

Conservation Services Programme

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Sea Turtle Medium-Term Research Plan 2022- 2023

December 2022

Conservation Services Programme

Department of Conservation

1. Purpose

The Conservation Services Programme (CSP) undertakes research to understand and address the effects of commercial fishing on protected marine species in New Zealand fisheries waters ([CSP Strategic Statement](#)).

This research plan (the plan) outlines a rolling five-year research programme to deliver on the sea turtle population, mitigation and interaction research component of CSP. It has been developed as part of the work of the CSP Research Advisory Group ([CSP RAG](#)) and will be used in the development of CSP Annual Plans and any other relevant delivery mechanisms.

Development of the plan has been guided by the objectives of the CSP, Te Mana o te Taiao - Aotearoa New Zealand Biodiversity Strategy 2020 and the Department's Endangered, Threatened and Protected Species Bycatch Strategy and Roadmap (Bycatch Strategy). It has also been informed by reviews of sea turtle bycatch in New Zealand, the conservation status of the species, and relevant international priorities for research and conservation of sea turtles (Ekert et al. 1999; Harley & Kendrick 2006; Lewison & Crowder 2007; Hamann et al. 2010; Benson et al. 2011; Roe et al. 2014; Godoy 2016, 2017; Godoy et al. 2016; Hitchmough et al. 2016; WCPFC 2017; Godoy & Stockin 2018; Parker & Rexer-Huber 2019; Abraham et al. 2021; Pilcher 2021; Dunn et al. 2022).

Research falling outside the scope of the CSP, including bycatch of protected species by recreational fishers, is not covered by this plan.

2. CSP objectives

Objective A. *Proven mitigation strategies are in place to avoid or minimise the effects of commercial fishing on protected species across the range of fisheries with known interactions.*

Objective B. *The nature of direct effects of commercial fishing on protected species is described.*

Objective C. *The extent of known direct effects of commercial fishing on protected species is adequately understood.*

Objective D. *The nature and extent of indirect effects of commercial fishing are identified and described for protected species that are at particular risk to such effects.*

Objective E. *Adequate information on population level and susceptibility to fisheries effects exists for protected species populations identified as at medium or higher risk from fisheries.*

3. Status of sea turtles in New Zealand waters

The five species of sea turtle known to occur in New Zealand waters and their conservation status are listed in Table 1. All sea turtles are protected within the Territorial Sea and Exclusive Economic Zone under the Wildlife Act 1953. Sea turtles are also subject to the Western and Central Pacific Fisheries Commission (WCPFC) Conservation and Management Measure 2018-

04: Conservation and Management of Sea Turtles. Among other things, the latter requires all members, co-operating members and participating territories adopt the FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations and ensure the safe handling of all captured sea turtles, in order to improve their survival.

Loggerhead sea turtle (*Caretta caretta*), hawksbill sea turtle (*Eretmochelys imbricata*) and olive ridley sea turtle (*Lepidochelys olivacea*) are vagrants, whereas New Zealand's offshore waters are a foraging habitat for leatherback turtles (*Dermochelys coriacea*) migrating from western Pacific nesting beaches (Benson et al. 2011; Godoy 2016; Hitchmough et al. 2016; Dunn et al. 2022). In contrast, inshore habitats around the upper North Island constitute a transitional developmental ground for post-pelagic immature green turtles (Godoy et al. 2016). The New Zealand green turtle population comprises immature juveniles to large subadults. The female:male sex ratio is 1.7:1, similar to warm temperate foraging grounds in eastern Australia. Size at recruitment to New Zealand inshore habitats is about 40.8 cm curved carapace length (Godoy et al. 2016).

Table 1. Conservation status of sea turtles occurring in New Zealand waters.

Common names	Scientific Name	Family	Protecting Legislation	NZTCS Status	Qualifier	IUCN Red List status
Leatherback sea turtle	<i>Dermochelys coriacea</i>	Dermochelyidae	Wildlife Act 1953	Migrant	TO	Critically Endangered
Loggerhead sea turtle	<i>Caretta caretta</i>	Cheloniidae	Wildlife Act 1953	Vagrant	DP, TO	Critically Endangered
Hawksbill sea turtle	<i>Eretmochelys imbricata</i>	Cheloniidae	Wildlife Act 1953	Vagrant	DP, TO	Critically Endangered
Olive ridley sea turtle	<i>Lepidochelys olivacea</i>	Cheloniidae	Wildlife Act 1953	Vagrant	DP, TO	Vulnerable
Green sea turtle	<i>Chelonia mydas</i>	Cheloniidae	Wildlife Act 1953	Migrant	TO	Endangered

