse species (Labridae), blue cod (Parapercis colias) and butterfish (Odax pullus) (pers obs)."*

A number of reefs and rocks within that complex are identified as Maungaharuru Tangitu Statutory Acknowledgement Reefs (Maungaharuru-Tangitu Hapu & Hawkes Bay Regional Council 2016, Figure 5), and briefly described in Maungaharuru-Tangitū Statements of Association (The Maungaharuru-Tangitū Hapū et al. 2013) including:

- Ruatoetoe and Te Una, which are located offshore of Tangoio Bluff, opposite the mouth of Te Ngarue River. Ruatoetoe was known for its tarakihi and Te Una for its moki.
- Kiore, a rat shaped rock on the south side of Tangoio Bluff, that is a good place to collect kai moana.
- Tamatea, a rock at Tangoio used as an indicator of low tide.
- Panepaoa, which is known for its moki and as a diving hole for crayfish. Panepaoa is located south of Te Ngarue River mouth, and < 2 km from the potential interventions proposed for the Whirinaki coastal hazard unit.

The potential for reefs of at the southern end of Tangoio reef complex to be adversely affected by the proposed interventions will need to be considered in an AEE. Based on the limited amount of information obtained during this review, it appears as though the ecological values of the reef are reasonably high, but additional information would be required to fully characterise the reefs and assess potential ecological effects.

Figure 6: Multibeam image of Pania Reef, showing the Napier Port's 2016 dive and video survey coverage (from Sneddon et al. 2017).




## 6.5 FISH AND FISHERIES

A substantial amount of information is available on fish and fisheries within the area of interest. Key sources include:

- Smith (2017a) and Smith (2017b) that provide insights on fish and fishing by recreational and commercial fishers, and on areas and species of importance to tangata whenua.
- Haggitt & Wade 2016 and Sneddon et al. (2017) that provide detailed assessments of commercial fishing activity.
- Kilner and Akroyd (1978) and Ataria et al. (2007) that provide detailed information on fish in Ahuriri Estuary.
- Braw Research Limited (2021) that examines the effects of seabed disposal of dredge spoil on the commercial catch of gurnard and flatfish.

It is likely that in most cases, the available data would be sufficient for assessing the effects of the proposed interventions on fish and fisheries, but specific data may be required if sensitive habitats such as reefs, estuaries or the Moremore Mātaitai Reserves are potentially affected by the proposed activities.

## 6.6 BIRDS

Specific, relevant information on the effects of port redevelopment (changes to coastal structures), dredging and spoil disposal, on birds in the Clifton to Tangoio area is provided in McClellan (2017). The following species/groups are considered:

- Northern blue penguin/ korora (*Eudyptula minor iredalei*; At Risk–Declining).
- Black-billed gull/tarapunga (*Larus bulleri*; Threatened–Nationally Critical).
- White-fronted tern/ tara (*Sterna striata striata*; At Risk–Declining).
- Shag species (Black shags/kawau (*Phalacrocorax carbo novaehollandiae*; At Risk–Naturally Uncommon); spotted shag/parekareka (*Stictocarbo punctatus punctatus*; Not Threatened), pied shag/kāruhiruhi (*P. varius varius*; At Risk–Recovering), little black shag/kawau tūi (*P. sulcirostris*; At Risk–Naturally Uncommon), and little shag/ kawau paka (*P. melanoleucos brevirostris*; Not Threatened).
- Foraging seabirds.

McClellan (2017) indicates that the diversity of seabirds around Napier is high and includes the three gull species, five species of shag, white-fronted tern, and blue penguin. Eighteen other seabird species are listed as having been recorded from vessels leaving Napier.

More comprehensive information should be available once HBRC complete a regional bird survey and mapping exercise currently being undertaken, which will provide an overview of the distribution of birds in the region (Anna Madarasz-Smith pers. com.). Other general sources of information include eBird[2], which is a collaborative, international online resource for the birding community, that enables sightings, photos and sounds to be recorded and shared. eBird contains sightings of 121 bird species in and around Napier (which includes the area of interest), with hotspots mainly situated along the open coast, and in estuaries and coastal wetlands. A high concentration of records come from the Ahuriri Estuary, airport and Westshore coastal areas (see estuary section below). A reasonable number of sightings have also been reported from the Napier to Clifton coastal area, but sightings from north of Napier are relatively sparse.

Information on bird species and their regional distributions will provide guidance on the significance of sites to birds during project planning phases. However, local assessments by bird specialists are likely to be required for interventions with the potential to disturb roosting, foraging, or nesting areas, or areas critical for species that are habitat limited (e.g., wetland areas used by fern bird or banded rail)[3].

[2] https://ebird.org/region/NZ-HKB-031?yr=all&m=

[3] Based on currently available information, the proposed interventions appear unlikely to affect such areas or birds.

