Hector's and Māui dolphin research strategy

27 October 2021

Department of Conservation
Te Papa Atawhai

New Zealand Government

Hector's and Māui dolphin research Strategy

The Purpose

- support the Government's vision that New Zealand's Hector's and Māui dolphin populations are resilient and thriving throughout their natural range;
- support the long-term goal of ensuring Hector's and Māui dolphin subpopulations are thriving or increasing, supported by an enduring, cohesive and effective threat management programme across New Zealand;
- improve knowledge of poorly understood threats, the nature of those threats, and their extent; and
- identify and prioritise resources for new research, monitoring of populations and management measures, and to inform management responses to those threats.

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Sub-populations

The TMP operates on a "subpopulation" scale.

This means it differentiates between the two sub-species and recognizes:

South Island:

East coast South Island (**ECSI**) with local populations:

- Cloudy Clifford
- Kaikōura
- Banks Peninsula
- Timaru
- Otago

West coast South Island (**WCSI**)

North coast South Island(**NCSI**)

South coast South Island (**SCSI**)

North Island:

West coast North Island (**WCNI**) divided into

northern zone for the area north of Cape Egmont in Taranaki

southern zone for the area south of Cape Egmont to Wellington.

East coast North Island (**ECNI**)

Map of sub-population areas

Including local areas for ECSI

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Collaborative research planning

- To allow input into this process by the science community, two workshops were held with invited participants from New Zealand and overseas to:
- • Evaluate relevant knowledge gaps;
- • Identify tools and methods to fill these gaps; and
- • Prioritise research to best advance our understanding of Hector's and Māui dolphins, with a view to informing appropriate future management options for each sub-species.

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The Prioritisation:

demographics, distribution, abundance, and connectivity of small sub-populations.

- • West coast North Island northern zone: epigenetic aging, distribution monitoring, and refining of habitat preference models (including diet, and prey distributions).
- • South coast South Island: abundance, annual breeding rate, and distribution.
- • North coast South Island: abundance and distribution.
- • Otago: abundance, determining whether this is a closed or open population, and distribution.
- • Key demographic data is still required for life history tables, and key amongst these is an understanding of the frequency of pods with calves. This is best addressed by analysing the long-term Banks Peninsula Marine Mammal Sanctuary database.

Ranking	Research need	Key Populations
1	Demographic assessment of sub-populations: annual reproductive rates, reproductive status, age and sex structure, and survival rates – to assess the level of risk each population faces and monitor population trajectory	WCNI – *northern Zone* ECSI –Banks Peninsula
2	Determine distribution with particular focus on smaller sub-populations and areas recognised as high risk or uncertain from the Spatially Explicit Fisheries Risk Assessment SEFRA. Understanding temporal and spatial variability in key populations	WCNI – *northern Zone* NCSI – Golden & Tasman Bays NCSI – Marlborough Sounds ECSI – Cloudy Bay ECSI – Otago SCSI – Te Waewae Bay
3	Estimated total population size and annual rates of population growth or decline for key populations	WCNI – *northern Zone* NCSI – Golden & Tasman Bays NCSI - Marlborough Sounds ECSI –Banks Peninsula ECSI - Otago SCSI – Te Waewae Bay
4	Improving estimates of bycatch rates using data with better spatial and temporal coverage	ECSI - Timaru
5	Understanding offshore distribution	WCNI – *northern zone* NCSI – Golden & Tasman Bays NCSI – Marlborough Sounds ECSI – Cloudy Bay ECSI – Otago SCSI – Te Waewae Bay
6	Improve existing distribution modelling from the TMP risk assessment	WCNI – *northern zone* SCSI – Porpoise Bay
7	Better understand cryptic mortality rates	ECSI – Kaikoura ECSI – Timaru
8	Understanding transmission pathways and population level risk from Brucella and Tuberculosis. The effects of Brucellosis on reproductive output, as this appears to affect reproductive females. And Investigate the potential for full-screen health assessments	WCNI – *northern zone* WCNI – *southern zone* ECNI NCSI – Golden & Tasman Bays NCSI – Marlborough Sounds ECSI – Cloudy Bay ECSI – Kaikoura ECSI – Pegasus Bay and Banks Peninsula
		ECSI – Timaru ECSI – Otago SCSI – Porpoise Bay SCSI – Te Waewae Bay WCSI - Karamea North WCSI
9	Understanding factors influencing connectivity/dispersal between subpopulations	NCSI – Golden & Tasman Bays NCSI – Marlborough Sounds ECSI – Cloudy Bay ECSI - Otago SCSI – Porpoise Bay
10	Estimating bycatch from recreational, cultural and illegal fishing	WCNI – *northern zone*
11	Reconciling population estimates from different methods and techniques, to understand and potentially correct for inherent biases when using each method	ECSI – Cloudy Bay ECSI - Kaikoura
12	Understanding dolphin diet and the seasonal/temporal distribution of prey	WCNI – *northern zone* NCSI – Golden & Tasman Bays SCSI – Porpoise Bay SCSI – Te Waewae Bay WCSI
13	Addressing the seasonal disparity in carcass collection and assessing for more cryptic causes of death during the winter period	WCNI – *northern zone*
14	Understanding Genetic population structure which may influence the population resilience and therefore population viability, and changes in genetic diversity through time	WCNI – *northern zone* NCSI – Golden & Tasman Bays NCSI – Marlborough Sounds ECSI – Cloudy Bay ECSI – Timaru ECSI – Otago SCSI – Porpoise Bay WCSI - Karamea North
15	Understanding genetic relationships and connectivity of adjacent Hector's dolphin populations.	WCNI – *northern zone* NCSI – Golden & Tasman Bays NCSI – Marlborough Sounds ECSI – Cloudy Bay ECSI – Timaru ECSI – Otago SCSI – Porpoise Bay WCSI - Karamea North
16	Understanding factors that influence trawl capture	ECSI – Timaru
17	Understanding how dolphins are using the water column	ECSI – Kaikoura
18	Understanding the sub-lethal effects of noise and the suitability of existing regulations	Not dependent on sub-population
19	Understanding diel movements and foraging behaviour	WCNI – *northern zone* NCSI – Marlborough Sounds ECSI – Cloudy Bay
20	Understanding the distribution and genetics of ephemeral populations e.g. ECNI	WCNI – *southern zone* ECNI
21	Understanding how the dolphins are interacting with different fisheries. Fine scale behaviour around fishing gear, vessels, and different fisheries types.	ECSI – Kaikoura ECSI - Timaru
22	Are ECNI dolphins a remnant population or new immigrants?	ECNI
23	Understanding what factors within turbidity are driving distribution.	
24	Estimating potential climate change effects on each sub-population, with special focus on Māui dolphins and understanding thermal thresholds for calves	ECSI –Banks Peninsula
25	Understand climate change effects on key prey species	ECSI –Banks Peninsula SCSI – Te Waewae Bay

