IN THE ENVIRONMENT COURT OF NEW ZEALAND
AUCKLAND REGISTRY

I TE KŌTI TAIAO O AOTEAROA
TĀMAKI MAKAURAU ROHE

IN THE MATTER	of the Resource Management Act 1991
AND	of an appeal under clause 14 of Schedule 1 of the Act
BETWEEN	**NEW ZEALAND REFINING COMPANY LIMITED**
	MANGAWHAI HARBOUR RESTORATION SOCIETY INCORPORATED
	TOP ENERGY LIMITED
	ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND INCORPORATED
	CEP SERVICES MATAUWHI LIMITED
	MINISTER OF CONSERVATION

VINCENT CARLYLE KERR EVIDENCE IN CHIEF

MARINE ECOLOGIST

TOPIC 11: BIODIVERSITY AND OUTSTANDING NATURAL FEATURES/LANDSCAPES

2 OCTOBER 2020

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WYNNWILLIAMS

FEDERATED FARMERS OF NEW ZEALAND

TRANSPOWER NEW ZEALAND LIMITED

NORTHPOWER LIMITED

Appellants

AND **NORTHLAND REGIONAL COUNCIL**

Respondent

1. Introduction, qualifications and experience

1.1 My name is Vincent Carlyle Kerr. I hold a Bachelor of Biological Science degree from the University of Oregon, USA and a National Diploma in Horticulture from the Royal Institute of Horticulture, Lincoln College.

1.2 I am a member of the New Zealand Marine Sciences Association. I am the principal of Kerr and Associates and am engaged in environmental consulting with a focus on marine ecology work and marine protected area planning. I have worked as a marine technical officer for Northland Conservancy, Department of Conservation (**DOC**). I have also worked as a contractor and consultant in marine and freshwater ecology for DOC in Northland.

1.3 I am a founder and current trustee of the Northland based Mountains to Sea Conservation Trust which is amongst New Zealand's largest marine and freshwater environmental education providers.

1.4 I have been involved in marine ecology work in Northland for the past twenty years. In that time I have lead numerous marine habitat mapping projects, coastal inventories, ecological descriptions and have established a number of survey and monitoring programs around Northland. I have been an active diver and marine photographer here in New Zealand and throughout the Central Pacific for forty years.

1.5 I have a website which has a complete list of the technical reports and publications that I have authored.[1]

1.6 I was engaged by Northland Regional Council (**Council**) in 2015 to assist with the review and development of the Proposed Regional Plan for Northland's (**Proposed Plan**) mapping projects for significant ecological areas, significant bird areas and other biodiversity mapping.

Code of conduct

1.7 I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014 and agree to comply with it. The contents of this statement are within my area of expertise. I have not omitted to

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[1] www.kerrandassociates.co.nz

consider material facts known to me that might alter or detract from the opinions expressed in this statement.

2. Scope of evidence

2.1 This evidence is structured as follows:

a. Executive summary;

b. Background and purpose of the Significant Ecological Area (**SEA**) and Significant Bird Area (**SBA**) worksheets developed for SEA and SBA mapping;

c. Comment on appeal points seeking SEA and SBA site specific map changes, including:

i. The inclusion of the Important Bird Area (**IBA**) maps in the SBA layer;

ii. The reinstatement of the SEA layer in the Marsden Point Zone;

iii. The reduction of SEA areas in the Mangawhai Harbour;

iv. The removal of the SBA Upper Harbour areas in Mangawhai; and

v. The addition of SEA mapping, including use of Outstanding Natural Character (**ONC**) and High Natural Character (**HNC**) area worksheets.

d. Conclusion.

3. Executive summary

3.1 In 2015 I was engaged by Northland Regional Council (**Council**) to create a Significant Ecological Marine Mapping Resource, based on Appendix 5 of the Regional Policy Statement or Northland. My evidence summarises the process for developing the SEA and SBA mapping and also comments on the various appeal points that seek site specific changes to the SEA and SBA mapping.

3.2 At the time that we undertook the SBA mapping in 2015 and 2016, we did not have all of the information on the Important Bird Area system, which is now available. While we did consider the IBA information in the context of our broad scale mapping approach, we decided not to include the full spatial detail of the layers. I would support inclusion of the IBA mapping layer if it were part of a comprehensive regional mapping process that also considered the currently available information against a clearly stated mapping goal.

3.3 There are significant ecological values in the area west of the Northport facility. Accordingly, I support the reinstatement of this area as SEA as sought by Royal Forest and Bird Protection Society (**Forest and Bird**).

3.4 Mangawhai Harbour Restoration Society (**MHRS**) seek to reduce the three shellfish areas identified as SEAs and the reclassification of the Mangawhai Harbour SBA layer to omit the Upper Harbour area above the causeway. I do not support the relief sought by MHRS.

3.5 The challenges to the SEA mapping put forward by CEP Services Matauwhi Limited's (**CEP Services**) in their appeal are discussed. In relation to this, I provide further clarification of the mapping and SEA scoring process, including consideration of natural character information and terrestrial values. While I support the identification of one of the seventeen areas I understand CEP Services is pursuing (Uruti Bay), I do not support the other areas sought.

4. Background and summary of SEA and SBA mapping

4.1 As part of the work preparing for the Proposed Plan I was engaged by the Council to create a Significant Ecological Marine Mapping Resource based on Regional Policy Statement for Northland's Appendix 5 criteria for ecological significance. The Appendix 5 criteria provides a methodology for assessing and identifying areas of significant indigenous vegetation and significant habitats of indigenous fauna in terrestrial, freshwater and marine environments. I have included the text of Appendix 5 in **Attachment 1** to this evidence.

4.2 At the outset of this project it was clear that this was going to be a very challenging task considering the complexity of Northland's estuarine and coastal environment, and the very high natural values in much of Northland. We convened an expert group to examine the issues involved and test solutions to adapting the Appendix 5 ecological criteria to marine coastal and estuarine marine habitats.[2] We worked through a number of examples and tested various ways of using the criteria.

4.3 Observations and recommendations from the Expert Group process were documented in a summary report[3] that served as a guideline for completing the project. In this process a checklist was adapted to facilitate a scoring process of candidate areas from a marine perspective using the Appendix 5 criteria.

4.4 As we began scoring areas around Northland, the Expert Group adopted a practice of gathering information and undertaking initial assessments that indicated which areas were potentially high ranking. These areas were then put through a further evaluation process. Areas that did not make the cut for 'high ranking' were described as low ranking. This meant that they were areas that were not evaluated further for the assessment of 'high ranking'. Of the areas further evaluated, some areas dropped out of the 'high ranking' group and were labelled 'medium ranking'.

4.5 In the second stage of the project we worked through each area of Northland, gathering useful background information and going through the exercise of scoring each area with our criteria worksheet. For each high ranking area, we produced a SEA worksheet that:

a. summarised the scoring process and evaluation of the criteria;

b. ranked the reliability of the information; and gave a general description of the ecological values present, supported by key references.

4.6 The intention of this process was to produce worksheets that would guide users of the system to immediately get an overview of the ecological values represented in the area, their importance and information contained in key references for that area.

4.7 At the conclusion of the mapping project a second technical report was produced that outlined in further detail the processes and decisions that

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2 A list of the members of the expert group is provided in Appendix 2 to the Methodology report in footnote below.

3 Kerr, V.C., 2015. Identification and Mapping of Significant Ecological Marine Areas in Northland: Project Brief and Guide to Assessment. Prepared for the Northland Regional Council. Kerr and Associates, Whangarei.

were taken in implementing the mapping and scoring of ecological significance.[4] The ultimate result was the Significant Ecological Area mapping that was notified with the Proposed Plan and associated worksheets.

4.8 During the course of working with marine SEA scoring guidelines for estuaries and exposed coast we became conscious that the bird values were widespread across Northland and found ourselves undertaking two parallel scoring efforts for each area that dealt with different information systems and different ecological considerations which lead to difference in results. It was equally obvious to all the ecologists involved that these shorebirds and seabirds are indeed part or integrated with the marine ecosystems. Council staff proposed that we separate the two layers into marine SEA and bird SEA layers. They argued that from a planning point of view this allowed for more flexibility in the development and application of planning provisions.

4.9 In considering the spit between a bird SEA and a marine SEA the most significant difference came when applying criterion 2(b) of Appendix 5 to estuarine bird species. Criterion 2(b) provides:

> 2. Rarity / distinctiveness
>
> …
>
> (b) Indigenous vegetation or habitat of indigenous fauna that supports one **or** more indigenous taxa that are threatened, at risk, data deficient or uncommon, either nationally or at the relevant ecological scale.

4.10 The New Zealand Threat Classification System for birds, unlike for marine organisms, is sophisticated. Northland estuarine environments have some of the highest numbers of threatened bird species in the country. These species can be described in functional groups of birds that use the estuaries, nearby beaches and shallow coastal waters in different ways. Collectively there are very few areas in Northland estuaries or that do not support threatened shorebirds. This includes many areas that would be considered degraded in terms of marine biodiversity values. To resolve

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4 Kerr, V.C., 2016. Methodology Report Mapping of significant ecological areas in Northland. A report to the Northland Regional Council, Kerr & Associates, Whangarei, New Zealand.

this difference in evaluation based on bird values, a decision was made to create separate maps, scoring evaluations and worksheets for birds and marine values. When the process moved to the coastal areas a similar situation arose where significant shorebirds and seabird values were supported by all Northland's open coastline when assessed against criterion 2(b) of Appendix 5. The method chosen for the open coasts and offshore islands bird values and marine values was to do the ecological evaluation separately and produce separate layers.

4.11 Once the above decision was made on creating the bird SEA layers a team of experienced ecologists supervised by Dr Ray Pierce assembled available information which was evaluated using a seabird and shorebird assessment worksheet in a scoring process similar to that done for the marine SEAs. Worksheets were created for the high scoring estuaries and descriptive documents were produced for the open coast and offshore areas. For high scoring bird and marine SEAs areas there are references, a narrative and the details of the scoring provided on the worksheets which illustrate and detail the scoring. For medium and low scoring areas the scoring process was not documented in the same manner as for the high scoring areas. This was mainly due to resource constraints. To better understand how the scoring was done, it is advisable to work through the evaluation and scoring guideline document[3] that was produced from the work of the Expert Group process. That document provides explanations and examples to inform how we would delineate between low and medium and high scoring evaluations.

5. Inclusion of Important Bird Area maps and overview of the SMMSA

5.1 Forest and Bird's appeal on the SEA maps seek to include the Important Bird Area maps in the SBA layer, including identified bird colonies.

5.2 When considering the relief sought by Forest and Bird, it is important to acknowledge the spatially orientated information, gathering effort and mapping work that is brought together in the IBA system. We need this kind of information to provide a spatially comprehensive picture of bird use and ecological function in our environment in order to support mapping systems, which can drive policy and regulations.

