INT2023-04 Identification of marine mammals, turtles and protected fishes captured in New Zealand commercial fisheries

Annual summary of photographs assessed (2024/25).

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Contents

Introduction

This project forms part of the Conservation Services Programme (CSP), which is administered by the Department of Conservation (DOC). The purpose of the project is to determine, primarily through examination of photographs, the taxon and where possible sex, age-class and provenance of marine mammals, turtles and protected fishes observed in interactions with New Zealand commercial fisheries (including dead specimens discarded at sea and animals released alive). In this case observed means captures recorded by Ministry for Primary Industries fisheries observers.

Fisheries observers generally do not retain carcasses of protected marine mammals, turtles and fish species killed incidentally in commercial fisheries. All observed protected species interactions with fisheries are documented digitally, including with digital imagery (still images and sometimes video). This project provides a check on the identifications made by fisheries observers at sea and attempts to capture as much information on the biology of the species concerned and nature of the interactions as is possible from images.

The key deliverables are:

1. Creation of marine mammal, turtle and protected fish ID spreadsheet for upload to Fisheries New Zealand.
2. Annual report summarising the photographs assessed.

Methods

Details of observed protected marine species (cetaceans, pinnipeds, reptiles and fishes) bycatch events contained in the Central Observer Database (COD) and images of bycaught animals were provided by the Data Management team, Fisheries Science and Information, Fisheries New Zealand – Tini a Tangaroa (FNZ), Ministry for Primary Industries on 12 February 2026 (Sanders et al. 2025). One record of a shark identified by the observer as MAK (i.e. shortfin mako, *Isurus oxyrinchus*), a QMS species, for which no images were provided was deleted from the extract. This shark was caught in a squid trawl. The observer's notes stated its 'decomposed body' had been found in the pound, indicating it was dead prior to capture.

Image files were labelled with the trip number by FNZ. As well as showing the bycaught animal or animals these also generally included a label displaying the trip number, event and interaction number and the species code of the bycaught animal. This information was also provided in the spreadsheet detailing each bycatch event. Other information sometimes recorded in the images included associated species, CSP tags, measure mats and tape measures and occasionally gear and/or structures that could be used to identify the vessel type.

Protected species were identified to the lowest taxon possible using standard identification guides and expert knowledge (King 1995; Roberts et al. 2015. The Fishes of New Zealand. Te Papa Press, Wellington Department of Conservation 2024). This information as well as sex and maturity data were inserted into the COD extract and provided to the Fisheries Bycatch Programme, Marine Bycatch and Threats Team, Department of Conservation. Where sex and maturity were difficult to determine from observer images or there were no images the lengths recorded in the COD extract were used to infer these parameters.

Results

The COD extract recorded a total of 102 observed captures of protected marine mammals and fishes. A total of 355 images of 80 marine mammals and protected fishes caught during 35 (83.3%) of the 42 observed trips documented in the COD extract were reviewed. All photographs were of trawl bycatch. Although the quality of the images varied considerably, it was possible to verify the species of all bycaught animals photographed. Images taken at night or below deck were generally of lower quality (i.e. blurred, poorly exposed, low resolution) than those taken on deck during daylight. All protected species were correctly identified by observers (Table 1).

Code	Species	Photographed		Number correctly identified by observer	Total
		No	Yes		
BDO	Bottlenose dolphin *Tursiops truncatus*		8	8 (100%)	8
BSK	Basking shark *Cetorhinus maximus*		2	2 (100%)	2
FUR	New Zealand fur seal *Arctocephalus forsteri*	21	65	65 (100%)	86
HSL	New Zealand sea lion *Phocarctos hookeri*	1	3	3 (100%)	4
PIW	Pilot whale *Globicephala* sp.		1	1 (100%)	1
WPS	Great white shark *Carcharodon carcharias*		1	1 (100%)	1
Total		**22**	**80**	80 (100%)	**102**

Table 1. Number of bycaught marine mammals and protected fish photographed and identified by observers.

