

# **INT2024-07 Collection and curation of tissue samples from protected fishes and turtles**

## **Final Annual Report 2024/25**

**Prepared for the Department of Conservation  
9 April 2025**

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**Tāmaki  
Paenga Hira  
Auckland  
War Memorial  
Museum**



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# Introduction

This project (INT2024-07) forms part of the Conservation Services Programme (CSP) administered by the Department of Conservation (DOC). The aim of the CSP is to avoid, remedy, or mitigate the adverse effects of commercial fisheries on protected species through the provision of conservation services that describe the direct and indirect effects of commercial fishing on protected species, provide information on the population level and susceptibility to fisheries of protected species most at risk from commercial fishing, and identify effective mitigation strategies (DOC 2024).

Biological sampling of protected species caught incidentally during fishing operations provides information essential for the assessment of population status and trends, and other management processes. However, carcasses of protected species generally cannot be retained and returned to port for detailed scientific examination and are usually discarded at sea. Operational constraints, health and safety considerations and the size of the animals often make detailed examination or biological sampling of bycaught protected species at sea difficult or impossible. However, biochemical analyses of small tissue samples such as fin clips or small plugs (biopsies) of skin and underlying muscle can provide important information on population size, structure and connectivity; trends in genetic diversity of populations; habitat preferences; feeding ecology; size at maturity and reproductive periodicity (Pardini et al. 2001; Hauser et al. 2002; Hoelzel et al. 2006; Gubilli et al. 2012; Francis & Ritchie 2016; Hillary et al. 2018; Lieber et al. 2020; Ng et al. 2024).

Although relatively easy to collect, tissue samples need to be carefully stored and curated, particularly as it can take a long time to accumulate a sufficient sample size for analysis. Long-term storage generally requires freezing to at least -20°C, preferably -80°C, and a system for tracking and retrieving samples and any associated data. In November 2021 Tāmaki Paenga Hira Auckland War Memorial Museum was contracted by DOC to establish and operate a tissue archive for protected fishes and marine reptiles as an extension of CSP Project INT2018-04 Improving the collection of data and samples from bycatch basking sharks (Francis 2019, Finucci et al. 2021).

The objectives of the Protected Species Tissue Archive are to:

- 1) Establish a physical archive for tissue samples collected from protected species that meets accepted national and international standards, maximises their scientific value and allows tracking of the samples and the outputs any research using them.
- 2) Coordinate the collection, receipt and curation of tissue samples collected for research by fisheries observers, DOC staff, and collaborating organisations and individuals.
- 3) Increase the visibility of samples to researchers.
- 4) Report on the status and uses of tissues stored in the archive.
- 5) Establish appropriate cultural controls for the storage, use and disposal of tissue samples obtained from taonga species.

The archive is partially funded by CSP with in-kind support provided by Auckland Museum. The core role of the Museum is to care for the taonga of Aotearoa New Zealand in a culturally appropriate way. Our procedures are continually improved to ensure they follow national and international best practice, and our vision includes supporting transition to ethical research that is respectful and inclusive of indigenous peoples. At the same time the museum is actively developing its own tissue holdings to support integrated taxonomic research, conservation genetics and the growing interest in genomics.

The purpose of this report is therefore to:

- describe any changes to procedures
- report on the number of tissue sampling kits distributed in 2024/25
- provide an update on tissue samples archived in 2024/25 including information on species, source location and number
- report on requests and use samples by researchers, including publications.

# The Protected Species Tissue Archive

All tissue samples deposited in the archive are rehoused in 1.5 ml cryovials (capable of being stored across different freezer temperatures) and stored in absolute (99.5%) ethanol at -20°C. Large samples are divided between several vials to ensure an appropriate ratio of ethanol to tissue, to retain as much tissue as possible for subsampling, and to minimise the amount of tissue that needs to go through a freeze-thaw cycle when subsampled.

Tissue samples are tracked and reported on using Vernon Systems collection management software (Vernon CMS) (<https://vernonsystems.com/products/vernon-cms/>). This software is used to manage all Tāmaki Paenga Hira Auckland War Memorial Museum’s collections. Vernon CMS database fields were assessed against the Global Genome Biodiversity Network (GGBN) Data Standard and tissue-specific fields were developed and added to Vernon.