## 6.7 ESTUARIES

Ahuriri Estuary appears to be the only estuary directly impacted by the proposed interventions, which in the case of the estuary, consist of an inflatable storm surge barrier being constructed across the harbour entrance. Ahuriri Estuary is a remnant of the former Ahuriri Lagoon, which was uplifted by 1–2 m in the 1931 Napier earthquake, exposing around 1300 ha of seabed. Subsequent drainage and reclamation further reduced the lagoon to its current extent of around 470 ha of true estuary and 175 ha of wetlands. Despite that, the estuary remains an area of regional and national significance. It is listed as Significant Conservation Area under the Regional Coastal Environment Plan, a Wetland of Ecological and Representative Importance (WERI), a Site of Special Wildlife Interest (SSWI), and has been identified as a nationally significant fisheries habitat (Harper 2018). Areas between the Southern Marsh, Westshore Lagoon and the estuary, from the low level bridge to Pandora Pond also have Wildlife Refuge status under the Wildlife Act 1953 (Madarasz-Smith 2014). The estuary has also been identified as a site that meets the criteria for designation as Ramsar wetland site (Hawke's Bay Regional Council 2018).

A substantial amount of information exists about the estuary. Habitats have been mapped by HBRC (Figure 7), and assessments have characterised its biota and environmental quality. Studies have shown that the estuary acted as a nursery and/or feeding ground for at least 29 fish species, contained dense shellfish beds, and supported an assemblage of other invertebrate species (Kilner & Akroyd 1978, Ataria et al. 2007, Table 2). In addition, over 70 species of wetland birds use the estuary, 17 of which migrate annually from the Arctic (Hawke's Bay Regional Council 2018). These include the eastern-bar tailed godwit (*Limosa lapponica baueri*; At Risk–Declining), and many nationally Threatened and At Risk species such as the Australasian bittern (*Botaurus poiciloptilus*; Threatened–Nationally Critical) and royal spoonbill (*Platalea regia*: At Risk–Naturally Uncommon). The estuary is also one of the most important wintering sites in New Zealand for pied stilt (*Himantopus himantopus leucocephalus*; Not Threatened) (McClellan 2017). New Zealand Birds Online (nzbirdsonline.org.nz) expands on those figures by listing over 100 bird species that may be observed in and around the estuary, once terrestrial species are included.

A matrix of salt marsh and salt meadow fringes parts of the estuary, with outer bands of salt meadows (largely comprosed of the glasswort herbs *Selliera radicans* and *Samolus repens*) and central areas of salt marsh (primarily consisting of sea rush, *Juncus kraussii* subsp. *australiensis*) Other native salt marsh and salt medow species include, amoung others, the glasswort *Salicornia quinqueflora*, New Zealand sea spurrey *Spergularia tasmanica*, native musk *Thyridia repens*, and bachelor's button *Cotula coronopifolia* (see White (2004); Strong (2014) and Cornes et al. (2019) for more details).

State of the Environment monitoring by HBRC has been regularly conducted at four sites in the estuary since 2006, and additional assessments and monitoring have been conducted in relation to specific research projects, and resource consent applications and monitoring. This has generated a considerable amount of information on sediment texture, sediment quality and infaunal community composition in the central estuary (see Figure 8 to Figure 10 for examples of where data has been collected and some of the results obtained). However, little benthic data is available for the outer and upper estuary. In general, benthic data obtained from the central area indicates that:

- Sediments are relatively coarse, with high proportions of gravel around channels, sandier sediments are present on central banks and sandflats around the estuary margins, and muddy sediments are present in creeks and around creek mouths.

- Sediment contaminant concentrations tend to be low in the main estuary, but concentrations of some contaminants are elevated up tidal creeks and around creek mouths.
- The diversity of benthic communities is moderate, with polychaete worms the most abundant taxa group. Cockles (*Austrovenus stutchburyi*) are widespread in the central estuary but relatively few are of harvestable size. Pipi (*Paphies australis*) are also present, but their distribution and numbers are patchy.

Overall, a significant amount of information is available on Ahuriri habitats, environmental quality, and species diversity, but gaps remain for benthic habitats of the upper and lower estuary. The available information will provide a good foundation for assessing ecological effects, but additional information may be required once the physical effects of the proposed interventions are better defined.

Figure 7: HBRC habitat map of Ahuriri Estuary.

Figure 8: Examples of sampling stations assessed for sediment texture in Ahuriri Estuary (Eyre 2009; Smith 2014; Strong 2014; Smith 2016; Kelly 2017).