Ranked research need and key sub-populations

Research priorities by sub-population

Population	Research need	Potential Approaches	Theme [Priority]
WCNI *northern zone*	Age structure	Epigenetic aging from biopsy	1.a.i [1]
	Reproduction	Analysis of historical field observation, coupled with epigenetic aging	1.a.i [1]
	Genetic population structure and connectivity	Genetic analysis of existing samples and from biopsy	1.a.ii [14], 1.a.iii [15]
	Distribution	Acoustic monitoring and drone survey. Refine habitat preference models.	1.b.i.1[2], 1.b.i.2 [5], 1.b.i.5 [6]
	Abundance	Genetic capture-recapture, drone survey programme	1.c.i [3]
	Behaviour/movement	Drone	2.a [5], 2.d [19]
	Diet	Isotope analysis from biopsy. DNA analysis of contents of alimentary canal.	2.b [12]
	Prey distribution	Fish trap/ prey surveys/ analysis of fishery and survey data.	1.b.5 [6], 2.b.[12]
	Estimating levels of recreational, cultural, and illegal fisheries by-catch		3.a.iii [10]
	Disease	Necropsy of recovered carcasses. Beach surveys	3.b.i,ii,iii [8], 3.b.iv [13]
WCNI *southern zone*	Genetics	Opportunistic biopsy	1.b.6 [20]
	Distribution	Citizen science – sightings	1.b.i.6 [20]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]
ECNI	Genetics	Opportunistic biopsy	1.b.6 [20]
	Distribution	Citizen science – sightings	1.b.6 [20]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]
NCSI Golden and Tasman Bays	Distribution and Genetics	Targeted and opportunistic biopsy programmes	1.a.ii [14], 1.a.iii [15], 1.b.i.1 [2], 1.b.i.2 [5]
	Abundance	Boat-based and drone surveys	1.c.i [3]
	Connectivity	Acoustic monitoring	1.b.4 [9]
	Diet	Isotope analysis from biopsy	2.b [12]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]
NCSI Marlborough Sounds	Genetics	Targeted and opportunistic biopsy programmes. Boat-based and drone surveys	1.a.ii [14], 1.a.iii [15], 1.b.i.1 [2], 1.b.i.2 [5]
	Abundance	Targeted and opportunistic biopsy programmes. Boat-based and drone surveys	1.c.i [3]
	Distribution	Boat-based and drone surveys. Citizen science – e.g. from tourism operations.	1.b.i.1 [2], 1.b.i.2 [5], 2.d [19]
	Connectivity	Genetics and Acoustic monitoring	1.a.ii [14], 1.a.iii [15], 1.b.4 [9]
	Diet	Isotope analysis from biopsy	2.b [12]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]
	Genetics	Genetic analysis of existing samples	1.a.ii [14], 1.a.iii [15]
	Connectivity to Marlborough Sounds	Acoustic monitoring	1.b.i.1 [2], 1.b.i.2 [5]
ECSI Cloudy Bay	Distribution	Drone	1.b.i.1 [2], 1.b.i.2 [5], 2.d [19]
	Reconciling population estimate methods	Analysis of data from previous studies.	1.c.ii [11]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]
ECSI Kaikoura	Reconciling population estimate methods	Analysis of data from previous studies.	1.c.ii [11]
	Diving behaviour	Acoustic tag?	2.c [17]
	Presence and Behaviour around set nets at depth set, setting and hauling	Acoustic monitoring	3.a.ii [7], 2.c [17], 3.a.v [21]
	Cryptic mortality	Acoustic and visual monitoring	3.a.ii [7]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]
ECSI Banks Peninsula	Demographics – frequency of pods with calves	Analysis of long-term BPMMS dataset	1.a.i [1]
	Demographic changes with environmental variables.	Analysis of long-term datasets. Is dependent on data from previous question	1.a.i [1], 3.d.ii [24], 3.d.iii [25]
	Ongoing population monitoring	Visual surveys	1.c.i [3]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]
ECSI Timaru	Genetics – how do they relate to other ECSI open or closed population	Biopsy	1.a.ii [14], 1.a.iii [15]
	Interaction with trawl fisheries	Acoustic and visual monitoring	3.a.i [4], 3.a.iv [16], 3.a.v [22]
	Cryptic mortality	Acoustic and visual monitoring	3.a.ii [7]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]
ECSI Otago	Abundance	Boat based visual survey	1.c [3]
	Offshore distribution	Acoustic monitoring	1.b.i.1 [2], 1.b.i.2 [5]
	Genetics – how do they relate to other ECSI populations and SCSI, open or closed population	Biopsy	1.a.ii [14], 1.a.iii [15], 1.b.i.4 [9]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]
SCSI Porpoise Bay	Genetics	Targeted Biopsy	1.a.ii [14], 1.a.iii [15], 1.b.i.4 [9]
	Dolphin prey modelling	Prey survey, modelling	1.b.i.5 [6], 2.b [12]
	Diet	Isotope analysis of biopsy	2.b [12]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]
SCSI to Te Waewae Bay	Winter Distribution	Drone survey, acoustic monitoring	1.b.i.1 [2], 1.b.i.2 [5]
	Abundance	Drone/aerial survey	1.c.i [3]
	Diet	Biopsy/carcass Isotope?	2.b [12]
	Dolphin prey modelling	Prey surveys	2.b [12], 3.d.iii [26]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]
WCSI Karamea North	Genetic connectivity to Golden Bay	Boat based biopsy sampling	1.a.ii [14], 1.a.iii [15]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]
WCSI	Diet?	Isotope analysis from existing samples?	2.b [12]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]