Each tissue sample is assigned a unique TA number, and wherever possible associated with museum voucher specimens and original specimen identifiers (e.g. New Zealand Centre for Conservation Medicine, Auckland Zoo; researchers’ labels), the source collection, date of acquisition and original collector. Images associated with tissue samples in lieu of voucher specimens are attached to the Vernon database records and maintained within the Auckland Museum servers. These images allow for independent confirmation of species identification. Permission to share images collected as part of the fishery observer program is sought from MPI prior to release.

Other data fields include: cataloguer, date catalogued, measurements of the animal, tissue preparation date, who it was prepared by, object count, field collection date, specimen category, specimen category notes, field collection location, collection method, latitude and longitude of the collection locality, storage method, general flags, condition at acquisition and condition notes.

Due to the protected status of the species, access to archived samples is moderated by the Marine Species Manager, DOC, in consultation with mana whenua (iwi/whānau/hapū).

## *Cultural Protocols and Controls*

As the agency primarily responsible for the management of protected species, consultation with mana whenua on the use of specimens and data obtained from these taonga is generally undertaken by DOC. Any restrictions placed on the use of specimens by mana whenua communicated to the museum are associated with the specimen record in Vernon CMS and original specimen labels are kept by collection managers. Additional protocols involving the development Traditional Knowledge and Biocultural Labels via the [Local Contexts](#) Hub were described in the 2024 report and in detail by Anderson & Hudson (2020) and Liggins et al. (2021). The [Protected Species Tissue Archive – Auckland Museum](#) project has been created in the hub to hold these Notices and will record if a Māori community places a Label on any part of the collection. In addition, notices can be applied directly within the Vernon database using the appropriate Acquisition, Provenance & Rights and Research & Attribution fields. The museum is committed to ongoing collaboration and partnership with Māori on the care and stewardship of this collection and recognizes that the tissue archive currently has incomplete or missing information pertaining to mana whenua interests in protected species.

Access to archived samples will be moderated by the Marine Species Manager (DOC) in consultation with mana whenua. Auckland Museum will therefore:

- i. Record rights and permissions in the Vernon CMS
- ii. Direct researchers wishing to access tissue samples held in the archive to the Marine Species Manager (DOC) and the relevant iwi/whānau/hapū

- iii. Work with DOC, mana whenua and researchers to define appropriate conditions of loan and reporting requirements, including but not limited to the provision and sharing of data and research findings, acknowledgement of indigenous intellectual property rights, and acknowledgement of mana whenua, DOC and the museum in any publications arising from the research.

### *Increasing the Visibility of Samples to Researchers*

Tissue archive samples and associated data are discoverable on Auckland Museums Collections Online. Locality information provided through Collections Online is generalised due to the protected and threatened status of these species. Data in the tissue archive is shared through the Genomic Observatories Meta-Database (GEOME: <https://geome-db.org/workbench/project-overview?projectId=597>). This web-based database makes the tissue archive searchable alongside other global collections. Tissue archive data is also shared with GBIF as part of regular Auckland Museum data uploads to that platform.

Ricky-Lee Erickson, former Collection Manager, Land Vertebrates & Tissue Archive, gave the following presentation to the annual conference of the Society for the Preservation of Natural History Specimens conference, Okinawa, Japan, September 2-6, 2024: *Bringing invisible genetic samples into focus: a new tissue archive with cultural permissions and international data standards in mind*. Topics covered by this presentation included development of the tissue window in Vernon CMS after mapping GGBN core fields to Vernon fields, standardization of tissue storage at Auckland Museum, development of the Rights process for Cultural Permissions and content of the archive. The following challenges encountered during the establishment and operation of the archive were identified:

- data loss due to poor historical curation
- the need to chase researchers for tissue samples
- Genbank's reliance on researchers to enter the correct institution code and registration numbers when submitting data
- reluctance of Fisheries NZ to provide location data for specimens caught incidentally in commercial fisheries
- linked records in Vernon CMS do not automatically update.