5.3 At the time that we planned and undertook the SBA and SEA mapping project in 2015-2016, we did not have all of the information on the IBA system that is now available. At the time, the sampling effort of the IBA system was largely focused in the Auckland region rather than in Northland. Beyond data on specific areas and species such as Mangawhai and Fairy Tern, the information was not comprehensive in a spatial sense nor a species sense. In saying that, to be comprehensive in a spatial and species sense across the entire Northland area is a mammoth task. Therefore, when attempting to map SEAs and SBAs, we had to make decisions on the following:

a. Whether we map sites and species of which we have adequate knowledge and not map larger areas of sea and coast where we know species are present often or occasionally?

b. Is the use or presence of an area by a particular species of high importance to them and would ecological impact result from disturbance?

c. Do we recognise that virtually all of Northland does in fact have these species using the coastal environments in a wide range of ways, some critical to their survival and some more dispersed and flexible in a spatial sense?

5.4 Once we finished assembling information we decided to map the large areas where bird values are known, if not rigorously documented. We did this in order to reflect the importance of the dispersed nature of these bird values. The planning team felt this was the most useful way to approach the mapping exercise.

5.5 It is noted that we did not specifically map seabird colonies and breeding sites. There is support for the idea that these areas do have a special ecological, if not critical, importance to the species and that these areas are spatially confined and therefore afforded the highest possible form of protection. Based on what we now have as a SBA layer it could be helpful to have an additional information layer which spatially identifies key specific and spatially defined areas. For example, the IBA identifies breeding areas, roosting sites and priority foraging areas that can be mapped in relation to the critical spatial extents that some species have in relation to the breeding season and chick rearing.

5.6 In order to undertake the inclusion of IBA mapping, information and mapping thresholds need to be consistent across the target mapping area. This level of work was simply not possible with the resources available to the Council when the SEA project was run. It is important to note that when you look at the entire Northland area and all of the species in the area it becomes a very complex task. The level of difficulty bears some similarity to our challenge of mapping marine mammal values in the coastal area. Our data is based on the specific areas where our project team looked for species and therefore does not reflect a full picture of the comprehensive manner in which these animals use and depend on the coastal marine areas.

5.7 In all cases where disperse values are apparent, often the hardest task is to document where a given species does not go rather than where they are known to go in carrying out their ecological function. As I mentioned above, this level of work was simply not possible with the limited resources available to the Council at the time that we undertook the SEA project. This is why we did not include IBA maps in the SBA layer.

5.8 Figure 1 below shows Important Bird Area mapping in the North Eastern North Island.

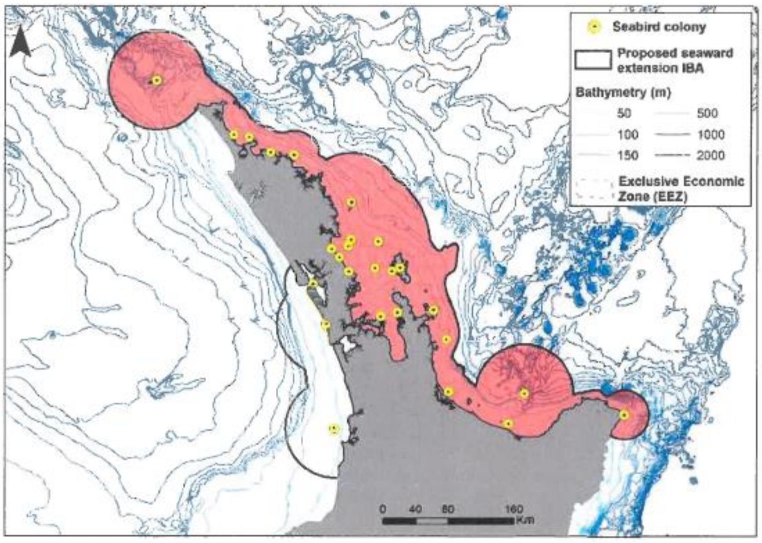

Figure 1: Important Bird Areas in the North Eastern North Island.

5.9 To summarise my opinion regarding the inclusion of the IBA information in the offshore seabird layer – if we were to move to a different mapping approach which looked to comprehensively map individual species' spatial use on a regional basis, then in my opinion the inclusion of IBA maps would certainly be a valuable addition to the data available.

5.10 Turning specifically to the marine mammal and offshore seabird ecological values, the comments I have made on the mapping process apply in a similar manner but there is a greater challenge of scale and complexity in terms of the lifestyle of the species involved and their ecology.

5.11 With marine mammals generally, our data in relation to the presence of species has been gathered on an opportunistic basis and has not been approached with a goal of spatially defining presence nor uses of space or ecological function. Even where we have done decades of research on specific species, the spatial coverage is far from complete and it does not point to a conclusion that the animals use the whole coastal area.

5.12 An example is the mapping of Orca, *Orcinus orca*. The data looking North to South on the East Coast show many more sightings of Orca as you move South towards the Hauraki Gulf, and less sightings in the Far North. It is highly unlikely that this reflects the true situation, but it does reflect the intensity of the observations. On the West Coast, data is sparse and clearly cannot be compared to the data from the East coast in any systematic way. In terms of the ecology of these species, very little information on critical behaviours and dependencies has been documented in a way that supports detailed mapping on a regional basis.

5.13 In contrast to this overview is evidence that marine mammals are very mobile, their lifestyles are complex and they are widely dispersed. Based on observations and expert opinion of marine mammals, experts will say that many of the species are present in Northland waters in virtually all areas. My own experience in Northland certainly supports that view.

5.14 Given our resource constraints, we decided to create a marine mammal values layer that included all of the offshore waters.

5.15 When we looked at seabird values, again we had the problem of the dispersed nature and diversity of the species and lifestyles involved. Based on the spatial information we were able to assemble at the time, it soon became apparent that we could not rule out the presence of significant values anywhere in the Northland waters. This lead to the layer we proposed, which includes all of the Northland waters in a seabird layer.

6. Marsden Point zoning

6.1 Forest and Bird also seek the reinstatement of the SEA layer in the Marsden Point Zone.

6.2 The area in question represents the eastern edge of the mapped SEA area of Marsden Bay running west along the shore to One Tree Point. In its submission on the Proposed Plan, Northport Limited sought that this corner of the SEA be re-classified as not highly significant and therefore be excluded from the SEA layer. The hearings panel recommended that the SEA be re-classified, which the Council accepted in its decisions. Figure 2 below shows the decisions version of the SEA layer in Marsden Point. Figure 3 shows the notified version of the SEA layer in Marsden Point.

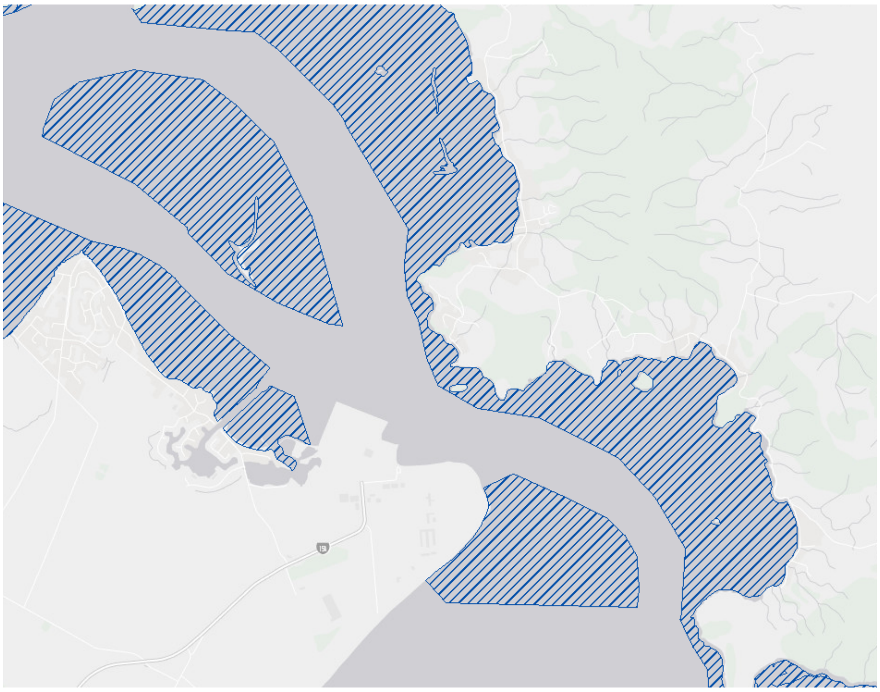

Figure 2: Decisions version of the SEA layer in Marsden Point.

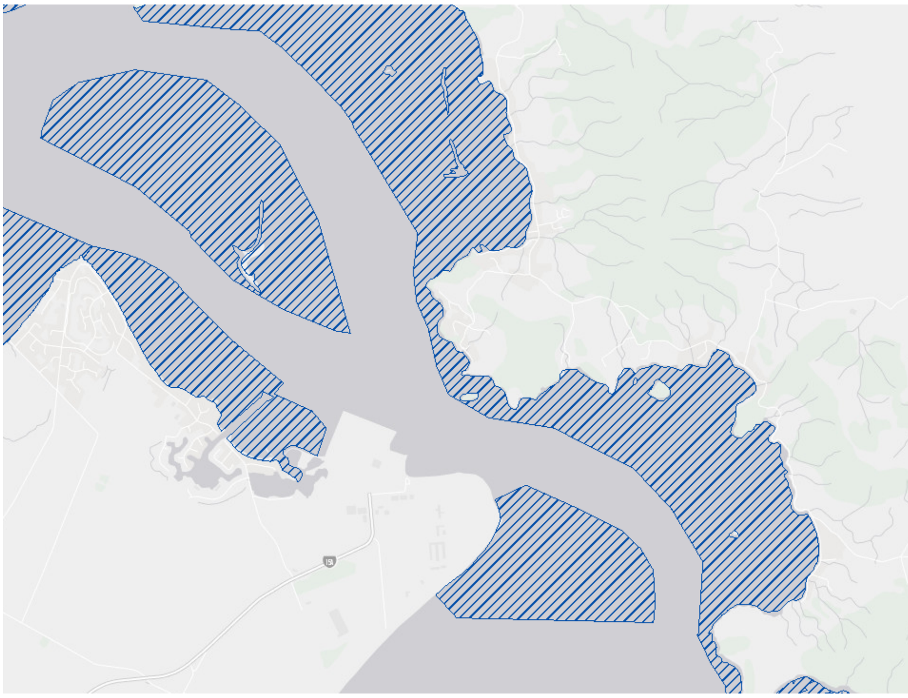

Figure 3: Notified version of the SEA layer in Marsden Point.

6.3 The context of this request is Northport's stated plan to expand the port facility further into Marsden Bay. Various considerations of regionally significant infrastructure and port facility planning are involved in this. I do not intend to comment on these processes, only to say that regardless of these high level planning process I would expect any change of a mapped SEA to have appropriate consideration on its ecological merit.

6.4 I have visited and observed this area of Marsden Bay many times in the last three decades. Based on my observations, I consider that this area has the following ecological values:

a. the area supports a cockle shellfish bed and can be characterised as having a fine sand substrate typical of shellfish beds in this part of the harbour;

b. historically there have been scallop beds along this shore;

c. currently there are small patches of seagrass re-establishing in the area; and

d. generally in the harbour, seagrass over the past 10 years has undergone a dramatic recovery from very low levels. It is not known why this dramatic recovery has taken place.