Research priorities by sub population

North Island

Population	Research need	Potential Approaches	Theme [Priority]
WCNI *northern zone*	Age structure	Epigenetic aging from biopsy	1.a.i [1]
	Reproduction	Analysis of historical field observation, coupled with epigenetic aging	1.a.i [1]
	Genetic population structure and connectivity	Genetic analysis of existing samples and from biopsy	1.a.ii [14], 1.a.iii [15]
	Distribution	Acoustic monitoring and drone survey. Refine habitat preference models.	1.b.i.1[2], 1.b.i.2 [5], 1.b.i.5 [6]
	Abundance	Genetic capture-recapture, drone survey programme	1.c.i [3]
	Behaviour/movement	Drone	2.a [5], 2.d [19]
	Diet	Isotope analysis from biopsy. DNA analysis of contents of alimentary canal.	2.b [12]
	Prey distribution	Fish trap/ prey surveys/ analysis of fishery and survey data.	1.b.5 [6], 2.b.[12]
	Estimating levels of recreational, cultural, and illegal fisheries by-catch		3.a.iii [10]
	Disease	Necropsy of recovered carcasses. Beach surveys	3.b.i,ii,iii [8], 3.b.iv [13]
WCNI *southern zone*	Genetics	Opportunistic biopsy	1.b.6 [20]
	Distribution	Citizen science – sightings	1.b.i.6 [20]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]
ECNI	Genetics	Opportunistic biopsy	1.b.6 [20]
	Distribution	Citizen science – sightings	1.b.6 [20]
	Disease	Necropsy of recovered carcasses	3.b.i,ii,iii [8]

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Current Research

- Current research projects with project descriptions will be updated regularly as they are developed. These current research projects can be viewed in an active document that will be updated regularly, including links to associated outputs available through the DOC webpage.

Project theme	Project description
Life history and population dynamics	Determining abundance of Māui dolphins and other demographic parameters through genetic mark-recapture on a five-yearly basis. Including determining population trend.
Life history and population dynamics	Epigenetic aging of Māui dolphin population from biopsy samples
Life history and population dynamics	Updated Genetic analysis of Hector's dolphin samples within NZCeTA
Life history and population dynamics	Population estimate for Hector's dolphins from Otago using photo ID
Habitat use, behaviour, and diet	Revealing Māui diet through stable isotope analysis of samples from biopsy
Habitat use, behaviour, and diet	Revealing Hector's dolphin diet from top of the South Island through stable isotope analysis of samples from biopsy
Understanding threats	Necropsy programme

Questions?

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