The observed bycatch of marine mammals and protected fishes between 1 July 2024 and 30 June 2025 is summarized in Tables 2 and 3. New Zealand fur seals (*Arctocephalus forsteri*) constituted 84% of the observed bycatch. Most (95.3%) were caught in trawls, with 71.4% caught in trawls targeting hoki and squid (Table 2). The average number of fur seals caught per trip was 2.05 (range 0 – 8, sd. 1.82). Three fur seals caught in trawls were released alive, all others caught in trawls were dead when landed. The dead animals included remains of three that were dead prior to capture. One was a skull only, the other two were decomposing carcasses. All three fur seals caught on ling (*Genypterus blacodes*) longlines were reported to be alive at the vessel and came off the hooks as they were being lifted out of the water. Fur seal bycatch in trawls was widespread, occurring in Cook Strait, off Westland, off Canterbury (Canterbury shelf and Mernoo Saddle), and on Chatham Rise, Snares shelf and Bounty shelf. Fur seal bycatch by bottom longline occurred on Bounty shelf, and by set net on the margin of Conway Trough off Conway River, North Canterbury.

All New Zealand sealions (*Phocarctos hookeri*) were caught east to northeast of Auckland Island in trawls targeting squid (Table 2). All were dead when landed. Eight common bottlenose dolphins (*Tursiops truncatus*) were caught in a squid trawl on the western Chatham Rise. All were dead when landed. The pilot whale (*Globicephala* sp.) was a decomposing carcass brought up in a squid trawl on the continental slope east of Stewart Island. The observer

reported a squid jig was embedded beneath the whale's right pectoral fin. Decomposition of the carcass was so advanced that identification to species was not possible, however, the location of the capture suggests it is most likely to have been a southern long-finned pilot whale (*Globicephala melas edwardii*) (Rice 1998).

	Fishing Method			
Target species	**BLL**	**SN**	**TWL**	**Total**
BAR			7	7
HOK			11	11
JMA			2	2
LIN	1		2	3
SBW			2	2
SCH		1		1
SQU			15	15
Withheld			1	1
Total	**1**	**1**	**40**	**42**

Table 2. Number of commercial fishing trips with observed bycatch of marine mammals or protected fishes reported between 1 July 2024 and 30 June 2025. Fishing method: bottom longline (BLL), set net (SN) and trawl (TWL).Target species: barracouta, *Thyrsites atun* (BAR); hoki, *Macruronus novaezelandiae* (HOK); jack mackerel, *Trachurus* spp. (JMA); ling, *Genypterus blacodes* (LIN); southern blue whiting, *Micromesistius australis* (SBW); school shark, *Galeorhinus galeus* (SCH), arrow squid, *Nototodarus sloanii* (SQU); Withheld, target species cannot be identified due to MPI guidelines for the release of fisheries information.

Method and target species	**Protected Species**						**Total**
	BDO	**BSK**	**FUR**	**HSL**	**PIW**	**WPS**	
Bottom longline:							
LIN			3 (1)				**3**
Set net:							
SCH			1 (1)				**1**
Trawl:							
BAR			7 (6)			1 (1)	**8**
HOK			30 (11)				**30**
JMA			2 (2)				**2**
LIN		1 (1)	1 (1)				**2**
SBW			12 (2)				**12**
SQU	8 (1)		30 (14)	4 (4)	1 (1)		**44**
Withheld		1 (1)					**1**
Total	**8** (1)	**2** (2)	**86** (37*)	**4** (4)	**1** (1)	**1** (1)	**102**

Table 3. Marine mammal and protected fish bycatch observed between 1 July 2024 and 30 June 2025 by method and target species (number of trips). Protected species: bottlenose dolphin, *Tursiops truncatus* (BDO); basking shark, *Cetorhinus maximus* (BSK); New Zealand fur seal, *Arctocephalus forsteri* (FUR); New Zealand sea lion, *Phocarctos hookeri* (HSL); pilot whale, *Globicephala* sp. (PIW);

great white shark, *Carcharodon carcharias* (WPS). Target species: barracouta, *Thyrsites atun* (BAR); hoki, *Macruronus novaezelandiae* (HOK); jack mackerel, *Trachurus* spp. (JMA); ling, *Genypterus blacodes* (LIN); southern blue whiting, *Micromesistius australis* (SBW); school shark, *Galeorhinus galeus* (SCH), arrow squid, *Nototodarus sloanii* (SQU); Withheld, target species cannot be identified due to MPI guidelines for the release of fisheries information. * The total number of trips catching FUR was only 37 however both BAR and SQU were targeted during one trip.