6.5 Supporting the descriptive summary above, intertidal benthic sampling studies conducted in this area between 1997 and 2008 found high invertebrate species richness dominated by polychaetes, bivalves, gastropods and crustaceans, with evidence of particularly high numbers of juvenile pipi in some years, including at sites just west of the Port.[5][6][7] Limited sampling has been conducted at sites that fall specifically within the area now excluded from the original SEA, but two such sites were sampled in 2018.[8] The 2018 survey results confirmed the high macroinvertebrate abundance and diversity indicative of the biologically rich character of the intertidal flats, showing similar or higher levels of faunal abundance and species richness to sites further west that lie within the 'revised' boundary of the SEA being appealed.

6.6 In terms of satisfying the SEA criteria this shellfish habitat is typical of a productive and healthy shellfish bed. It is also a continuation of this habitat which reaches from Marsden Bank to One Tree Point, with the Refinery and Port facilities interrupting what was once a continuous clean sand shoreline merging to a sand flat at Marsden Bay. Removing more of Marsden Bay from the natural state may add to the potential but largely unknown adverse effects of interrupting this continuous habitat.

6.7 To summarise, there are significant ecological values in the area of the original SEA which Forest and Bird are seeking be reinstated. Accordingly, I consider that the original assessment of this proposed SEA is valid and I support its reinstatement.

7. Reduction of SEAs in Mangawhai Harbour

7.1 MHRS have challenged the areas designated as SEAs because of the presence of shellfish beds in the Mangawhai Harbour. MHRS seek to

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5 Poynter, M.; Keesing, V. (2002). Marsden Point Deepwater Port marine intertidal benthos sampling 1997-2002 summary baseline report. Unpublished report prepared by Poynter & Associates Environmental Ltd and Boffa Miskell Ltd. 148 p.

6 Poynter, M. (2008). March 2008 Marsden Point intertidal monitoring. Unpublished report prepared by Poynter & Associates Environmental Ltd for Northland Regional Council. 43 p.

7 Griffiths, R. (2012). Whāngārei Harbour Estuary Monitoring Programme 2012. Northland Regional Council report. 70 p.

8 Spyksma, A.; Brown, S. (2018). Northport Intertidal Ecology Report. Unpublished report prepared by 4Sight Consulting Ltd for Northport. 48 p.

reduce the spatial area of the SEA layer covering shellfish beds in Mangawhai.

7.2 The shellfish areas in Mangawhai have a long documented history of significant cockle, *Austrovenus stutchburyi* communities and have been included in the Ministry for Primary Industries Northland Shellfish Study.[9] From 1999 to 2015 Mangawhai Harbour shellfish beds have been monitored in this MPI study which over time show that the areas of the SEAs are suitable habitat for shellfish and that the population have been consistently healthy in terms of abundance. There is some fluctuation in this data over time but this is normal for shellfish beds.

7.3 The Council is developing a SEA monitoring program. In September 2019 a detailed survey for shellfish abundance was carried out by a Council team lead by their estuary ecologist, Richard Griffiths. Results of this study indicated high abundance of cockle *Austrovenus stutchburyi* well dispersed over each of the three SEA areas. In all three areas the mean abundance per m^2 is 2-3 times that considered as a threshold level for classification of shellfish beds for fisheries purposes.[10] The 2019 survey results also indicated good diversity of associated species for that community and substrates being suitable for excellent shellfish growth. The 2019 survey is attached as Appendix 1. Figure 4 below shows the SEA layer in Mangawhai.

9 Berkenbusch, K.; Abraham, E.; Neubauer, P., 2015. Intertidal shellfish monitoring in the northern North Island region, 2013–14. New Zealand Fisheries Assessment Report 2015/15. 79 p.

10 Hewitt J.E & Funnell G.A. (2005). *Benthic marine habitats and communities of the southern Kaipara*. Prepared by NIWA for Auckland Regional Council. Auckland Regional Council. Technical Publication 275pp.

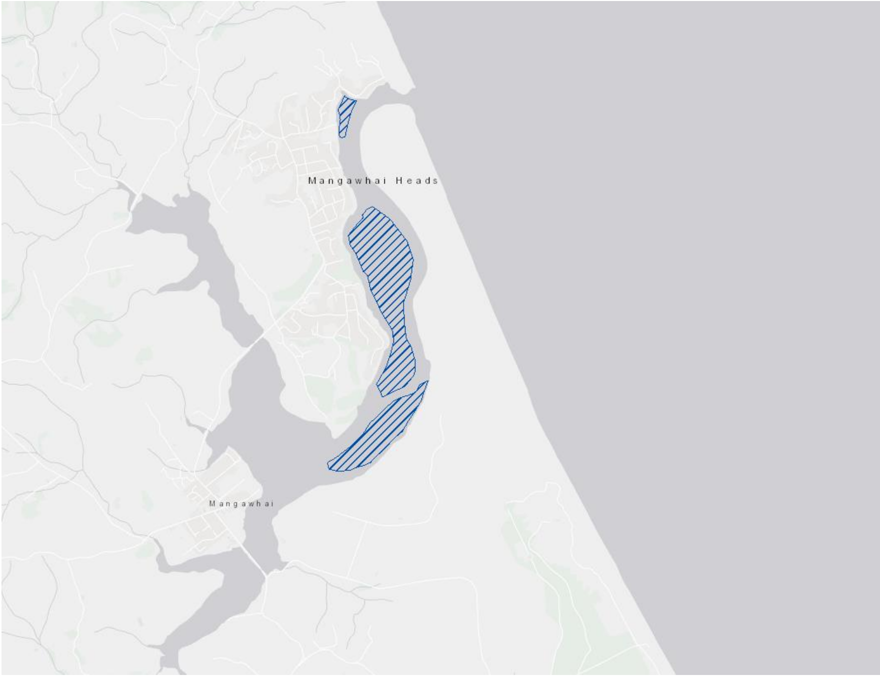

Figure 4: SEA layer in Mangawhai.

7.4 Based on my review of the SEA process, the historical data and the most recent survey data, I consider that the three SEA areas in Mangawhai Estuary are correctly drawn and well supported by current and long term survey data. Accordingly, I do not support the reduction of the SEA layer in Mangawhai as sought by MHRS.

8. Removal of SBA Upper Harbour areas in Mangawhai

8.1 MHRS also seek the removal of the SBA Upper Harbour areas in Mangawhai.

8.2 I do not support the arguments put forward by MHRS for removing the SBA designation for the Upper Harbour areas. The scoring and worksheet for Mangawhai Harbour was done by a Northland Regional Council biologist with extensive experience in Northland estuaries and a senior ornithological scientist, Dr Ray Pierce. Dr Pierce is the former Conservation Advisory Scientist for the Department of Conservation, Northland Conservancy. Dr Pierce has extensive experience in these mangrove habitats and with the bird species on the list of threatened and at risk species that were used in arriving at the SBA. Dr Pierce is familiar with the Mangawhai Harbour and the literature documenting past surveys. In summarising the bird values, the SBA assessment sheet says the following about Mangawhai Harbour:

> Mangawhai Estuary is a small estuary, but it contains a wide variety and representative succession of habitats spanning dunes, tidal flats, channels, mangroves, saltmarsh and freshwater wetlands and adjacent shrubland. It is the single most important breeding ground for the Nationally Critical NZ fairy tern which breeds on the sandspit, and individuals forage in the estuary or just offshore for much of the year. The estuary is also important for breeding of a number of other threatened or at risk birds, notably northern NZ dotterel, Caspian tern, pied shag, reef heron, white-fronted tern and variable oystercatcher, with several migrant species visiting at different times of the year (refer Table below). The saltmarshes and mangroves support Australasian bittern, banded rails, fernbirds and others. The estuary has nationally important significance on the basis of being the primary breeding ground for a NZ-endemic and critical taxon, the NZ fairy tern.[11]

8.3 Of the full list of species listed in the SBA assessment there are species like Godwits, Wrybills and Dotterels which are not commonly associated with Upper Harbour habitats. However, the 17 species in this list that are associated with upper harbour habitats either as occasional visitors or as full time resident species, are dependent on these habitats.

8.4 It should be noted that published studies of Fairy Tern food foraging behaviour[12] demonstrated that these birds have a preferred feeding strategy based on small fish species which live in shallow waters on the edges of mangroves. The surveys associated with Fairy Tern foraging were primarily focused on the lower and middle sections of the Mangawhai Harbour, however the feeding strategy is a highly specialised one that is perfectly adapted to the mangrove edge environments of the upper harbour. The birds have been observed in these areas. Figure 5 below shows the Mangawhai SBA layer that MHRS seek to reduce.

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11 SBA worksheet for estuarine birds Mangawhai Harbour.

12 Ismar,S.M.H. et al 2013. Foraging ecology and choice of feeding habitat in the New Zealand Fairy Tern *Sternula nereis davisae.* Bird Conservation International 24: 72 – 8

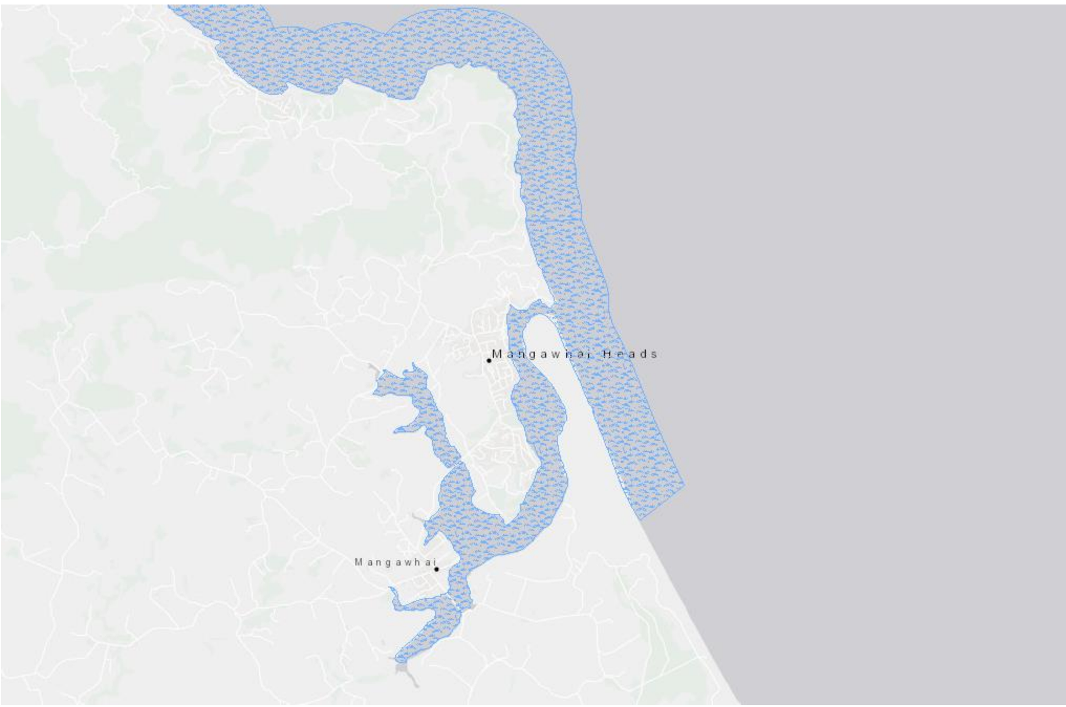

Figure 5: Mangawhai SBA layer.