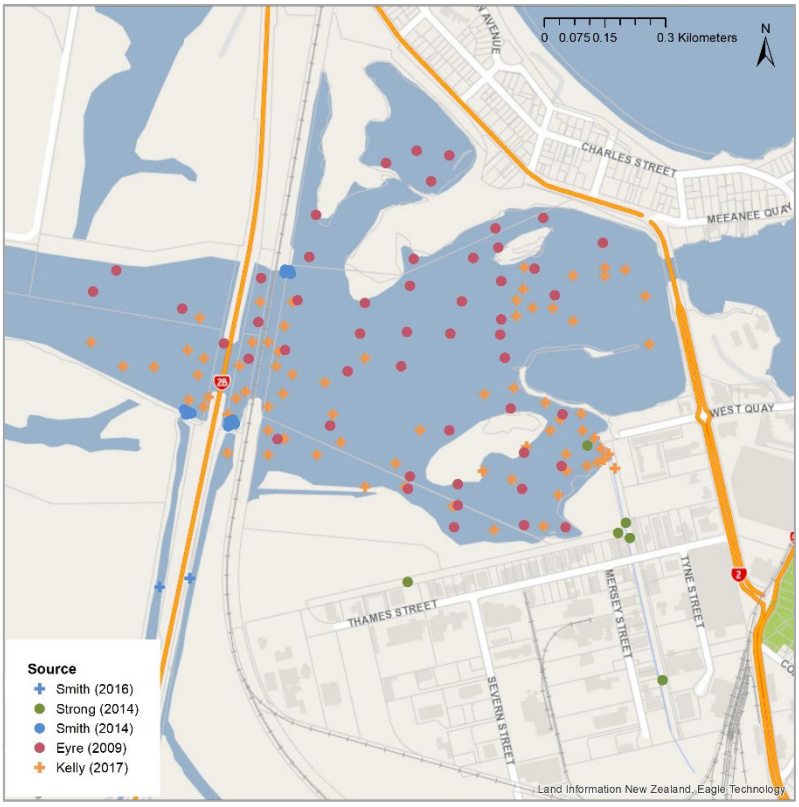


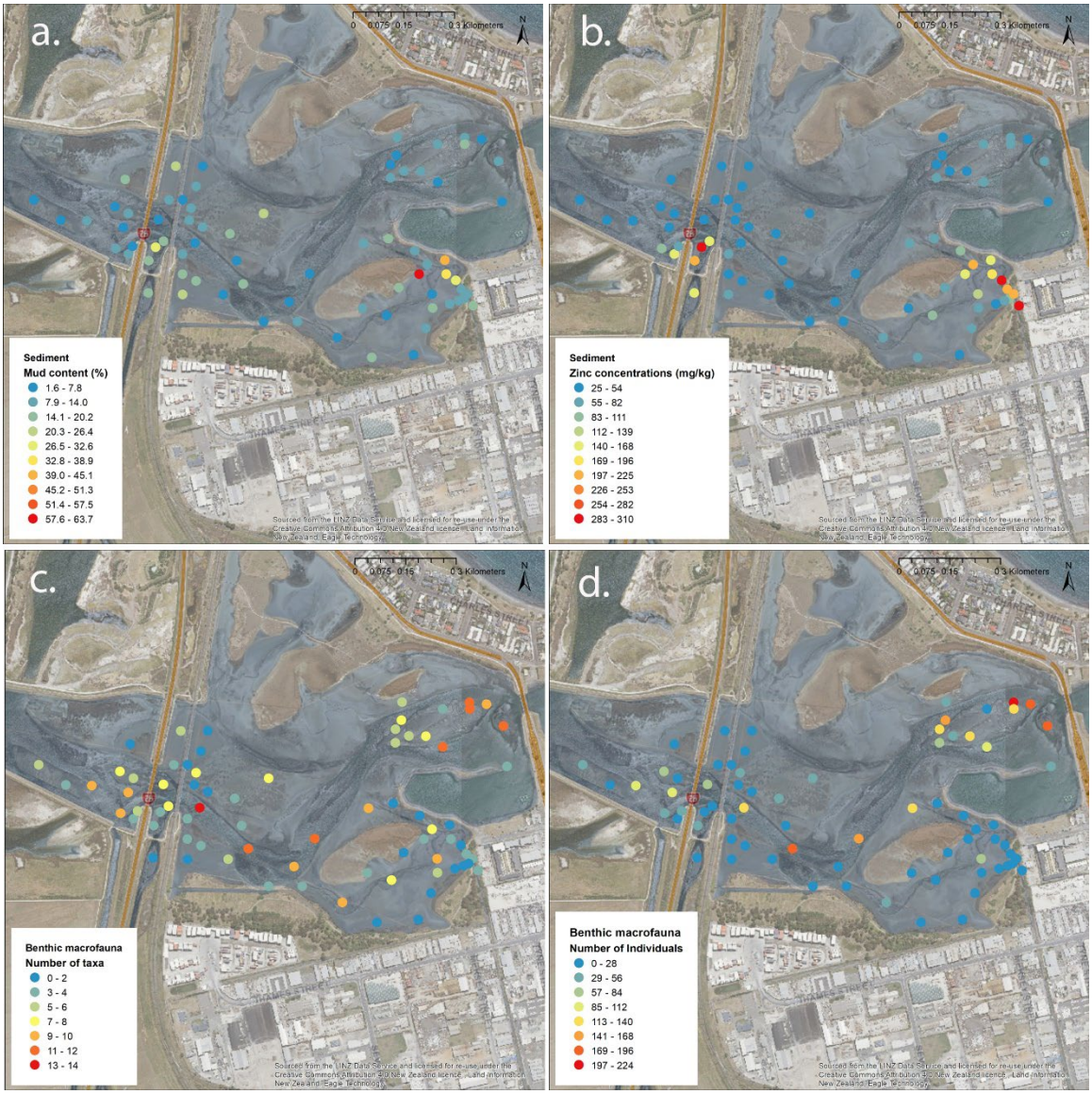
Figure 9: Examples of sampling stations assessed for benthic ecology and contaminants in Ahuriri Estuary (Eyre 2009; Smith 2014; Strong 2014; Smith 2016; Kelly 2017).