4. Information needs

Hamann et al. (2010) identified the following global research priorities to aid the conservation of sea turtles:

1. Reproductive biology

1.1. What are the factors that underpin nest site selection and behaviour of nesting turtles?

1.2. What are the primary sex ratios being produced and how do these vary within or among populations and species?

1.3. What factors are important for sustained hatchling production?

2. *Biogeography*

2.1. What are the population boundaries and connections that exist among rookeries and foraging grounds?

2.2. What parameters influence the biogeography of sea turtles in the oceanic realm?

2.3. Where are key foraging habitats?

3. *Population ecology*

3.1. Can we develop methods to accurately age individual turtles, determine a population's (or species') mean age-at-maturity, and define age-based demography?

3.2. What are the most reliable methods for estimating demographic parameters?

3.3. How can we develop an understanding of sea turtle metapopulation dynamics and conservation biogeography?

3.4. What are the past and present roles of sea turtles in the ecosystem?

3.5. What constitutes a healthy turtle?

4. *Threats*

4.1. What will be the impacts from climate change on sea turtles and how can these be mitigated?

4.2. What are the major sources of fisheries bycatch and how can these be mitigated in ways that are ecologically, economically and socially practicable?

4.3. How can we evaluate the effects of anthropogenic factors on sea turtle habitats?

4.4. What are the impacts of pollution on sea turtles and their habitats?

4.5. What are the etiology and epidemiology of fibropapillomatosis (FP), and how can this disease be managed?

5. *Conservation strategies*

5.1. How can we effectively determine the conservation status of sea turtle populations?

5.2. What are the most viable cultural, legal and socio-economic frameworks for sea turtle conservation?

5.3. Which conservation strategies are working (have worked) and which have failed?

5.4. Under what conditions (ecological, environmental, social and political) can consumptive use of sea turtles be sustained?

As New Zealand is a foraging ground for leatherback turtles and a post-pelagic settlement habit for juvenile green turtles, the information required to understand and mitigate the effect of commercial fisheries on these species is therefore (Hamann et al. 2010 research topics indicated in brackets):

- What are the connections between source populations/nesting beaches and New Zealand (2.1)?
- What is the status of the populations interacting with New Zealand fisheries (2.1, 3.3, 5.1)?
- What parameters influence the distribution of sea turtles in New Zealand waters, particularly with respect to overlap with commercial fisheries (2.2)?
- Where are the key foraging habitats for each species (2.3)?
- How might climate change influence the occurrence and distribution of sea turtles and overlap with commercial fisheries in New Zealand (4.1)?
- What are the major sources of fisheries bycatch and how can these be mitigated (4.2, 5.3)?

5. Proposed research

Dunn et al. (2022) found 273 reported turtle captures in commercial fisheries between 2007–08 and 2020–21 (range 2–58, average 19.5 per year). Forty-nine (17.9%) were reported by fishery observers, with the majority being self-reported by fishers. Leatherback turtles were the most frequent species in self-reported captures (n = 217; 79.5%), followed by green turtles (n = 25; 9.2%). Thirty-seven (76%) of the turtles reported by observers were leatherbacks. Most turtle captures were reported in surface longline fisheries targeting bigeye tuna or swordfish off northeast North Island (FMA1) between January and April each year. Most captures of all species were in surface longline fisheries with small numbers of leatherback, green and loggerhead turtles taken in inshore bottom trawl, and small numbers of green and loggerhead turtles on bottom longlines (Dunn et al. 2022). No captures were reported in set net fisheries, although interactions with set net fisheries are known to occur elsewhere.

The projects proposed in this research plan address the knowledge gaps identified above and are intended to improve understanding of the actual and potential risks to sea turtles from commercial fishing.

The projects have been developed to wherever possible provide:

- improved identification of bycaught turtles
- improved reporting of bycatch
- collection of biological data and where appropriate samples
- better understanding of connectivity between New Zealand foraging grounds and source breeding populations
- improved understanding of spatial and temporal overlap with commercial fisheries
- assessment of post-release survival
- mitigation and release methods that maximise post-release survival.