8.5 Based on all of the known species associated with the Upper Harbour mangrove and channel habitats, I consider that the SBA criteria is clearly supported. Accordingly, I do not think that the Upper Harbour areas should be removed from the SBA layer.

9. Addition of SEA mapping

9.1 CEP Services seek additional SEA mapping, including the use of ONC and HNC area worksheets. CEP Services' appeal states that currently the SEA mapping is incomplete and that there are areas that meet the SEA criteria which have not been mapped.

9.2 CEP Services' argument appears to be based on three technical reports provided by Ms Lissette Collins that assess sites of 'High Natural Character' against the criteria for ecological significance in the Regional Policy Statement for Northland in seventeen areas. Ms Collins concludes that the Appendix 5 criteria were not applied properly or consistently, and as a result, some areas with significant ecological values have not been correctly identified.

9.3 With the exception of the Uruti Bay area (which has been successfully addressed in mediation agreement), I disagree with the conclusions drawn by Ms Collins. However, I would like to commend Ms Collins for the useful summary of information and the challenges to the mapping process which is important in that it assists us in testing the SEA mapping process in the Northland context.

9.4 Throughout her evidence, Ms Collins makes the case for a range of terrestrial ecological values in the seventeen areas investigated. Ms Collins specifically points to values that score highly in Criterion 3 – ”Diversity and pattern” and Criterion 4 – “Ecological context”. Ms Collins primarily focuses on the terrestrial components of the system and values. For example, she argues that because of the presence of the sequence of good riparian cover and bush regeneration, saltmarsh and mangrove that the marine ecological values should be scored high ranking.

9.5 There are two issues that I would like to address:

a. First, when we undertook our assessment we considered the natural character classification and worksheets as part of assessing connectivity, catchment ecological values and connectivity to marine habitats and values in the SEA scoring information. Catchments or shorelines that had high natural character values did not automatically trigger SEA classification of high significance. In some cases where the terrestrial values coincided with high marine values, the connectivity between these components did in fact trigger high SEA significance. However, where marine values could not be documented we did not score the ecological function and connectivity as high ranking.

b. Second, in my opinion there was not sufficient evidence of marine components and values to support high rankings in the reports completed by Ms Collins

9.6 The challenge of undertaking an assessment of marine ecological values is in understanding marine ecological context. When undertaking the assessment, I asked the following questions when I looked at the scoring to put the process in a marine context.

a. Are the marine components of the ecological sequence in question good examples of their type, degraded and of significance size?

b. What are the catchment values, riparian cover, wetlands and presence of active restoration activity and support by the community?

9.7 In all the cases that Ms Collins has put forward (with the exception of the Uruti Bay case), the marine values associated with these catchments were degraded with sedimentation. In these areas the marine component which formed the connectivity to the salt marsh (edge community) and freshwater systems, were mangrove forests.

9.8 In assessing the mangrove component, I looked at the size of the habitat, the general health evidenced by the canopy cover and presence of mature trees in the community. Ecological connectivity implies that each component of an ecological sequence is healthy and functioning.

9.9 I would like to clarify two further points relating to the application of the criteria for ecological significance.

9.10 The first point relates to the challenge of scale and the process of applying consistent scoring of classification across a large region like Northland. I would accept that there is an intention of the SEA criteria to include all significant examples of the ecological values in question. The hard edge of this is the mapping context and arriving at a working definition of the term ‘significant’. In ecology, when considering factors including complexity, diversity, connectivity, productivity and scale is important. In any mapping system that is adopted to represent natural values a decision has to be made as to the scale that the assessment and mapping will apply to.

9.11 The second is that the SEA mapping layer is a regional system of mapping for all of Northland which includes the greatest diversity of estuaries in the country. The expert group involved in the mapping exercise discussed a number of scenarios of small to large estuaries and sediment affected to pristine and arrived at the current mapping approach. This is not intended to be the last word on the issue of scale in terms of applying these criteria, however it is a starting point. For instance, in the future there could be far more detailed ecological information assembled and the classification scoring could be undertaken at much finer scales for all or parts of the Northland region. This would lead to different results as ecological components at finer scales could be identified and reconsidered. The point is that scale matters in ecological classification. This should not be seen as inconsistencies or error; it is in fact a different view of what is a complex interaction of species and habitats in the marine environment.

9.12 To conclude, I would not recommend re-classification of the remaining sixteen areas referred to by CEP Services as high scoring marine significant areas. My assessment has not changed from the original scoring on these sites. In all cases, while there are arguably important terrestrial values and elements of terrestrial natural character, there are not high marine values in these sites supporting full ecological sequences with the marine area.

10. Conclusion

10.1 In this evidence I have sought to clarify a number of points regarding the process of mapping the SEA and SBA areas. The SEA and SBA mapping that we undertook was a challenging task considering the complexity of Northland's estuarine and coastal environment and the challenges associated with applying the RPS Appendix 5 criteria. The SEA and SBA mapping layers we produced are useful to signal that important values are present in a given area and that various precautionary restraints controls are appropriate where activities may impact on those natural values. However, with ecological value mapping, any layer produced always needs to be treated as a work in progress that can be improved in the future when there is more detailed information and better resolution at finer scales. This certainly applies to the current mapping layers.

10.2 I have also provided comment on the various appeals that challenge the SEA and SBA mapping layers.

10.3 I would like to point out that most of the appeals before the Court offer statements that the mapping is wrong or inadequate, when the actual substance of what they want is more or less controls in planning instruments. Ecological value mapping by definition is a best possible representation of values present at a given scale relating to an agreed classification. In the marine environment in particular, we will always need to use proxies such as habitats, indicators, species and communities as we will never have perfect information. How we use these proxies in resolving classification questions will always be subject to question and debate, and rightfully so from a science perspective as it is by definition an approximation or representation of the natural world. The question is: does the mapping resource help us with the task of manging and caring for the environment?

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Vincent Carlyle Kerr
2 October 2020

Appendix 1: Mangawhai SEA habitat assessment

Mangawhai SEA habitat assessment

Date: January 2020

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Contents

Introduction

In the Proposed Regional Plan for Northland (Northland Regional Council 2016), three marine significant ecological areas (SEAs) have been identified in the Mangawhai Estuary. In September 2019, Northland Regional Council (NRC) conducted a habitat assessment of these SEAs. This report documents the key findings of that survey.

Methods

Study area

Mangawhai estuary is located on the east coast of the Northland peninsula (Figure 1).

Figure 1. Mangawhai Estuary.

Sampling sites

For the northern SEA, transects were located 50m apart with stations located 50m along each transect (Figure 2). In the mid and southern SEAs, transects were located 100m apart with stations located 100m along each transect (Figure 3 & 4).

Figure 2. Sample locations in the northern SEA.

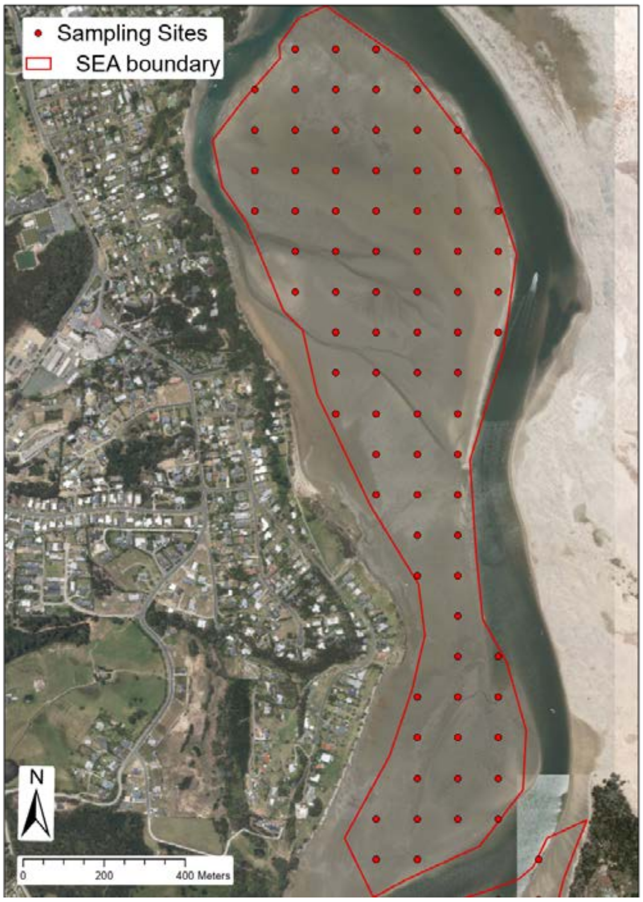

Figure 3. Sample locations in the mid SEA.

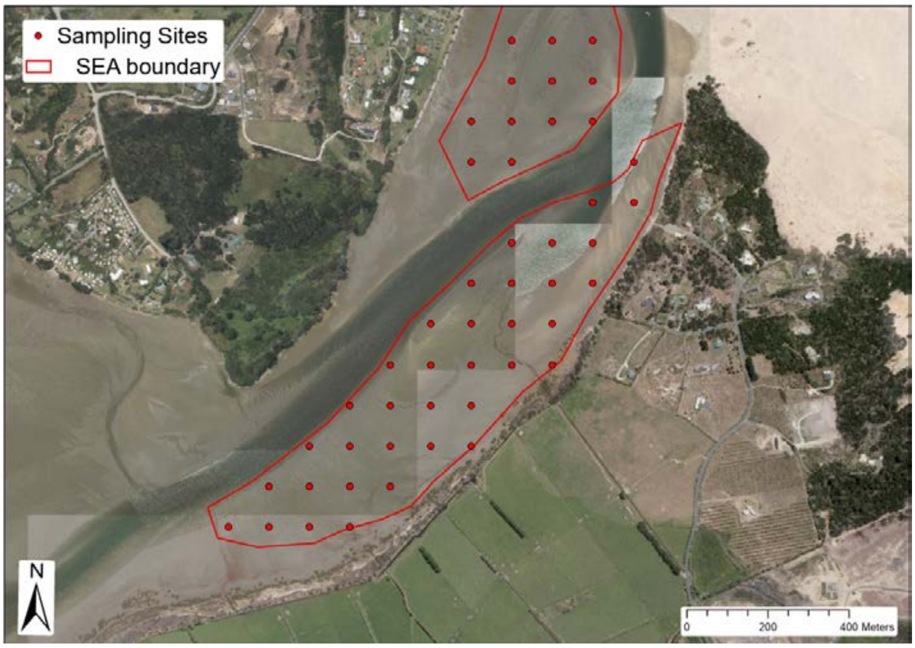

Figure 4. Sample locations in the southern SEA.

Sampling methods - substrate

At each sampling station the substrate was classified into one of nine categories (Table 1). These categories were developed by Griffiths *et al.* (2019) from the sediment categories in the Estuary Monitoring Protocol (Robertson *et al*., 2002) and an intertidal habitat survey of Waikato estuaries conducted by Needham *et al.* (2013).

Table 1. Substrate categories.