Table 2: Fish species and their relative abundance (- = not encountered; + = rare; ++ = frequent; +++ = common) recorded in Ahuriri Estuary (adapted from Ataria et al. 2007).

| Common name | Scientific name | Abundance (Kilner & Akroyd 1978) | Abundance (Ataria et al. 2007) |
|---|---|---|---|
| **Yellow-belly flounder** | *Rhombosolea leporina* | +++ | +++ |
| **Sand flounder** | *Rhombosolea plebeia* | +++ | +++ |
| **River flounder** | *Rhombosolea retiaria* | ++ | - |
| **Common sole** | *Peltorhamphus latus* | + | - |
| **Yellow-eyed mullet** | *Aldrichetta forsteri* | +++ | +++ |
| **Grey mullet** | *Mugil cephalus* | ++ | ++ |
| **Kahawai** | *Arripis trutta* | ++ | + |
| **Parore** | *Girella tricuspidata* | +++ | + |
| **Short-finned eel** | *Anguilla australis* | +++ | + |
| **Long-finned eel** | *Anguilla dieffenbachii* | + | - |
| **Cockabully** | *Forsterygion nigripenne* | ++ | +++ |
| **Common bully** | *Gobiomorphus cotidianus* | ++ | + |

| | | | |
|---|---|---|---|
| **Inanga** | *Galaxias maculatus* | + | + |
| **Common smelt** | *Retropinna retropinna* | ++ | +++ |
| **Spotty** | *Notolabrus celidotus* | + | ++ |
| **Stargazer** | *Genyagnus monopterygius* | + | - |
| **Trevally** | *Pseudocaranx dentex* | + | ++ |
| **Red cod** | *Pseudophycis bachus* | + | - |
| **Gurnard** | *Chelidonichthys kumu* | + | - |
| **Snapper** | *Chrysophrys auratus* | + | - |
| **Moki** | *Latridopsis ciliaris* | + | - |
| **Skate** | *Raja* spp. | + | - |
| **Spiny dogfish** | *Squalus* spp. | + | - |
| **School shark** | *Galeorhinus galeus* | + | - |
| **Brown trout** | *Salmo trutta* | + | - |
| **Garfish** | *Hyporhamphus ihi* | + | - |
| **Barracouta** | *Thyrsites atun* | + | - |
| **Blue mackerel** | *Scomber japonicus* | + | - |
| **Kingfish** | *Seriola lalandi* | + | - |
| **Herring** | *Clupea* sp. | - | +++ |
| **Clingfish** | - | - | + |
| **Wrasse** | - | - | + |

Figure 10: Examples illustrating the types of data generated from assessments of the central body of Ahuriri Estuary: a) percentages of mud (< 63 µm sediment fraction) b) concentrations of zinc in surface sediments, and c) number of taxa in ecological core samples, and d) number of individuals in ecological core samples (adapted from Kelly 2017 and Kelly 2018).



# 7 GAPS RELATED TO KEY ISSUES AND VALUES

## 7.1 SMOTHERING BY DEPOSITED OR REDISTRIBUTED SAND AND GRAVEL

### 7.1.1 INTERVENTIONS INVOLVED

- Renourishment where materials are directly deposited on the seafloor or shore, and/or redispersed and redeposited at remote sites.
- Groynes and other control structures that affect sediment dynamics on the coast.

### 7.1.2 SPATIAL UNITS AFFECTED

- Te Awanga
- Haumoana
- Clive/East Clive
- Westshore
- Bay View
- Whirinaki

### 7.1.3 SUSCEPTIBLE HABITATS

- Beaches and other shoreline habitat.
- Nearshore, sediment habitats.
- Nearby reefs.

### 7.1.4 PRELIMINARY COMMENT ON THE LIKELIHOOD OF SIGNIFICANT ADVERSE EFFECTS

- Depends on the location and scale of interventions, but on a case-by-case basis, at least minor adverse effects are expected.
- Significant adverse ecological effects appear unlikely on a case-by-case basis, unless sediment and gravel deposition and/or redistribution occurs at sites close to sensitive habitats, such as reefs and biogenic structures.
- There is potential for multiple minor impacts (including the impacts of other activities) to lead to more significant ecological effects.

### 7.1.5 STATE OF KNOWLEDGE

A large body of information is available on the effects of the disposal of port dredgings on the Westshore shallow subtidal (see summary of findings in Sneddon et al. 2017), the Napier Port's offshore disposal area (Sneddon & Atalah 2018; Sneddon 2019a, 2021), and Pania Reef (Sneddon et al. 2017; Sneddon 2019b, 2020; Sneddon & Dunmore 2021). Relevant information is also available on the characteristics of Rangatira (Anderson 1997, 1998; EMS 2004; Smith 2013b; Sim-Smith & Kelly 2019) and Town Reefs (Sneddon & Dunmore 2021), and subtidal sediment quality and communities off the Haumoana, Clive (see Golder Associates (NZ) 2013 and Apex Environmental Limited 2020), and Whirinaki shorelines (see Smith 2017a). However, data from the Haumoana and Clive areas mainly comes from areas over 2 km offshore, and inshore data from Whirinaki was last obtained in 2015.