The great white shark (*Carcharodon carcharias*) was caught in a barracouta trawl in western Foveaux Strait and was alive when found in the net. It is not known if it was still alive when released. One basking shark (*Cetorhinus maximus*) was caught in a trawl targeting white warehou (*Seriolella caerulea*) on Puysegur Ridge in October 2024. The other was caught on the continental slope south of Snares Islands in December 2024 in a trawl targeting ling. Both were reported as alive when landed, although it is unclear if they were still alive when released.

	Life Status Code			
Species Code	**1**	**2**	**4**	**Total**
BDO		8		8
BSK	2			2
FUR	7	75	4	86
HSL		4		4
PIW			1	1
WPS	1			1
Total	**10**	**87**	**5**	**102**

Table 4. Summary of life status of bycaught protected species recorded by fishery observers. Species code: bottlenose dolphin, *Tursiops truncatus* (BDO); basking shark, *Cetorhinus maximus* (BSK); New Zealand fur seal, *Arctocephalus forsteri* (FUR); New Zealand sea lion, *Phocarctos hookeri* (HSL); pilot whale, *Globicephala* sp. (PIW); great white shark, *Carcharodon carcharias* (WPS). Life status: alive (1), dead (2), dead prior to capture (4).

Sex and maturity of bycaught animals

Non-fish bycatch observer sex codes were reported for all bycaught animals with additional observations on sex sometimes recorded in the comments column (Table 5). Overall observers determined sex for 80% of observed marine mammals and protected fishes. This included all bottlenose dolphins and New Zealand sealions, one basking shark, one great white shark and 67 (78%) New Zealand fur seals (Table 5).

Sex and maturity of bycaught animals determined after review of observer images and lengths reported in the COD extract are summarized in Table 6. Where no images were available observer lengths and sexes were compared with the reported sex-specific lengths at maturity and maximum sizes for the species concerned. Sex and maturity of fur seals were often difficult to determine from observer images due to a combination of factors, including: the animal's dense, dark fur; poor photo quality; lack of genital imagery and the general condition/appearance of the animal. Length measurements recorded in the COD extract were used to infer the sex of as many animals as possible. It was not possible to accurately estimate lengths of bycaught animals from most of the photographs provided because

measure mats or tape measures were not always shown in photographs, positioned correctly or able to be read, although these were nevertheless useful for determining relative sizes of bycaught animals.

	Observer_sex_code				
Species	**1** (Male)	**2** (Female)	**3** (Unknown)	**4** (Not determined)	**Total**
BDO		8			8
BSK	1			1	2
FUR	47	20	13	6	86
HSL		4			4
PIW				1	1
WPS	1				1
Total	49	32	13	8	102

Table 5. Summary of sex of bycaught marine mammals and protected fishes reported by observers. Species code: bottlenose dolphin, *Tursiops truncatus* (BDO); basking shark, *Cetorhinus maximus* (BSK); New Zealand fur seal, *Arctocephalus forsteri* (FUR); New Zealand sea lion, *Phocarctos hookeri* (HSL); pilot whale, *Globicephala* sp. (PIW); great white shark, *Carcharodon carcharias* (WPS). Undetermined category includes animals that were not photographed.