Substrate categories	Description
Very soft mud	The surface appears brown with a black anaerobic layer below. When walking on the substrate you'll sink greater than 5cm.
Soft mud	The surface appears brown with a black anaerobic layer below. When walking on the substrate you'll sink 2-5cm.
Firm mud/sand	A mixture of mud and sand, the surface appears brown with a black anaerobic layer below. When walking on the substrate you'll sink 0-2cm.
Firm sand	Firm sand flats may be mud-like in appearance but are granular when rubbed between the fingers, and solid enough to support an adult's weight without sinking more than 1-2cm. Firm sand may have a thin layer of silt on the surface making identification from a distance impossible.
Mobile sand	The substrate is clearly recognised by the granular beach sand appearance and the often rippled surface layer. Mobile sand is continually being moved by strong tidal currents and often forms bars and beaches. When walking on the substrate you'll sink less than 1cm.
Soft sand	Substrate containing greater than 99% sand. When walking on the substrate you'll sink greater than 2cm.
Very soft sand	Substrate containing greater than 99% sand. When walking on the substrate you'll sink greater than 5cm.
Gravelfield	Sediment characterised by unconsolidated gravel (2-20mm diameter). Visually observed to cover ~70-100% of sediment surface to the extent that very little (or none) of the underlying sediment is visible.
Shell hash	The substrate is dominated by shells.

Sampling methods - epifauna

At each sampling station, a $0.25m^2$ quadrat was placed on the ground and all animals (excluding shellfish) were recorded. In addition, any crustacean burrows, algae, seagrass or mangroves within the quadrat were recorded.

Sampling methods – incidental observations

Any unusual flora or fauna encountered between stations was recorded. In addition, bird observations were recorded at each SEA.

Sampling methods - shellfish

Samples were collected by taking a sample unit consisting of two adjacent, circular cores (with a 150mm diameter) pushed into the substrate to a depth of 150mm. The contents from the two cores were aggregated (so each sample unit covered a cross sectional area of $0.0353m^2$) and passed through a 6mm aperture sieve. All cockles (*Austrovenus stutchburyi),* wedge shell (*Macomona Liliana)* and pipi *(Paphies australis*) retained on the sieve were counted. A photograph was taken of all the shellfish, and the images were analysed using Photoblique v2.0.16. This software allows the user to set the spatial scale of the photographs using a reference measure, such as a ruler, and then measure the shell length of each shellfish (Figure 5). In order to allow for batch processing of the spatial scale of the photographs, each field officer had a specially adapted 20L bucket. The lid of each bucket had a hole drilled through it and an indent to match their phone's camera. This ensured that each photograph was taken at the same height and centred in the middle of the bucket.

The shell length measurements made using Photoblique were exported as a csv and used to calculate the proportion of juveniles and adults, and to estimate the biomass of cockles.

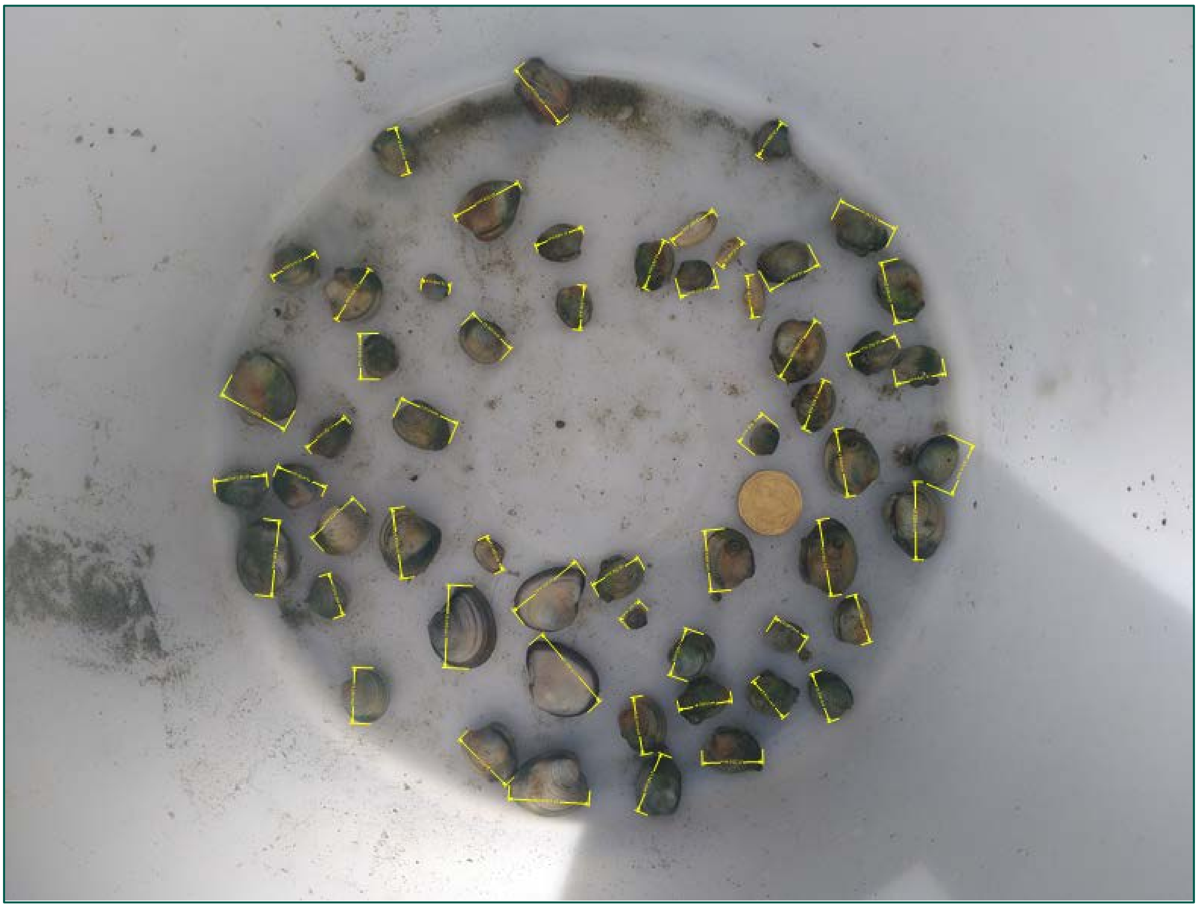

Figure 5. Shellfish measurements using Photoblique v2.0.16.

Data analysis – shellfish

The mean density (per square metre) and standard error was estimated for juvenile and adult cockles and wedge shells in each SEA. Cockles 15mm or greater in shell length and wedge shell 30mm or greater were classified as adults (Griffiths *et al.* 2019). Very few pipis were recorded, so juvenile and adult densities were not estimated separately. Instead the mean density (per square metre) and standard error was calculated for all pipis.

For the purpose of this survey each SEA was treated as one stratum. The total population for each stratum was estimated by calculating the average density (per square metre) and then multiplying this by the area of the SEA using the formula:

$$Total\ population\ (X) = \sum_{i-1} W_i \bar{x}_i$$

Where: W_i is the stratum area (m^2), and $\bar{x}_i$ is the average density (per square metre) in stratum *i.*

Length weight relationship

The weight of individual shellfish was estimated using the length of each shellfish and an established length-weight relationship:

$$W = aL^b$$

The relationship between length-weight relationship derived by Williams *et al.* (2009) for cockles at Snake Bank, Northland, where a = 0.00014 and b = 3.29, was used to estimate cockle biomass. W is weight in g and L is length in mm.

There are currently no established length-weight relationships for wedge shell as it is not a commercially important species, therefore biomass was not calculated for wedge shells. There are established length-weight relationships for pipi, but as very few pipi were recorded in the survey, biomass was not estimated.

Results – substrate

Substrate in the northern SEA was predominantly firm sand with some mobile sand found in the upper intertidal area towards the north-western area of the SEA (Figure 6). Substrate in the mid SEA was predominantly firm sand in northern area of the sandflat with a combination of mobile sand, shell hash and mobile sand towards the south of the sandflat (Figure 7). Substrate in the southern SEA was predominantly firm sand, with some areas of mobile sand and a smaller area of soft sand (Figure 8).

Figure 6. Substrate type in the northern SEA.

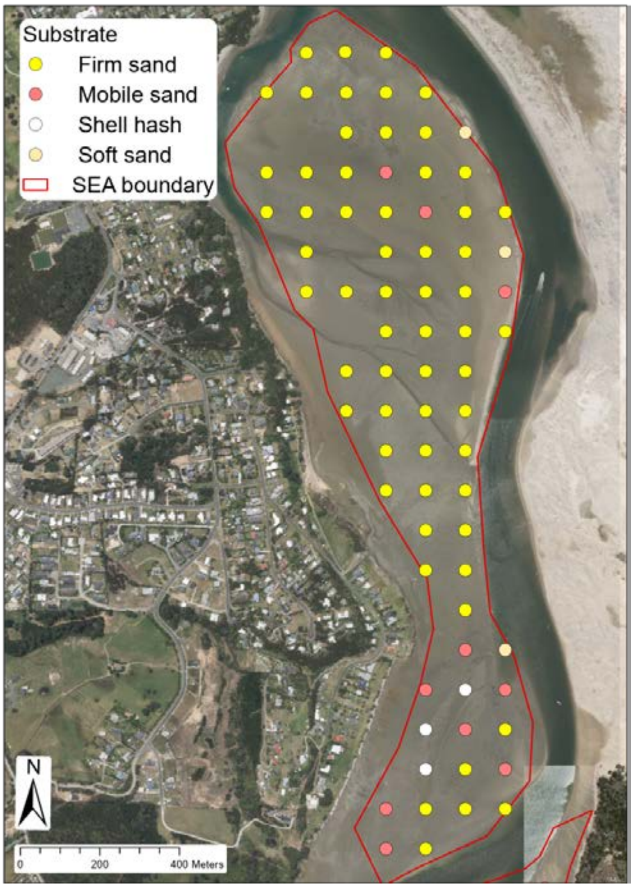

Figure 7. Substrate type in the mid SEA.

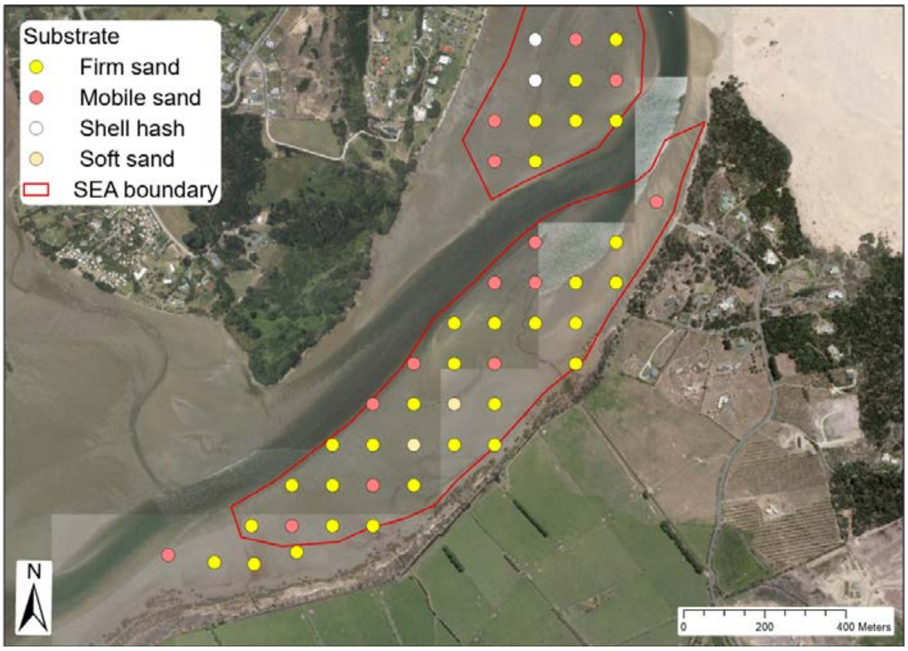

Figure 8. Substrate type in the southern SEA.