### 7.1.6 KNOWLEDGE GAPS

Gaps in data coverage include subtidal seafloor communities of the Te Awanga and Bay View areas, and nearshore, seafloor communities of the Haumoana and Clive areas. Site specific information from these areas is likely to be required to gain consent for the deposition of sediment. Consideration should also be given to updating data that is greater than 5 years old.

It is assumed that effects on shoreline ecology are likely to be minor, but little empirical data exists to support that conclusion (apart from the areas around Rangatira Reef and towards the Port). This is identified as a gap. It is recommended that this is filled through a combined shoreline survey that characterises the communities present and identifies any sensitive habitats that could be affected by the proposed interventions.

Little data was identified for subtidal reefs, including Clive Hard, that could potentially be affected north and south of Napier. The lack of information on those features would be a key gap if materials were to be deposited or dispersed onto these features.

Predictions of sediment dispersal away from the primary deposition site and where it ends up, would typically be used to underpin an ecological assessment of effects. Currently, that information does not exist. Consequently, that is a key gap.

The long-term, cumulative ecological effects of the sediment deposition, together with other activities carried out in the area are uncertain. The lack of knowledge of about that issue is considered to be a key gap.

## 7.2 ACCELERATING THE SPREAD AND PROLIFERATION OF MARINE PESTS

### 7.2.1 INTERVENTIONS INVOLVED

- All activities carried out within the coastal marine area.

### 7.2.2 SPATIAL UNITS AFFECTED

- All spatial units.

### 7.2.3 SUSCEPTIBLE HABITATS

- All marine habitats and surrounding coastal habitats if materials (such as gravel) are sourced from inland or riverine areas where pest species occur (e.g. Chilean needle grass).

### 7.2.4 PRELIMINARY COMMENT ON THE LIKELIHOOD OF SIGNIFICANT ADVERSE EFFECTS

- Unwanted species, and other invasive marine pests can, and do, have significant adverse ecological and societal impacts. Preventing their arrival, establishment, spread and proliferation are therefore seen as regional and national priorities.
- Proposed interventions are likely to promote the spread and proliferation of pests if they are introduced to (or are already present in) areas where renourishment materials are sourced, or the vessels or equipment used are fouled by marine pests.
- Risks can be reduced through appropriate biosecurity plans and practices, but the cumulative nature, large scale and long timeframes for proposed interventions means that biosecurity is likely to be an important, ongoing issue.

### 7.2.5 STATE OF KNOWLEDGE

This is a continuously evolving issue. New Zealand has a rapidly expanding list of pests that are spreading within and among regions. Most marine pests can be spread in dredge material and through vessel movements. Having up-to-date information on the pests present at any given time is of fundamental importance, as is having robust plans and processes for managing risks. This is typically addressed through the development and implementation of a biosecurity management plan.

### 7.2.6 KNOWLEDGE GAPS

The current absence of a biosecurity plan is a gap.

## 7.3 SEDIMENT SUSPENSION

### 7.3.1 INTERVENTIONS INVOLVED

- Renourishment where materials are directly deposited on the seafloor, and/or redispersed to remote sites.

### 7.3.2 SPATIAL UNITS AFFECTED

In most cases beach renourishment is expected to involve the addition of gravel to the foreshore rather than depositing sand in adjoining subtidal areas for redispersal onto beaches (which has been used at Westshore). For completeness, this has been included as a potential option for all spatial units, even though it is only likely to be applied to a limited number of sites. The spatial units potentially affected are therefore:

- Te Awanga
- Haumoana
- Clive / East Clive
- Westshore
- Bay View
- Whirinaki

### 7.3.3 SUSCEPTIBLE HABITATS

- Water column.
- Subtidal reef and sediment habitats.

### 7.3.4 PRELIMINARY COMMENT ON THE LIKELIHOOD OF SIGNIFICANT ADVERSE EFFECTS

- Suspended sediments have a variety of adverse ecological effects, including (but not limited to):
    - clogging the gills of filter feeders and decreasing their filtering efficiency;
    - impeding the capture of prey by predators that use vision such as snapper; and,
    - reducing the light available for photosynthesis by macroalgae and phytoplankton (see Morrison et al. 2009).
- The suspension of sediments during renourishment activities is likely to involve the generation of short term, localised sediment plumes in a system already subject to elevated and variable turbidity levels. Against this background, it seems unlikely that suspended sediment will have a significant adverse ecological effect, but it will compound (albeit briefly) a significant existing issue.
- It is probable that this issue will need to be considered during consenting.

### 7.3.5 STATE OF KNOWLEDGE

The adverse effects of suspended sediment are well understood, and methods are available to assess and monitor ecological effects. The ecological effects of sediment suspended during Napier Port dredging and disposal have been, and are being, assessed through hydrodynamic modelling (Adamantidis 2017), water quality monitoring (Napier Port 2021) and ecological assessments and monitoring (Sneddon et al. 2017; Sneddon & Atalah 2018; Sneddon 2019a, b, 2020, 2021; Sneddon &

Dunmore 2021). Associated reports provide insights into available methods for assessing the potential risks of sediment suspension and dispersal, and for the subsequent monitoring of ecological effects, particularly in relation to sensitive habitats such as Pania Reef. The methods applied by the Port are of a high standard, and this is likely to be reflected in a high cost for the assessments and monitoring carried out.

