Conservation Services Programme

Sea Turtle Medium-Term Research Plan

December 2024

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, cooperating 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 likely to be vagrant in New Zealand waters, whereas leatherback (*Dermochelys coriacea*) and green (*Chelonia mydas*) sea turtles are migrants (Hitchmough et al. 2016). Leatherback turtles migrate annually from nesting beaches in the southwest Pacific to forage in oceanic and outer shelf habitats around northern and southern New Zealand beaches (Benson et al. 2011; Godoy 2016; Dunn et al. 2022). In contrast, green sea turtles appear to use inshore waters around the upper North Island as a transitional developmental ground (Godoy 2016; Godoy et al. 2016). Sizes of green turtles found around the upper North Island range in size from small post-pelagic juveniles to large subadults. The sex ratio is 1.7 females:1 male, similar to warm temperate foraging grounds in eastern Australia (Godoy et al. 2016). Size at recruitment to New Zealand inshore habitats is about 40.8 cm curved carapace length (Godoy et al. 2016). There is little information on the size and sex of leatherback turtles occurring in New Zealand waters (Dunn et al. 2022).

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	*Dermochelys coriacea*	Dermochelyidae	Wildlife Act 1953	Migrant	TO	Critically Endangered
Loggerhead sea turtle	*Caretta caretta*	Cheloniidae	Wildlife Act 1953	Vagrant	DP, TO	Critically Endangered
Hawksbill sea turtle	*Eretmochelys imbricata*	Cheloniidae	Wildlife Act 1953	Vagrant	DP, TO	Critically Endangered
Olive ridley sea turtle	*Lepidochelys olivacea*	Cheloniidae	Wildlife Act 1953	Vagrant	DP, TO	Vulnerable
Green sea turtle	*Chelonia mydas*	Cheloniidae	Wildlife Act 1953	Migrant	TO	Endangered

4. Information needs

The information required to understand and mitigate the effect of commercial fisheries on leatherback and green sea turtles in New Zealand waters includes (global research priorities from Hamann et al. 2010 indicated in brackets):

- identification of source populations and the connections between nesting beaches and New Zealand (2.1)
- the status of the populations interacting with New Zealand fisheries (2.1, 3.3, 5.1)
- identification of the parameters influencing the distribution of sea turtles in New Zealand waters, particularly with respect to overlap with commercial fisheries (2.2)
- identification of high use areas for each species (2.3)
- assessment of the influence of climate change on the occurrence and distribution of sea turtles and overlap with commercial fisheries in New Zealand (4.1)
- characterisation of fisheries interactions, catchability of sea turtles, estimation of post-release survival and the effectiveness of mitigation methods (4.2, 5.3).

5. Proposed research

A total of 273 sea turtles were reported as captured in New Zealand commercial fisheries between 2007–08 and 2020–21 (range 2–58, average 19.5 per year) (Dunn et al. 2022). 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 sea turtle captures were reported 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 largest number of sea turtle captures occurred in surface longline fisheries targeting bigeye tuna or swordfish off northeast North Island (FMA1) between January and April each year.

The projects proposed in this research plan address the research needs 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.

Monitoring Fishery Interactions

Historically, fishery observers have played an important role in providing independent information on catch, effort, fishing practices, documenting protected species interactions, the efficacy of mitigation measures, and collection of data and samples from live and dead specimens. 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 high levels 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. Roll-out of the electronic monitoring programme across the inshore fleet, including surface longliners, will hopefully address past gaps in observer coverage and reinstate observation of vessels considered too risky to deploy observers on.

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
- DNA samples to confirm species identification and determine source population
- location (as accurate as possible), date and time of interactions
- gear type
- duration of set
- size (curved carapace length, curved carapace width) and where possible, sex
- 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.

Information needs specific to longline fisheries include:

- sea surface temperature (SST) (°C)
- number of hooks from the turtle to the nearest float
- number of hooks between floats
- hook type and size
- bait type (squid, fish, artificial, lure)
- 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.

Although it is expected that all surface longline vessels will eventually be fitted with cameras for monitoring purposes, not all the footage will be reviewed. Research will be required to determine the level of review needed to accurately estimate levels of turtle bycatch and confirm what information on turtle interactions can be obtained from cameras (e.g., gear and bait type, status of the animal when brought to the vessel, how the animal was caught, types of injuries, condition of the animal and amount of attached gear upon release). Biological sampling and post-release mortality studies on protected sea turtles will require the placement of trained observers or researchers aboard fishing vessels with required Wildlife Act Authority and Animal Ethics Committee (AEC) approvals.

Green, hawksbill, olive ridley and loggerhead turtles

Owing to the small number of captures of these species in commercial fisheries, data collection will primarily be via the observer and electronic monitoring 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 inshore set net fisheries. At present, the ability to undertake this work is restricted by limited data and low levels of observer coverage (Dunn et al. 2022). Fisheries independent surveys of abundance and study of habitat use by green turtles in northern New Zealand is planned from 2025.

Leatherback turtle

The Western Pacific leatherback turtle populations that visit New Zealand waters are critically endangered and threatened with extinction if all anthropogenic impacts on the species are not reduced to near zero levels (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2020). Observed and estimated levels of bycatch in surface longline fisheries are high and nearly all turtles are released alive, however post-release mortality rates are currently unknown and they could be biologically significant (Dunn et al. 2022). In September 2024, FNZ undertook a project (PRO2023-15) to estimate post-release survivability based on currently available data and included a review of current methodology for estimates developed by Ryder et. al. (2006). Estimates were 85% survival rates, however there is still some doubt about the suitability of that methodology to a New Zealand commercial fishing context. More detailed information is required on how the animals are caught, particularly the number ingesting hooks and those being released with gear still attached; the condition upon release; and types of injuries suffered. Length and sex data of captured leatherback turtles is also needed to assess the biological significance of fishery interactions. Fishers would also benefit from training to improve handling and release techniques, and a review is required to ensure the most appropriate turtle de-hooking equipment is available on vessels. While a limited number of satellite-tagged leatherbacks have been tracked to northern New Zealand from western Pacific breeding beaches, the collection of tissue samples is needed to confirm the source populations of the turtles interacting with fisheries here. This is difficult to achieve without trained observers or researchers onboard vessels at the time of capture who have the required Wildlife Act authority and AEC approvals to carry out manipulations. The size of leatherback turtles also means it is not possible to satellite tag bycaught animals from the deck of fishing vessels and new tagging methods are being investigated for 'in-water' tagging. Catching and tagging free-swimming leatherback turtles requires a dedicated vessel, specialised equipment, a spotter aircraft and necessary AEC and Wildlife permits to undertake manipulations on protected

species (e.g. https://www.fisheries.noaa.gov/west-coast/science-data/marine-turtle-biotelemetry).

Work is ongoing to investigate the potential for use of a predictive modelling tool for leatherback turtle distribution and interaction with surface longline fisheries in New Zealand waters. This is based on the Upwell Turtle integrated species distribution model developed by Aimee Hoover for Western Pacific leatherback turtles using telemetry data (e.g. sea surface temp, bathymetry, residence times of leatherbacks, tracking data) and observations (fisher, observers and in the future electronic monitoring). 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. This is being addressed with an aerial survey of leatherback turtles in the Bay of Plenty region in March 2025 and results will inform predictive modelling. Results from the aerial survey will also help explore the potential for satellite tagging studies of free-ranging leatherbacks in New Zealand waters to improve knowledge of habitat use and regional connectivity. 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.

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Appendix 1.

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

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?