Results - epifauna

In total, 17 different taxa of benthic invertebrate were recorded (Table 2). No non-native taxa were recorded. One unusual organism, *Hydatina physis*, was recorded in the southern SEA. *H. physis* or Rose petal bubble shell is a species of sea snail, a marine opisthobranch gastropod mollusc. It is relatively uncommon in New Zealand (Andrew Spurgeon pers com). This is the first recording of the species in Mangawhai or the Kaipara District (source: http://www.mollusca.co.nz/).

Table 2. Epifauna recorded in Mangawhai.

Taxa	Common name
Austrovenus stutchburyi	Tuaki/Tuangi, Cockle
Paphies australis	Pipi
Macomona Liliana	Hanikura, Wedge shell
Fellaster zelandiae	Kina papa, Sand dollar
Hydatina physis	Rose petal bubble shell
Diloma subrostratum	Top shell
Austrominius modestus	Estuarine barnacle
Zeacumantus lutulentus	Koeti, Horn shell, Spire shell
Chiton glaucus	Papatua kakāriki, Chiton
Cominella glandiformis	Mud flat whelk
Cominella adspersa	Kawari, Speckled whelk
Anthopleura aureoradiata	Mud flat anemone
Notoacmea helmsi	Limpet
Patiriella sp	Cushion star
Unidentified worm	Unidentified worm
Unidentified crab	Unidentified crab
Unidentified shrimp	Unidentified shrimp

Results – incidental observations

In total ten different taxa of bird were recorded (Table 3).

Table 3. Bird taxa recorded at Mangawhai.

Northern SEA	Mid Sea	Southern SEA
Haematopus unicolor, Variable oystercatcher	*Haematopus unicolor,* Variable oystercatcher	*Haematopus unicolor,* Variable oystercatcher
Charadrius obscurus, Tūturiwhatu, Dotterel	*Charadrius obscurus,* Tūturiwhatu, Dotterel	*Charadrius obscurus* Tūturiwhatu, Dotterel
Larus dominicanus, Black-backed gull	*Larus dominicanus,* Black-backed gull	*Larus dominicanus,* Black-backed gull
Larus novaehollandiae, Red-billed gull	*Larus novaehollandiae,* Red-billed gull	*Larus novaehollandiae,* Red-billed gull
		Stemidae, unidentified Tern
	Sternula nereis, Tara-iti, Fairy Tern	
	Platalea regia, Spoonbill	*Platalea regia,* Spoonbill
	Limosa lapponica, Bar-tailed godwit	*Limosa lapponica,* Bar-tailed godwit
	Himantopus himantopus, Pied stilt	
		Morus serrator, Australasian Gannet

Results - cockles

Northern SEA

The extent of the northern SEA was determined to be 0.052km^2. The total population of cockles in the SEA was estimated to be 49.7 million (Table 4). The total biomass was estimated to be 169.6 tonnes (Table 5). High densities were found throughout the SEA although lower densities were found higher up the intertidal zone towards the north-western corner of the SEA (Figure 9).

Table 4. Cockle density and population found in northern SEA.

	Juvenile cockles	Adult cockles	All cockles
Sample size	20	20	20
Mean density per square metre	170	785	955
Standard error	54.5	151.1	178.7
Stratum area (m^2)	52055	52055	52055
Total population (millions)	8.8	40.9	49.7

Table 5. Cockle biomass found in northern SEA.

Sample size	Mean biomass (g/m^2) (SE)	Stratum Area (m^2)	Total (tonnes)
20	3257 (750.4)	52055.25	169.6

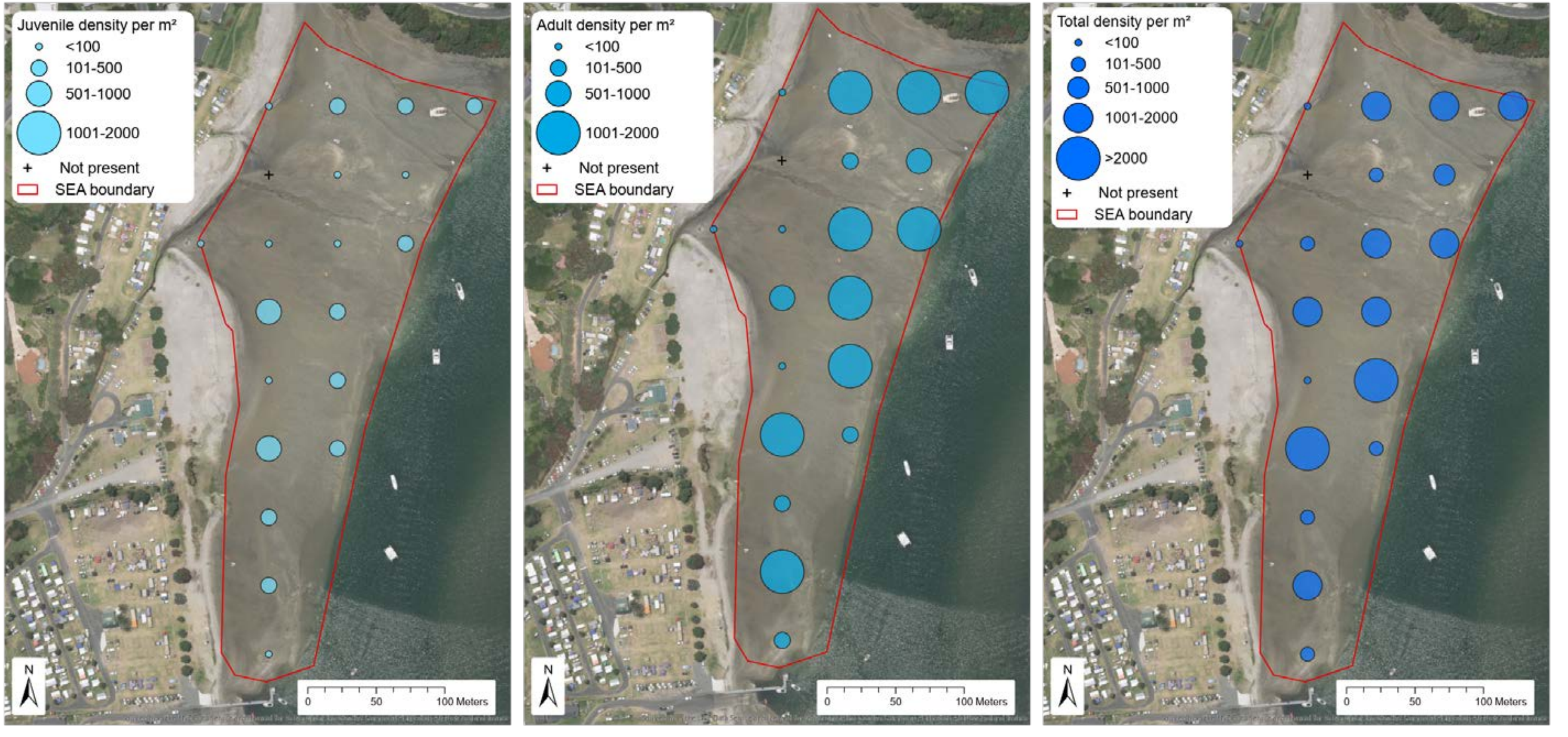

Figure 9. Cockle densities in the Northern SEA.

Mid SEA

The 2019 population of cockles in the SEA was calculated to be 659.6 million (Table 6). The total biomass was estimated to be 1577.3 tonnes (Table 7). The highest densities were found towards the northern edge of the sandflat, with densities as high as 3452 individuals per square metre at the tip of the sandflat. High densities were also recorded in the middle section of the sand flat and at the southern end of the SEA (Figure 10).

Table 6. Cockle density and population found in the mid SEA.

	Juvenile cockles	Adult cockles	All cockles
Sample size	76	76	76
Mean density (per square metre)	252	563	816
Standard error	34.4	61.1	80.1
Stratum area (m^2)	807955	807955	807955
Total population (millions)	203.9*	454.5*	659.6*

* There is a small difference between the juvenile and adult population and the total population because some cockles could not be measured due to broken shells.

Table 7. Cockle biomass found in the mid SEA.

Sample size	Mean biomass (g/m^2) (SE)	Stratum Area (m^2)	Total (tonnes)
76	1952 (227.7)	807955	1577.3

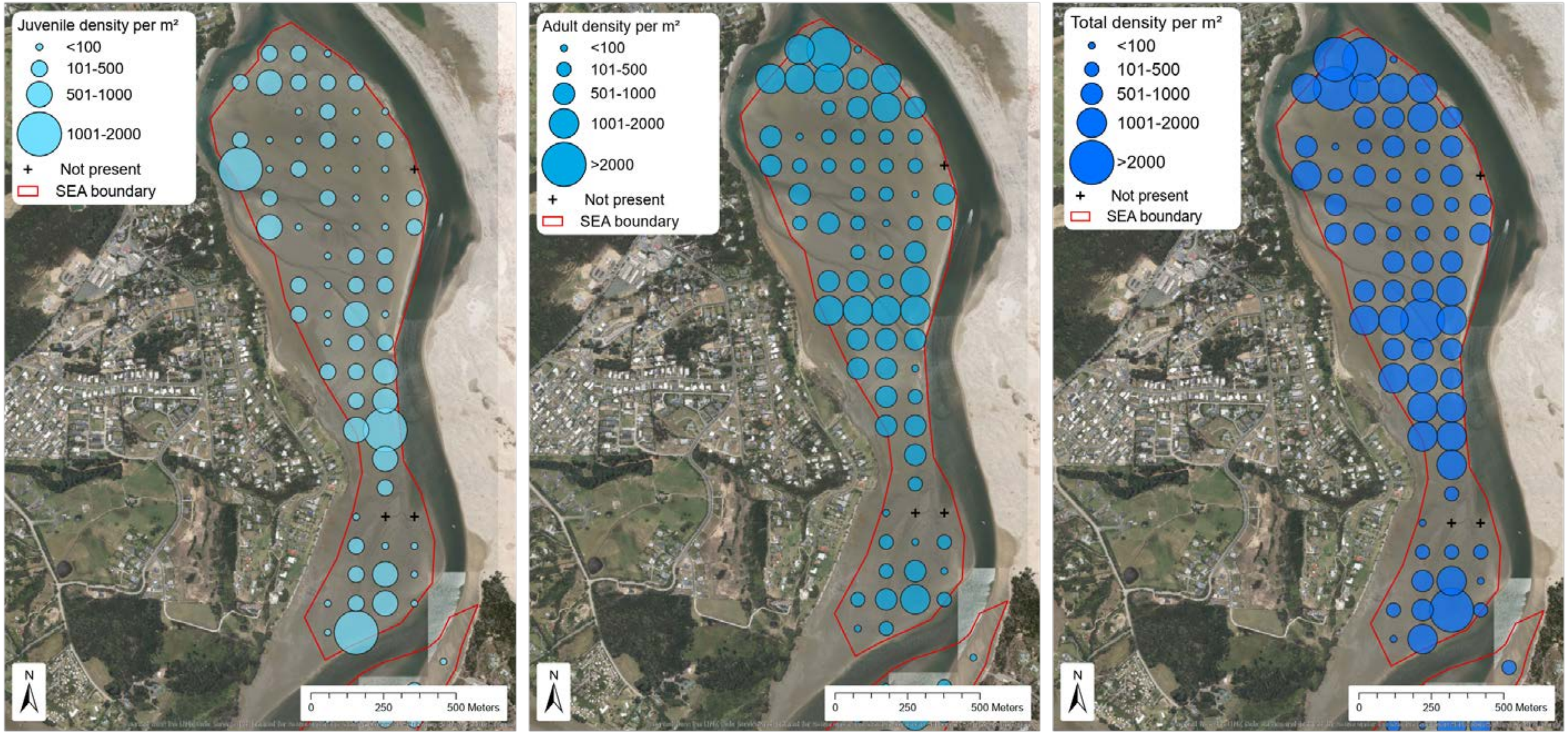

Figure 10. Cockle densities in the mid SEA.