Note that the findings from that work are unlikely to be directly transferable to other locations or situations. As such, additional assessments may be required for some, if not all, renourishment sites, particularly those that adjoin areas of reef. Predictions of plume generation and dispersal away from the primary deposition site, would typically be used to underpin an ecological assessment of effects. As that information does not exist, this is considered to be a key gap.

The long-term, cumulative ecological effects of the sediment deposition, together with other activities carried out in the area are uncertain.

### 7.3.6 KNOWLEDGE GAPS

- Site specific impacts of using deposited sediment for renourishment, including the impacts of sediment plumes and redispersal, particularly where sites adjoin areas of reef.
- The lack of knowledge about the long-term, cumulative ecological effects of the sediment deposition, together with other activities carried out in the area.

## 7.4 BURYING BENTHIC COMMUNITIES BENEATH STRUCTURES

### 7.4.1 INTERVENTIONS INVOLVED

- Groynes and other control structures, seawalls (depending on location and design), and storm surge barrier.

### 7.4.2 SPATIAL UNITS AFFECTED

- All units.

### 7.4.3 SUSCEPTIBLE HABITATS

- Beaches and adjacent surf zones, and possibly dunes and reef.

### 7.4.4 PRELIMINARY COMMENT ON THE LIKELIHOOD OF SIGNIFICANT ADVERSE EFFECTS

- Relatively minor, localised impacts are likely on a case-by case basis. Significant adverse effects on a case-by case basis are only likely to occur if the structures are large in scale, numerous, and/or cover sensitive habitats.
- There is potential for multiple minor impacts (including the impacts of other activities) to lead to more significant ecological effects.

### 7.4.5 STATE OF KNOWLEDGE AND KNOWLEDGE GAPS

Little ecological information is available for most of the habitats and areas potentially affected. This, and cumulative impacts are knowledge gaps.

## 7.5 HARDENING OF THE SHORELINE

### 7.5.1 INTERVENTIONS INVOLVED

- Groynes and other control structures, seawalls (depending on location and design), and storm surge barrier.

### 7.5.2 SPATIAL UNITS AFFECTED

- All units.

### 7.5.3 SUSCEPTIBLE HABITATS

- Beaches and adjacent surf zones, possibly dunes, and Ahuriri Estuary.

### 7.5.4 PRELIMINARY COMMENT ON THE LIKELIHOOD OF SIGNIFICANT ADVERSE EFFECTS

- Relatively minor, localised impacts are likely on a case-by case basis. Significant adverse effects on a case-by case basis are only likely to occur if the structures are large in scale, numerous, and/or cover sensitive habitats.
- There is potential for multiple minor impacts (including the impacts of other activities) to lead to more significant ecological effects.

### 7.5.5 STATE OF KNOWLEDGE AND KNOWLEDGE GAPS

Little ecological information is available for most of the habitats and areas potentially affected, or the ecological responses to hardening shorelines in this area (what species will colonise structures and what species (if any) will be displaced). These issues, together with cumulative impacts are knowledge gaps.

## 7.6 EFFECTS CAUSED BY CHANGES IN COASTAL PROCESSES

### 7.6.1 INTERVENTIONS INVOLVED

- Groynes and other control structures, seawalls (depending on location and design), and storm surge barrier.

### 7.6.2 SPATIAL UNITS AFFECTED

- All units.

### 7.6.3 SUSCEPTIBLE HABITATS

- Beaches and adjacent surf zones, Ahuriri Estuary, and possibly dunes.

### 7.6.4 PRELIMINARY COMMENT ON THE LIKELIHOOD OF SIGNIFICANT ADVERSE EFFECTS

- Relatively minor, localised impacts are likely on a case-by case basis. Significant adverse effects on a case-by case basis are only likely to occur if the structures are large in scale, numerous, and/or affect sensitive habitats.
- There is potential for multiple minor impacts (including the impacts of other activities) to lead to more significant ecological effects.
- More information on the proposed storm surge barrier is needed before the types and significance of ecological effects on Ahuriri Estuary can be determined.

### 7.6.5 STATE OF KNOWLEDGE AND KNOWLEDGE GAPS

Little ecological information is available for most of the habitats and areas potentially affected, or how coastal processes will be affected. These issues, together with cumulative impacts are knowledge gaps.

## 7.7 PHYSICAL DISTURBANCE OF THE COASTAL MARINE AREA (CMA) DURING CONSTRUCTION

### 7.7.1 INTERVENTIONS INVOLVED

- Groynes and other control structures, seawalls (depending on location and design), and storm surge barrier.

### 7.7.2 SPATIAL UNITS AFFECTED

- All units.

### 7.7.3 SUSCEPTIBLE HABITATS

- Beaches and adjacent surf zones, Ahuriri Estuary, and possibly dunes.