	Female			**Male**			**Sex Undetermined**			
Species	Juvenile	Sub-adult	Adult	Juvenile	Sub-adult	Adult	Juvenile	Adult	Unknown	**Total**
BDO	8									8
BSK						1		1		2
FUR	1	1	7	6	12	47	5	2	5	86
HSL	3	1								4
PIW								1		1
WPS						1				1
Total	12	2	7	6	12	49	5	4	5	102

Table 6. Sex and maturity of bycaught marine mammals and protected fishes determined from review of observer_sex_codes, images and reported lengths of the animals. Species code: bottlenose dolphin, *Tursiops truncatus* (BDO); basking shark, *Cetorhinus maximus* (BSK); New Zealand fur seal, *Arctocephalus forsteri* (FUR); New Zealand sea lion, *Phocarctos hookeri* (HSL); pilot whale, *Globicephala* sp. (PIW); great white shark, *Carcharodon carcharias* (WPS). The Sex Undetermined category includes animals that were not photographed.

Female New Zealand fur seals mature around 125 cm and reach a maximum length of 150 cm; males mature around 145 cm and reach a maximum length of 250 cm (McKenzie et al. 2007). In the absence of adequate genital imagery any fur seal over 150 cm was classified as a mature male, any animal over 145 cm as mature, those between 120-145 cm as sub-adult, and those less than 120 cm as juveniles. Observers reported the lengths of 84 fur seals, of these, nine (10.7%) reported as females were reclassified as males based upon genital imagery or size (i.e. they were too large to be females), and one animal identified as a male

was reclassified as unknown because of its size and inconclusive imagery. One 60 cm juvenile brought up in a hoki trawl on the central Chatham Rise in December 2024 was dead prior to capture and was probably a recently weaned pup (King 1995; McKenzie et al. 2007). Sex was determined for 74 (86%) fur seals, of which most (63%) were classified as mature males (Table 6).

Observers reported all four bycaught New Zealand sealions as females between 150-178 cm length. Photographs were available for three. Based upon their colour and build all three were juvenile females between 150-170 cm in length. Length of the sealion that was not photographed was reported to be 178 cm. At that size it may have been a sub-adult or mature female (Gales 2002; Leung et al. 2013).

All eight bottlenose dolphins were reported to be females. Observer imagery confirmed the sex of seven as female. The sex of the eighth could not be confirmed due to the position of the carcass and quality of the image; however it appeared to lack a male genital slit. Six of these dolphins were reported to be 220 cm in length and two 200 cm length, indicating they were all juveniles or sub-adults (Constantine 2002; Crowe et al. 2025; R. Constantine pers. comm.). As no measure mat or tape measure was visible in the images of these animals the reported lengths are likely to have been visual estimates (A. Cristobal, FNZ, pers. comm.). The length of the pilot whale carcass was reported as 6 m. Length at maturity of *G. melas edwardii* in the New Zealand region is around 570 cm for males and 450 cm for females (Betty et al. 2022).

The white shark was a mature male, as evidenced by the presence of large, rotatable claspers. It was caught in a barracouta trawl in western Foveaux Strait. The length of this fish was reported as 300 cm. It is not known if this is fork length (FL) or total length (TL), an actual measurement or visual estimate. Assuming the animal was 300 cm FL the estimated TL would be about 325 cm which is well below the minimum length at maturity of 350-360 cm TL, suggesting the length recorded in the COD extract is inaccurate (Roberts et al. 2015). The sex of the basking shark caught on Puysegur Ridge was confirmed as a mature male, based on the presence of large claspers. It had a reported length of 10 m. The sex of the other basking shark was not reported in the COD extract and could not be determined due to the oblique angle of the photographs and the amount of fish on the deck. As its length was reported to be 7.5 m it could have been a maturing male or juvenile female (Roberts et al. 2015).

Discussion

No misidentifications of protected species by fisheries observers were identified. Although, some ongoing issues with the quality of observer images were encountered (e.g. difficulty reading what was written on the labels and/or the graduations on the measure mats due to over exposure of the pale materials these are made of; out of focus, poorly lit or blurred images), this was generally compensated for by the availability of multiple images of each animal.

Length data recorded by observers was useful for determining maturity and in some cases the sex of many of the animals, particularly New Zealand fur seals (*Arctocephalus forsteri*). However, it was often unclear if these are actual measurements or visual estimates.