Southern SEA

The 2019 population of cockles in the SEA was calculated to be 245.3 million (Table 8). The total biomass was estimated to be 608.4 tonnes (Table 9). High densities were found throughout the SEA (Figure 11). There was only one site in the southern SEA where cockles were not present. This site was high up the intertidal area very close to the shoreline where cockles would not be expected to occur.

Table 8. Cockle density and population found in the southern SEA.

	Juvenile cockles	Adult cockles	All cockles
Sample size	33	33	33
Mean density (per square metre)	169	518	687
Standard error	32.0	83.0	108.7
Stratum area (m^2)	357151.9	357151.9	357151.9
Total population (millions)	60.3	185.0	245.3

Table 9. Cockle biomass found in the southern SEA.

Sample size	Mean biomass (g/m^2) (SE)	Stratum Area (m^2)	Total (tonnes)
33	1703 (293.9)	357151.9	608.4

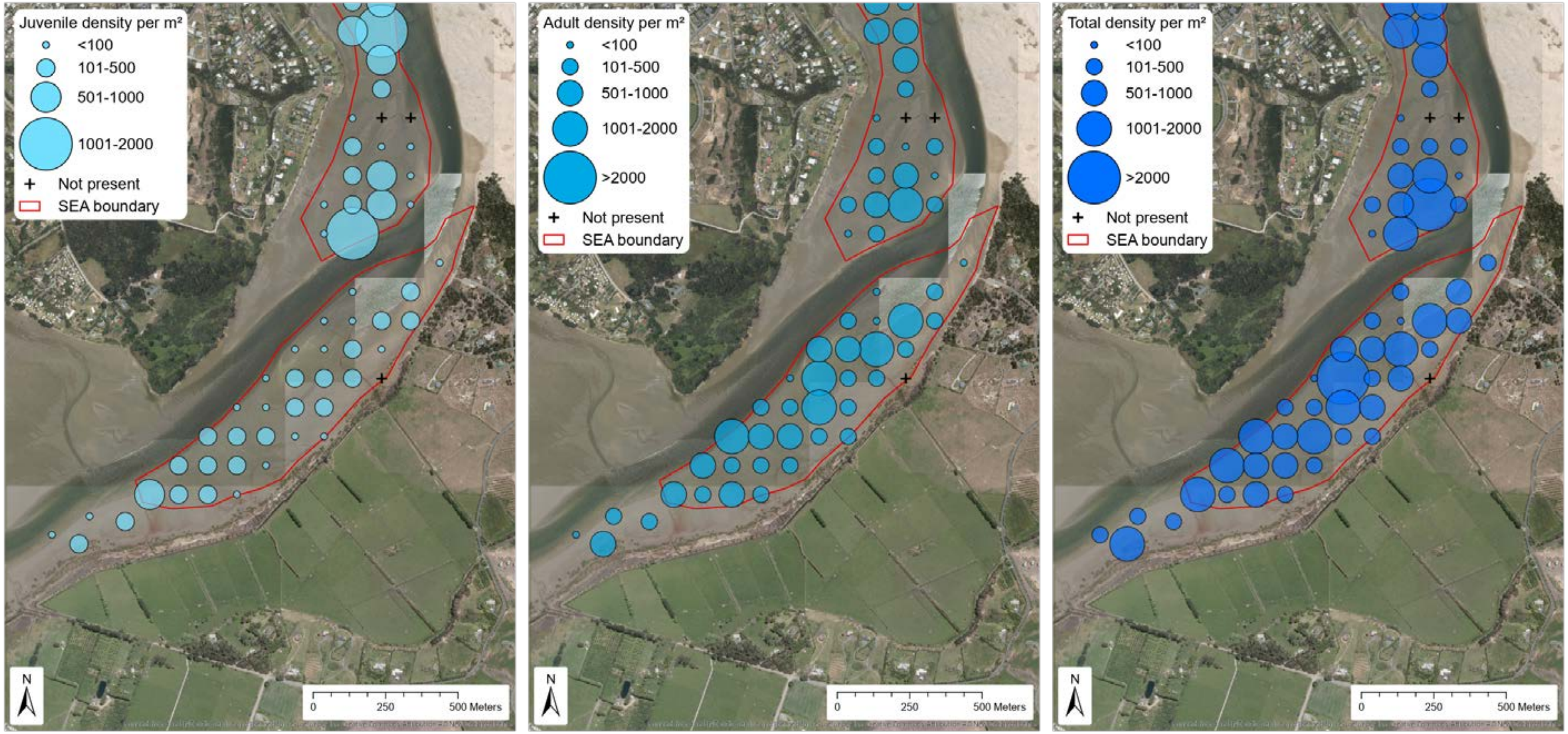

Figure 11. Cockle densities in the southern SEA.

Results – wedge shell

Northern SEA

The 2019 population of wedge shell in the SEA was calculated to be 4.2 million (Table 10). High densities were found throughout the SEA although lower densities were found higher up the intertidal zone (Figure 12).

Table 10. Wedge shell density and population found in the northern SEA.

	Juvenile wedge shells	Adult wedge shells	All wedge shells
Sample size	20	20	20
Mean density (per square metre)	48	33	81
Standard error	9.9	8.3	15.9
Stratum area (m^2)	52055.2	52055.2	52055.2
Total population (millions)	2.5	1.7	4.2

Mid SEA

The 2019 population of wedge shells in the SEA was calculated to be 89.6 million (Table 11). High densities were recorded throughout the SEA, although lower densities were found along the eastern edge of the SEA (Figure 13).

Table 11. Wedge shell density and population found in mid SEA.

	Juvenile wedge shells	Adult wedge shells	All wedge shells
Sample size	76	76	76
Mean density (per square metre)	83	28	111
Standard error	10.0	4.7	11.4
Stratum area	807955	807955	807955
Total population (millions)	66.8	22.9	89.6

Southern SEA

The 2019 population of wedge shell in the southern SEA was calculated to be 40.7 million (Table 12). High densities were found throughout the SEA (Figure 14). Additional samples collected outside the southern boundary of the SEA, contained moderate to high densities of wedge shells.

Table 12. Wedge shell density and population found in southern SEA.

	Juvenile wedge shells	Adult wedge shells	All wedge shells
Sample size	33	33	33
Mean density (per square metre)	86	28	114
Standard error	10.7	4.6	12.2
Stratum area (m^2)	357151.9	357151.9	357151.9
Total population (millions)	30.6	10.1	40.7

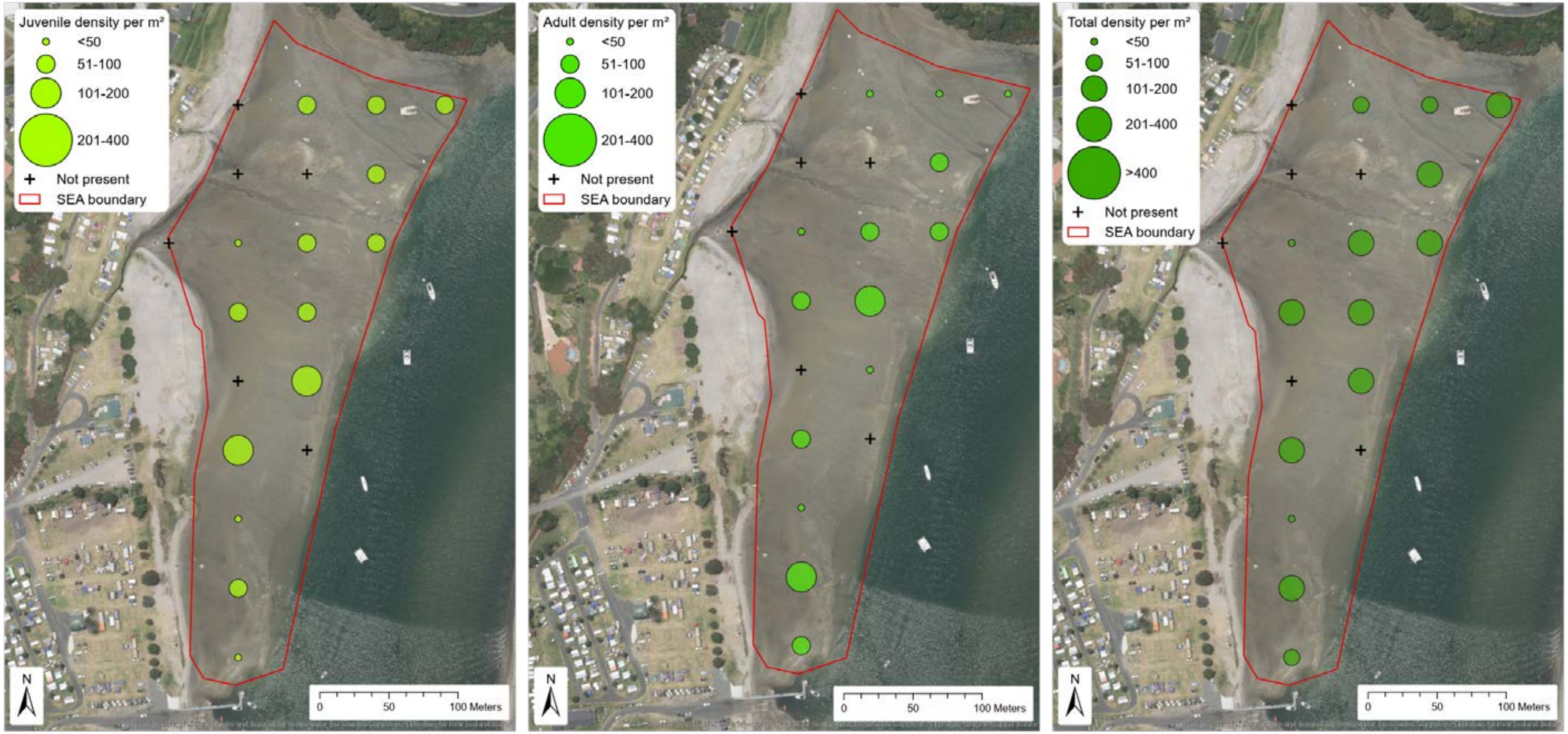

Figure 12. Wedge shell densities in the northern SEA.