## Archive Status and Activity in 2024-25

As of 8 April 2025, the Protected Species Tissue Archive contained 757 samples from 172 protected fishes and sea turtles (Table 1). Samples accessioned between 1 July 2024 and 19 February 2025 are listed in Table 2.

There have been no requests to refresh sampling kits this year, although six new sampling kits were made for a trip to the Ross Sea, Antarctica, at DOC's request. Twenty kits are available for deployment.

In May 2025 a request for tissue samples from 10-15 young-of-the-year (YOY) or juvenile white sharks (*Carcharodon carcharias*) collected over the last five years was received from Dr Adam Miller, Senior Ecologist, Ecological Genomics, Cesar Australia / Adjunct Associate Professor, Flinders University, South Australia. This request was for a global white shark genomic study that aims to use whole genome sequences and a new analytical pipeline to:

- Develop robust estimates of effective white shark population sizes ( $N_e$ )
- Provide context around current estimates of  $N_e$  by understanding how these compare to historical estimates and trends in population size
- Quantify the impacts of historical declines on the population sizes of white sharks

- Determine the likely growth trajectories of each population.

Following approval of the request by the Department of Conservation and completion of a Auckland Museum Research Loan Agreement samples from 18 YOY and juvenile white sharks were sent to Dr Miller and Dr Lauren Meyer, Flinders University.

**Table 1.** Total number of individuals and tissue samples of each species deposited in the Protected Species Tissue Archive on 8 April 2025.

Species	Common name	Species Code	Individuals	Samples
<i>Carcharhinus longimanus</i>	Oceanic whitetip shark	OWS	7	8
<i>Carcharodon carcharias</i>	White shark	WPS	62	118
<i>Cetorhinus maximus</i>	Basking shark	BSK	4	15
<i>Mobula birostris</i>	Oceanic manta ray	RMB	1	3
<i>Mobula mobular</i>	Spine-tail devil ray	MJA	2	2
<i>Epinephelus daemeli</i>	Spotted black grouper	SBG	1	1
<i>Dermochelys coriacea</i>	Leatherback turtle	LBT	4	10
<i>Chelonia mydas</i>	Green turtle	GNT	56	337
<i>Eretmochelys imbricata</i>	Hawksbill turtle	HBT	10	97
<i>Lepidochelys olivacea</i>	Olive ridley turtle	ORT	25	166
<b>Total:</b>			172	757

**Table 2.** Tissue samples deposited in the Protected Species Tissue Archive between 1 July 2024 and 19 February 2025.

Accession No.	Species	Common name	Date	Location	Collector
LH4211	<i>Eretmochelys imbricata</i>	Hawksbill turtle	11-May-10	Tokerau Beach, Karikari Peninsula	Department of Conservation
TA003361, 003362	<i>Chelonia mydas</i>	Green turtle	15-Jun-24	Algies Bay, Auckland	Department of Conservation
TA003363, 003364, 003365, 003366	<i>Chelonia mydas</i>	Green turtle	12-Jul-24	Devonport Beach, Auckland	Department of Conservation
TA003367, 003368, 003369	<i>Eretmochelys imbricata</i>	Hawksbill turtle	6-Aug-24	Te Arai Beach, Northland	Department of Conservation
TA003371, 003372	<i>Chelonia mydas</i>	Green turtle	19-Aug-24	Kendell Bay, Birkenhead	Department of Conservation
TA003370	<i>Chelonia mydas</i>	Green turtle	21-Aug-24	off Waiheke Island, Hauraki Gulf	Department of Conservation

Accession No.	Species	Common name	Date	Location	Collector
TA003373, 003374, 003375, 003376	<i>Chelonia mydas</i>	Green turtle	30-Aug-24	Urquharts beach, Whangarei	Department of Conservation
TA003396, 003397	<i>Chelonia mydas</i>	Green turtle	15-Oct-24	Otautu Bay Beach, Coromandel Peninsula	Department of Conservation
TA002182, 002173, 002216	<i>Lepidochelys olivacea</i>	Olive ridley turtle	30-Oct-24	Foxton Beach, Manawatu	Wildbase Hospital
TA002193, 002194, 002195	<i>Carcharodon carcharias</i>	White shark	7-Dec-24	Ahipara, Northland	Department of Conservation
TA002196, 002200	<i>Carcharodon carcharias</i>	White shark	7-Jan-25	Waikanae Estuary, Kapiti Coast	Department of Conservation
TA003653	<i>Chelonia mydas</i>	Green turtle	29-Jan-25	West Haven, Auckland	Department of Conservation