The capture of the eight bottlenose dolphins (*Tursiops truncatus*) is notable because there are relatively few published records of the species from the Chatham Rise (Torres et al. 2014). The New Zealand bottlenose dolphin population consists of two ecotypes, an inshore population and offshore (oceanic) population (Constantine 2002; Baker et al. 2019; Zaeschmar et al. 2020). Both ecotypes occur off the northeast North Island but exhibit low levels of interaction with each

other (Zaeschmar et al. 2020). The inshore population has been relatively well studied and is recognized as comprising at least four sub-populations: Kermadec Islands, northeast North Island (Northland – Bay of Plenty), Marlborough Sounds, and Fiordland/Stewart Island/Otago. Population structure, movements and behaviour differ between these sub-populations and there appears to be little or no female gene flow between them (Tezanos-Pinto et al. 2009; Baker et al. 2019). Very little is known about the offshore ecotype due to the scale of their movements (at least 650 km) and oceanic habitat (Zaeschmar et al. 2020). The Kermadec inshore population consists of at least 90 individuals, about 250 are estimated to occur off the northeast North Island, about 385 in Marlborough Sounds (with movements between east and west coasts of South Island observed) and about 270 in Fiordland/Stewart Island/Otago (Baker et al. 2019; Crowe 2022). The offshore population contains at least 478 individuals (Zaeschmar et al. 2020).

Although bottlenose dolphins are known to occur around the Chatham Islands and over the Chatham Rise very little is known of their distribution, biology, abundance or relationship to the rest of the New Zealand population (Brabyn 1991; Torres et al. 2014). Torres et al. (2014) suggested these dolphins may belong to the offshore ecotype. Although all New Zealand bottlenose dolphins are genetically more similar to *Tursiops* from populations considered to be the offshore ecotype than the inshore ecotype, the New Zealand offshore population is morphologically, spatially and behaviourally distinct from the inshore populations (Fig. 1) (Tezanos-Pinto et al. 2009; Baker et al. 2019; Zaeschmar et al. 2020). Elsewhere, such differences between inshore and offshore populations are also associated with limited gene flow between them (Tezanos-Pinto et al. 2009; Lowther-Thieleking et al. 2015; Oudejans et al. 2015; Allen et al. 2016; Pratt et al. 2023).

A distinctive behavioural trait of New Zealand offshore bottlenose is their frequent association with false killer whales (*Pseudorca crassidens*) and southern long-finned pilot whales (*G. melas edwardii*) (Zaeschmar et al. 2020). Bottlenose dolphins mass strand with both false killer whales and pilot whales relatively frequently at the Chatham Islands suggesting they are the offshore ecotype however it is not known if the pods of bottlenose dolphins seen close to shore around the archipelago are also the offshore ecotype. Compared to pods of offshore dolphins documented off the northeast North Island by Zaeschmar et al. (2020) group sizes of those seen by the author at the Chathams were small and they were not associated with other species. Morphologically the dolphins caught on the western Chatham Rise were most like the inshore ecotype described by Zaeschmar et al. (2020), suggesting it is possible that they are part of one of the South Island inshore subpopulations. Alternatively, their pale colour and lack of scarring may have been due to ontogeny. New Zealand bottlenose dolphins are among the largest in the world with females maturing around 2.7-3.0 m in length (Schneider 1999; Constantine 2002; Tezanos-Pinto et al. 2009; Crowe et al. 2025). At 200-220 cm length all those caught on Veryan Bank would have been juveniles or young sub-adults.