### 7.7.4 PRELIMINARY COMMENT ON THE LIKELIHOOD OF SIGNIFICANT ADVERSE EFFECTS

- Relatively minor, localised impacts are likely.
- Significant adverse ecological effects are unlikely on the open coast unless sensitive habitats such as dune systems are affected.

### 7.7.5 STATE OF KNOWLEDGE AND KNOWLEDGE GAPS

Little is known about the ecology in most of the habitats and areas potentially affected, or how construction will be carried out. These are knowledge gaps.

## 7.8 DUNE PLANTING

### 7.8.1 INTERVENTIONS INVOLVED

- All.

### 7.8.2 SPATIAL UNITS AFFECTED

- Te Awanga
- Clive / East Clive

### 7.8.3 SUSCEPTIBLE HABITATS

- Dunes.

### 7.8.4 PRELIMINARY COMMENT ON THE LIKELIHOOD OF SIGNIFICANT ADVERSE EFFECTS

- Ecological effects are likely to be positive rather than negative, if native (preferable eco-sourced) plants are used and precautions are taken to avoid spreading invasive pests.

### 7.8.5 STATE OF KNOWLEDGE AND KNOWLEDGE GAPS

Planting is common method of stabilising coastal dunes, with planting guides are readily available. No important knowledge gaps were identified in relation to this action.

## 7.9 GENERAL EFFECTS ON AHURIRI ESTUARY

### 7.9.1 INTERVENTIONS INVOLVED

- Storm surge barrier.

Note that the addition of stop banks around the Pandora Industrial area was originally proposed, but that option was discounted because of a prohibited activity rule relating to estuary impoundment (Simon Bendall pers. comm.).

### 7.9.2 SPATIAL UNITS AFFECTED

- Pandora (Ahuriri)

### 7.9.3 SUSCEPTIBLE HABITATS

- Depends on the design and physical effects of the proposed storm surge barrier.

### 7.9.4 PRELIMINARY COMMENT ON THE LIKELIHOOD OF SIGNIFICANT ADVERSE EFFECTS

- This will depend on the design and physical effects of the proposed storm surge barrier.

### 7.9.5 STATE OF KNOWLEDGE AND KNOWLEDGE GAPS

A wealth of information has been produced on the ecology and habitats of Ahuriri Estuary, although information from the upper and lower estuary is sparse. Additional information may be needed from these areas. However, the key gap is related to the design, construction methods and physical effects of the proposed barrier. Clearer information will be needed before ecological gaps can be identified and ecological effects determined.

## 7.10 GENERAL EFFECTS ON COASTAL VEGETATION

### 7.10.1 INTERVENTIONS INVOLVED

- Managed retreat and the construction of structures above the coastal margin.

### 7.10.2 SPATIAL UNITS AFFECTED

- Clifton
- Haumoana
- Clive / East Clive
- Ahuriri (possibly)
- Pandora (depending on offsite effects)
- Westshore (depending on the control structures used)
- Bay View (depending on the control structures used)
- Whirinaki (depending on the control structures used)

### 7.10.3 SUSCEPTIBLE HABITATS

- Terrestrial and wetlands.

### 7.10.4 PRELIMINARY COMMENT ON THE LIKELIHOOD OF SIGNIFICANT ADVERSE EFFECTS

- This will depend on the characteristics of the inventions, the scale and degree of physical effects and the types and values of vegetation and habitats effected.

### 7.10.5 STATE OF KNOWLEDGE AND KNOWLEDGE GAPS

Basic, regional scale information is available on coastal vegetation (Stevens & Robertson 2005) together with more detailed information for some areas (e.g., White 2004; Madarasz-Smith & Morrisey 2007; Strong 2014; Cornes et al. 2019). However, additional information and expertise may be required to assess and report on effects for particular areas and features.

## 7.11 GENERAL EFFECTS ON BIRDS

### 7.11.1 INTERVENTIONS INVOLVED

- All.

### 7.11.2 SPATIAL UNITS AFFECTED

- All units.

### 7.11.3 SUSCEPTIBLE HABITATS

- All.

### 7.11.4 PRELIMINARY COMMENT ON THE LIKELIHOOD OF SIGNIFICANT ADVERSE EFFECTS

- Relatively minor, localised impacts are likely on a case-by case basis. These could be positive for some species and adverse for others.
- Significant adverse ecological effects appear unlikely on the open coast (on a case-by case basis), but specialist advice is likely required to assess and report on effects for particular areas, interventions and bird species.
- There is potential for multiple minor impacts to lead to more significant ecological effects.
- More information on the proposed storm surge barrier is also needed before the types and significance of effects on birds in Ahuriri Estuary can be determined.

### 7.11.5 STATE OF KNOWLEDGE AND KNOWLEDGE GAPS

A reasonable amount of information exists on shore and sea birds in the area of interest, and on the potential effects of the proposed activities. This includes an assessment of port redevelopment, dredging and disposal on seabirds and shorebirds in Ahuriri Estuary (McClellan 2017), and other general sources of information such as eBird[4], New Zealand Birds Online (http://nzbirdsonline.org.nz/) and Birds New Zealand (https://www.birdsnz.org.nz/) and HBRC's biodiversity inventory (Hashiba et al. 2014). HBRC are also undertaking a regional bird survey and mapping exercise, that will provide an overview of the distribution of birds in the region. However, expertise is still likely required to assess and report on effects for particular areas and bird species, and the potential for cumulative effects needs to be evaluated.