Prioritisation of projects considered:

- species risk assessments and threat classification
- existing information and information gaps
- the frequency of fishery interactions

- potential synergies with research projects conducted or proposed by other agencies and research providers
- the potential to leverage additional resources from other programmes
- legal and logistic constraints (e.g., animal ethics, health and safety, retention of protected species, size and encounter rates)
- the need for periodic review to ensure ongoing relevance of data and sample collection.

Observer Programme

As well as providing independent information on catch, effort, and fishing practices fishery observers play an important role in documenting protected species interactions with fisheries, the efficacy of mitigation measures, and obtaining data and samples from live and dead specimens. However, prior to 2021-22, observer coverage in the surface longline fishery had not been optimised to document turtle bycatch (Godoy 2016; Dunn et al. 2022). Increased observer coverage of the surface longline fishery off the northeast North Island in 2021-22 coincided with the highest level of observed and reported turtle bycatch. Since then, observer coverage of surface longline fisheries has been very low due to health and safety considerations limiting the vessels observers can be deployed on. Full camera coverage of surface longline fisheries is planned and expected to be rolled out in the next two years.

Data required to adequately monitor and understand the impact of fishery interactions on sea turtles that should be collected through observation of commercial fisheries includes:

- photographs to confirm species identification
- spatial and temporal nature of interactions
- gear type (including hook type and size, bait type)
- duration of set
- size and where possible sex of the animals
- condition of the animal upon landing and release, including any injuries
- type and amount of gear attached to released animals
- the animal's response upon release
- tissue samples for genetic analyses from dead animals.

Specific information relevant to longline fisheries includes:

- sea surface temperature (SST) (°C)
- number of hooks from the nearest float
- number of hooks between floats
- species caught either side of the turtle
- how the animal was caught (i.e. entangled in backbone or branch line, hooked externally, body part hooked or entangled, hooked in the mouth, deeply hooked)
- length of line left attached to the animal.

Research will be required to determine the level of review of camera footage required to accurately estimate levels of turtle bycatch.

Green, hawksbill, olive ridley and loggerhead turtles

Owing to the small number of reported bycatch for these species in commercial fisheries data collection will be primarily via the observer and camera programmes.

Given the importance of the northern North Island as a post-pelagic settlement habit for juvenile green turtles, and the known range of interactions this species has with commercial fisheries elsewhere, further work is required to identify potential and actual interactions with inshore commercial fisheries in New Zealand, particularly set-net fisheries. At present the ability to undertake this work is restricted by limited data and observer coverage of these fisheries (Dunn et al. 2022). Opportunities to undertake fishery independent surveys of abundance and study habitat use by green turtles in northern New Zealand will be explored.

Leatherback turtle

The Western Pacific leatherback turtle population is critically endangered and threatened with extinction if all anthropogenic impacts on the species are not reduced to sustainable levels. Current levels of bycatch in surface longline fisheries are high and levels of post-release mortality are unknown but could be biologically significant. There is an urgent need to accurately estimate the total number of leatherback turtle captures and mortality in all fisheries, particularly surface longline fisheries. This will require improved observer coverage and/or a high level of review of camera footage once these are rolled out. Also required is detailed information on how the animals are caught, particularly the number ingesting hooks and those being released with gear still attached; the condition upon release; types of injuries suffered. Length and sex data of captured leatherback turtles is also needed to assess the biological significance of fishery interactions. While a limited number of satellite-tagged leatherbacks have been tracked to northern New Zealand, the collection of tissue samples for genetic identification of source populations/breeding beaches is also needed.

Work is ongoing on developing predictive models of leatherback turtle distribution in New Zealand waters. These models may be able to advise fishers of areas they should avoid due to the risk of leatherback turtle interactions as similar tools are used in Hawaii. However, data on leatherback turtle distribution in New Zealand is limited due to the absence of any fishery independent sources of information on distribution and density. Aerial surveys have proved useful in monitoring leatherback turtle distribution and abundance in the northwest Atlantic and California Current System and their use should be investigated in New Zealand. The deployment of more temperature and depth recorders on surface longlines, particularly in regions with reported leatherback turtle bycatch, would serve to improve habitat suitability models for leatherbacks and knowledge of the depths at which surface longlines fish. Opportunities to undertake satellite tagging studies of free-ranging leatherbacks in New Zealand waters will also be explored to improve knowledge of habitat use in New Zealand and regional connectivity.

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Appendix 1.

Global research priorities for sea turtles identified by Hamann et al. (2010)

1. Reproductive biology

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