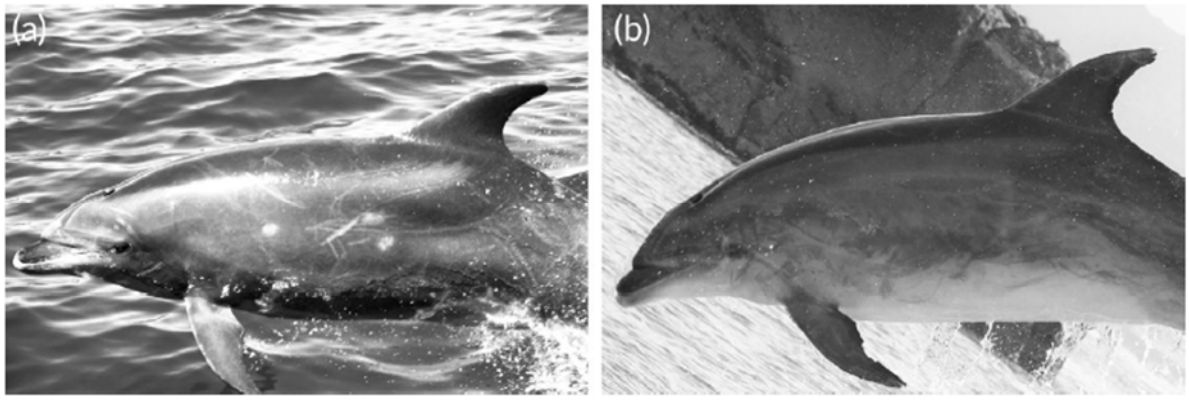

Fig. 1. Offshore/oceanic (a) and coastal (b) ecotypes of bottlenose dolphin (*Tursiops truncatus*) occurring off northeastern New Zealand (from Zaeschmar et al. 2020). The offshore ecotype is characterized by a more robust body, dark coloration and a high incidence of scars from cookie cutter shark (*Isistius brasiliensis*) bites. In contrast, the coastal ecotype is paler overall, particularly on the underside of the head and lower abdomen and generally does not exhibit cookie cutter shark scarring (Zaeschmar et al. 2020).

Fig. 2. Juvenile female bottlenose dolphins (*Tursiops truncatus*), 200-220 cm standard length, caught in a SQU trawl on the western Chatham Rise, in February 2025 (image courtesy of Observer Program, Fisheries New Zealand).

Bottlenose dolphins are considered Nationally Endangered due to their small population size and declining trends in abundance in Bay of Islands and Fiordland (Baker et al. 2019). As dolphin populations typically exhibit low resilience to fishing, any incidental fishing mortality affecting small, isolated populations can have a negative effect on population trend. No dolphin population has been observed to have a growth rate higher than about 4% per year (Reeves & Brownell 2009). This is due to their relatively high age of sexual maturity and low birth rate. Typical estimates of annual Potential Biological Removals (PBR) (a threshold for human induced mortality intended to prevent the population declining below the level that produces maximum recruitment) for cetaceans range from 0.6% to 0.9% of the minimum population estimate (Reeves & Brownell 2009). This suggests that New Zealand bottlenose dolphin subpopulations, including the offshore ecotype, are potentially vulnerable to incidental fisheries mortality, even when lethal interactions are relatively rare (Reeves & Brownell 2009; Allen et al. 2014, 2017; Byrd & Hohn 2017).

The small sizes, differing ecologies and limited interaction between the New Zealand *Tursiops* sub-populations imply each should be considered independent management units for conservation purposes (Baker et al. 2019; Zaeschmar et al. 2020). Historically, declines in abundance of *Tursiops* in two of these sub-populations (Bay of Islands, Fiordland) have been attributed to anthropogenic disturbance, particularly marine mammal tourism (Baker et al. 2019). This is presumably due to the low reported bycatch of *Tursiops* in commercial fisheries (Parker & Rexer-Huber 2018). However, low abundance combined with low coverage means fishery interactions with rare species are unlikely to be adequately detected by fishery observers, with underestimation of fishery mortality worsened if under-reporting by fishers occurs (Allen et al. 2014, 2017; MRAG Ltd. 2021). Given that under-reporting of protected species interactions is a common phenomenon globally, including in New Zealand, it should be a priority to improve the understanding of the population structure and biology of bottlenose dolphins across the Chatham Rise and around Chatham Islands where this species potentially interacts with multiple fisheries (Allen et al. 2017; Basran & Sigurðsson 2021).

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