[4] https://ebird.org/region/NZ-HKB-031?yr=all&m=

## 7.12 GENERAL EFFECTS ON FISH

### 7.12.1 INTERVENTIONS INVOLVED

- Renourishment, and possibly groynes, other control structures and Ahuriri storm surge barrier.

### 7.12.2 SPATIAL UNITS AFFECTED

- Te Awanga
- Haumoana
- Clive / East Clive
- Pandora
- Westshore
- Bay View
- Whirinaki

### 7.12.3 SUSCEPTIBLE HABITATS

- Estuary, surf zone, subtidal sediments, reefs.

### 7.12.4 PRELIMINARY COMMENT ON THE LIKELIHOOD OF SIGNIFICANT ADVERSE EFFECTS

- Potential for relatively localised impacts, which could be positive for some species and adverse for others.
- Significant adverse ecological effects appear unlikely on the open coast, but there is potential for multiple minor impacts to lead to more significant ecological effects.
- More information on the proposed storm surge barrier is needed before the types and significance of effects on fish that utilise Ahuriri Estuary can be determined.

### 7.12.5 STATE OF KNOWLEDGE AND KNOWLEDGE GAPS

The substantial amount of existing information on fish and fishing in the area of interest should be sufficient to inform an assessment of effects. Key sources include:

- Smith (2017a) and Smith (2017b) that provide insights on fish and fishing by recreational and commercial fishers, and on areas and species of importance to tangata whenua.
- Haggitt and Wade (2016) and Sneddon et al. (2017) that provide detailed assessments of commercial fishing activity.
- Kilner and Akroyd (1978) and Ataria et al. (2007) that provide detailed information on fish in Ahuriri Estuary.
- Braw Research Limited (2021) that examines the effects of seabed disposal of dredge spoil on the commercial catch of gurnard and flatfish.

However, an assessment will be needed to consolidate and contextualise available information, for the assessment of specific effects. This could potentially be done as a single assessment that covers the whole of the Clifton to Tangoio area. The potential for cumulative effects also needs to be evaluated.

# 8 CONCLUSIONS

The key ecological issues arising from the proposed coastal hazards interventions are likely to be related to the effects of/on:

- benthic communities that are smothered by deposited or redistributed sand and gravel;
- invasive pests, which can be spread by sediment dredging and disposal;
- water quality through sediment suspension and redispersal;
- benthic communities buried beneath control structures;
- sessile shoreline species due to the hardening of the shoreline by artificial structures (this may also increase susceptibility to the colonisation and proliferation of invasive, marine pests);
- habitat characteristics and quality caused by sudden, localised changes in coastal processes through the construction of coastal structures;
- physical disturbance of the Coastal Marine Area (CMA) by machinery involved in the construction of structures or beach renourishment;
- birds that either favour or are adversely affected by interventions and their construction;
- fish that either favour or are adversely affected by interventions and their construction;
- coastal wetlands through physical disturbance and occupation;
- dune planting.

A significant body of existing ecological data and information is available to inform the preparation of the consent related AEEs that will be required to implement the Clifton to Tangoio Coastal Hazards Strategy. However, in many cases additional site and activity specific information is likely to be required to obtain fill knowledge gaps. Of critical importance, will be an evaluation of the cumulative impacts of the proposed interventions, and the impacts of other activities on coastal ecology.

Other matters that should probably be considered are:

- The provision of marine sand for renourishment. Sourcing that material could substantially increase the extent of ecological impacts.
- The potentially beneficial impacts of initiatives aimed at limiting coastal erosion. Such works could reduce the release of eroded sediment and associated adverse effects on water quality and benthic habitats.

These matters have not been considered in detail, but they have the potential to either increase, or offset, cumulative ecological effects.

# 9 RECOMMENDATIONS

The purpose of this project was to test the Clifton to Tangoio Coastal Hazards Strategy 2120 from a coastal ecological perspective, and to determine whether sufficient baseline data is available to inform future assessments of environmental effects, for resource consenting purposes. It is the first stage in the plan for that process, with subsequent steps covering:

2. Mana whenua and community engagement.
3. Development of a proposed monitoring plan to fill key gaps.

4. Implementation of the monitoring plan.
5. Preliminary ecological input on Assessment of Ecological Effects (AEE) requirements to support any consent application(s).
6. Provision of detailed ecological input on AEE(s).

It is also recommended that:

- Customary ecological knowledge that can help inform this process be sought during engagement with mana whenua/mana moana.
- A combined synopsis of existing ecological knowledge and monitoring/assessment plan be produced, which summarises our current understanding of the values potentially impacted by Coastal Hazards Strategy and identifies options and methods for filling information gaps through monitoring and assessments.
- the Coastal Hazards Strategy be regularly revisited, and if necessary, revised to incorporate or respond to new information generated throughout the implementation process.

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