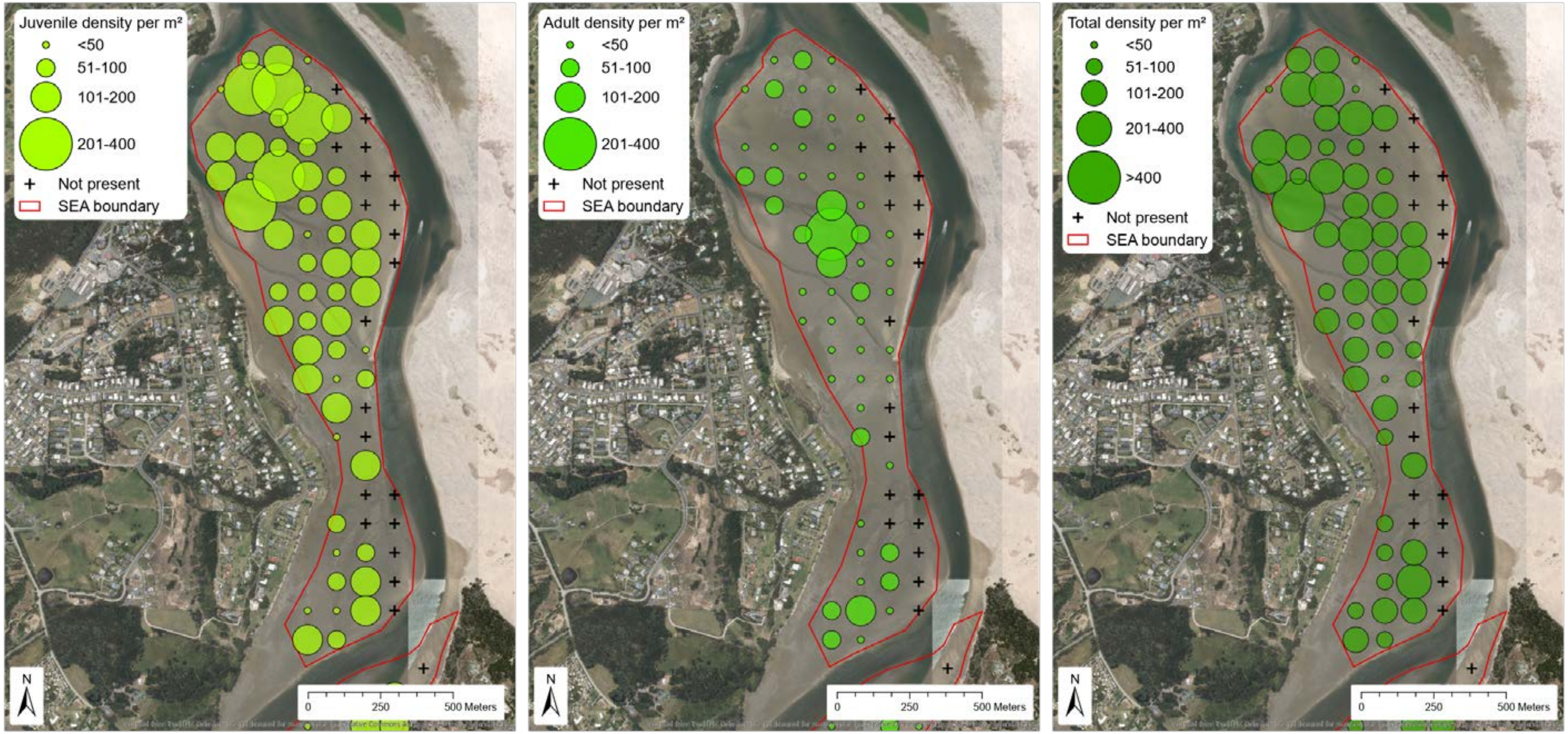

Figure 13. Wedge shell density in the mid SEA.

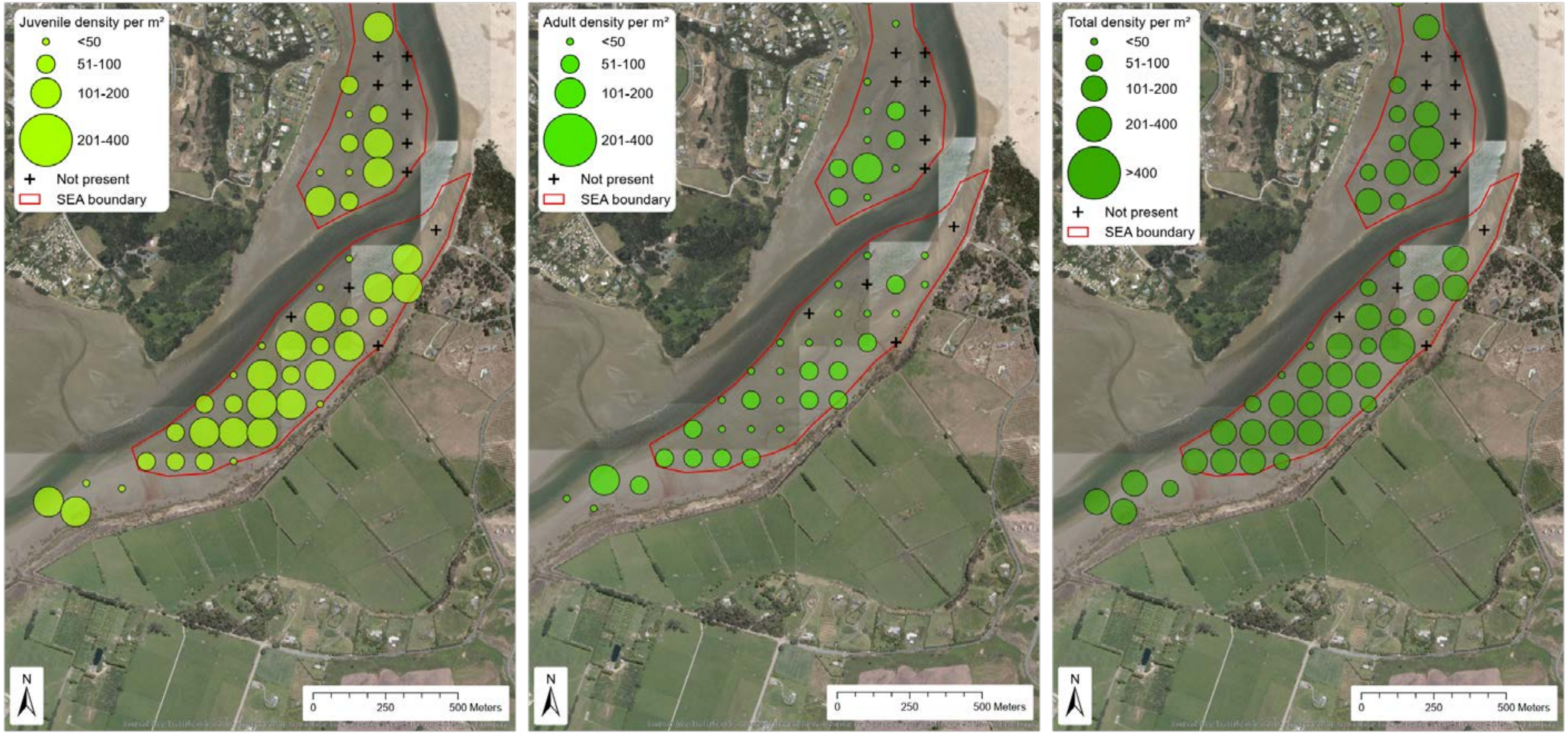

Figure 14. Wedge shell densities in the southern SEA.

Results – pipi

Northern SEA

The 2019 population of pipi in the northern SEA was calculated to be 1.3 million (Table 13).

Table 13. Pipi density and population found in northern SEA.

Sample size	Pipi density (per m^2) (SE)	Stratum Area (m^2)	Total (million)
20	25 (44.8)	52055.25	1.3

Mid SEA

The 2019 population of pipi in the mid SEA was calculated to be 7.9 million (Table 14).

Table 14. Pipi density and population found in the mid SEA.

Sample size	Pipi density (per m^2) (SE)	Stratum Area (m^2)	Total (million)
76	10 (2.5)	807955.3	7.9

Southern SEA

Only three pipi were recorded in the southern SEA. The population of pipi in the northern SEA was estimated to be 32,468 (Table 15).

Table 15. Pipi density and population found in southern SEA**.**

Sample size	Pipi density (per m^2) (SE)	Stratum Area (m^2)	Total
33	0.1 (0.1)	357151.9	32468

Summary

Substrate

Substrate in all three SEAs was comprised of mainly firm sand, with some areas of mobile sand. A recent habitat assessment of Ruakaka Estuary indicated that firm sand and mobile sand were important substrate types for cockles and wedge shells (Griffiths *et al.* 2019).

Epifauna

In total, 17 different taxa were recorded. The diversity of taxa recorded, and the individual species present were indicative of a healthy sand flat. No non-native taxa were recorded.

Birds

In total, ten taxa of birds were recorded. The diversity and numbers of bird taxa recorded was high for an intertidal sand flat (personal observation).

Cockles

The Ministry of Primary Industries has used a density of 25 cockles (>30mm shell length) per square metre, as a guideline to identify areas which may need management control (Pawley, 2012). Separately, Hewitt & Funnel (2005) developed an ecological classification for their survey of benthic habitats in the southern Kaipara Harbour, which was subsequently used by Griffiths (2014) in a survey of the northern Kaipara Harbour. Hewitt and Funnell (2005) classified cockle habitat if adult densities were greater than 226 individuals per square metre.

The mean density of adult cockles (>15mm shell length) in the northern, mid and southern SEA was 785, 563 and 518 individuals per square metre respectively. The current survey therefore indicates that all three SEAs contain extensive cockle beds.

Wedge shell

Needham *et al.* (2013) developed a classification system which classifies wedge shell habitat if densities are equal or greater than four individuals (>30mm shell length) from a 15 x 15cm area (177 individuals per square metre). The same classification criteria were used by Griffiths *et al*. (2019) in a habitat survey of Ruakaka Estuary.

The mean density of adult wedge shell (>30mm shell length) in the northern, mid and southern SEA was 33, 28 and 28 individuals per square metre respectively. The current survey therefore indicates that although wedge shells were found throughout all three SEA, the densities were generally below the number required to be classified as wedge shell habitat.

Pipi

Low densities of pipi were recorded in all three SEAs. Pipi are generally found from the low intertidal to subtidal zone. The current SEA boundary does not extend sufficiently down the tidal range to include subtidal habitat where large densities of pipi may be present.

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