## Discussion

The Protected Species Tissue Archive has been successful in consolidating a large number of tissue samples in a relatively short period of time, with samples sizes for great white shark, green turtle and olive ridley turtle close to or exceeding 30 individuals per species. The value of the archive as a long-term repository for this type of material was highlighted by the closure of the School of Natural Sciences at Massey University's Albany Campus in 2024. The closure put a large number of samples collected from more than 85 sea turtles that stranded in New Zealand DOC between 2003-2018 at risk. Although most of the material ultimately had to be discarded a team from DOC and the museum was able to catalogue and sub-sample all the material in the collection with associated provenance data, ensuring its ongoing availability for research.

Due to turnover and structural changes there is an ongoing need to remind DOC biodiversity staff, particularly rangers, to collect tissue samples from dead animals and send these to the archive. This is probably best done in early spring as the number of stranding events generally peaks between September and early December. At the same time there is also a need to formalize the process around sub-samples being sent to the tissue archive from the Auckland Zoo Vet Hospital. At present this process is haphazard and the archive does not receive tissue samples from every animal treated at the hospital.

The collection of tissue samples by fisheries observers and fishers remains low despite repackaging pre-existing kits into smaller containers to make them easier to pack into gear bags. This is likely due to infrequent capture of protected species, low observer coverage in some of the fisheries catching these species, health and safety restrictions preventing observers approaching the animals and the large size of some of the animals preventing them from being landed.

While the Local Contexts Hub provides an avenue for mana whenua to express their rights and interest in the samples stored in the tissue archive, some have expressed reservations about the process and would prefer to engage directly with either DOC or the museum on this matter.

## **Recommendations**

- 1) The Protected Species Tissue Archive has reached the point where it can begin providing essential material and data for research on New Zealand's protected fishes and marine reptiles and should therefore be continued.
- 2) Recent events in the tertiary education sector and changes to crown research institutes demonstrate that housing nationally significant collections such as this in museums provides for greater stability and continuity of care, as well as improved access to genetic samples.
- 3) DOC biodiversity staff should be reminded to collect and deposit tissue samples in the archive prior to the peak of turtle strandings in spring-early summer each year.
- 4) There is a need to improve the process around the deposition of tissue samples collected from animals treated at Auckland Zoo in the archive.
- 5) Agreements between DOC, researchers and mana whenua need to be clearly communicated to the museum so that these can be accurately reflected in the permissions and uses attributed to samples.
- 6) Efforts to maximise the number of samples collected by Fisheries Observers and/or fishers should be continued, particularly for threatened species with low sample sizes such as leatherback turtles and basking sharks.
- 7) The IUCN-SSC Marine Turtle Specialist Group and Asia-Pacific Marine Turtle Genetic Working Group (<http://www.marineturtlegenetics.org/>) should be updated on the status of the tissue archive and the process for loaning material from it.
- 8) Consideration should be given to expanding the archive to include other marine protected species such as corals.



## Acknowledgements

This work is an output from Conservation Services Contract *INT2024-07 Collection and curation of tissue samples from protected fishes and turtles*. Rebecca Bray, Ricky-Lee Erickson, Emily Workman, and Tom Trnski (AM), Libby Liggins (University of Auckland), Logan Gibb (MPI) and Karen Middlemiss (DOC) have played important roles in establishing and ensuring the success of this project. Thanks to all those researchers, observers, fishers and DOC staff that contributed samples to the archive, particularly Dr Dan Godoy for his donation of sea turtle samples and Odette Howarth (Massey) for the assistance she has provided in terms of the recovery, necropsy and sampling of protected sharks and turtles.

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## Appendices