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Operational Interactions with Threatened, Endangered or Protected Species in South Australian Managed Fisheries Data Summary: 2007/08 – 2016/17



A.I. Mackay

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PO Box 120 Henley Beach SA 5022

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Report to PIRSA Fisheries and Aquaculture

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EXECUTIVE SUMMARY

This is the eighth report on threatened, endangered and protected species (TEPS) interactions with South Australia's commercial fisheries. It is a legal requirement under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that all interactions between commercial fisheries and TEPS listed under the EPBC Act must be reported. An interaction is defined as "any physical contact a fisher, boat or fishing gear has with wildlife and protected species". Listed species include all seabirds, marine and freshwater reptiles, marine mammals and some protected fish species, including white sharks and syngnathids (seahorses, sea dragons and pipefish).

This report outlines the 2016/17 data on wildlife interactions, including TEPS, with fisheries from South Australian Managed Fisheries Wildlife Interaction Forms (WIFs) and synthesises interaction data submitted over a ten year period between 1 July 2007 and 30 June 2017. Data are presented by commercial fishery and taxonomic group.

During 2016/17, 498 interactions, involving 2,059 individual TEPS were reported in six South Australian managed fisheries. The fate of 99% of individuals was reported as 'alive' or 'alive / injured' with 1% (n = 21) reported as dead. The majority (92%) of individuals were reported as interacting in the 'other' category, which can include depredation events or sightings of TEPS, with all other individuals (n = 163) reported in either the 'caught', 'entangled' or 'impact' categories. Most interactions (78%) in 2016/17 were recorded in the Lakes and Coorong Fishery (LCF) and predominantly involved reports of long-nosed fur seals (*Arctocephalus forsteri*) depredating catch from nets and / or damaging gear.

The second highest number of TEPS interactions (12%) were reported in the South Australian Sardine Fishery (SASF). In 2016/17, 60 interactions with wildlife were reported in the SASF, involving 202 individuals. An observer was present during 15% of the reported interactions, and all interactions involved dolphins, except for one that involved a single Australian sea lion (*Neophoca cinerea*). While the species of dolphin is not always reported, it is assumed, based on long-term observer monitoring in this fishery, that all interactions involved short-beaked common dolphins (*Delphinus delphis*).

The third highest number (8%) of TEPS interactions in 2016/17 were reported from prawn trawl operations. Three commercial prawn fisheries operate in South Australia: Spencer Gulf Prawn Fishery (SGPF), West Coast Prawn Fishery (WCPF) and Gulf St Vincent Prawn Fishery (GSVPF).

The SGPF is the largest both in terms of number of licence holders and catch. In 2016/17, 39 interactions involving 40 TEPS individuals were reported, with the SGPF reporting 75% of interactions and WCPF reporting the remaining 25%. No interactions were reported in the GSVPF. One interaction involved the mortality of a dolphin after it impacted with the propeller of a vessel in the SGPF. This was the first report of a direct interaction between a cetacean and a prawn fishery in South Australia. All other interactions involved synnathids, with four mortalities reported.

The Abalone Fishery reported eight interactions involving sightings of single great white sharks (*Carcharodon carcharias*), while the Marine Scalefish Fishery (MSF) reported three interactions involving individual great white sharks with one resulting in an entanglement and mortality. No TEPS interactions were reported in either the Northern or Southern Zone rock lobster fisheries, Blue Crab Fishery (BCF) or Charter Boat Fishery (CBF) in 2016/17.

In 2016/17, most (75%) reported TEPS interactions with South Australian fisheries involved pinnipeds, followed by cetaceans (12%), protected fish species (10%) and then seabirds (3%). No interactions with reptiles were reported in 2016/17.

The total number of interactions and number of TEPS individuals were 16% and 23% lower, respectively, than reported in 2015/16. Inter-annual variability in the number of interactions reported in a fishery may reflect true TEPS interaction rates or may be a product of changes in reporting rates due to increased education or awareness among fishers about fishing regulatory requirements.

Keywords: Wildlife interaction reporting, TEPS

1. INTRODUCTION

1.1. Background

It is a legal requirement under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) to report any incidental capture or injury of a protected species during commercial fishing activities in State or Commonwealth waters. To facilitate reporting, PIRSA Fisheries and Aquaculture introduced a generic Wildlife Interactions Reporting Logbook on 1 July 2007. The logbook is used by licence holders in South Australian managed fisheries to report the occurrence and nature of interactions with listed wildlife, including Threatened, Endangered and Protected Species (TEPS).

Protected species include all seabirds, marine reptiles, marine mammals and some protected marine fish species, including great white sharks (*Carcharodon carcharias*) and syngnathids (seahorses, sea dragons and pipefish). A full list of species protected under the EPBC Act, South Australian *National Parks and Wildlife Act 1972* (NPWA) and schedule five of the South Australian *Fisheries Management (General) Regulations 2007* is provided in Appendices 1-5.

An interaction is defined as “any physical contact a fisher, boat or fishing gear has with wildlife and protected species”. Interactions can include TEPS becoming incidentally captured or entangled in fishing gear, TEPS depredating fishing gear (i.e. removing bait or catch) or making physical contact with the vessel. In addition, Abalone divers are asked to report all sightings of great white sharks while diving and from the vessel.

Fishers record information on the time and location of the interaction, the nature of the interaction, the type of fishing gear, and the species and number of individuals involved. The nature of an interaction is categorised as ‘caught’, ‘entangled’, ‘impact / collision’ and ‘other’. An example of an interaction that would fall under the other category would be loss of catch due to depredation. Fishers also record the fate of the individual after the interaction as alive, injured or dead.

The consequence of interactions between TEPS and fisheries will depend on the species involved, the nature of the interaction and type of fishing gear. Direct interactions with fishing operations can result in injury and death to TEPS individuals, or TEPS may exploit fisheries as an easily accessible food source, either through direct depredation of catch, feeding on discards or foraging in association with fishing operations. Incidental mortality as a result of fisheries interactions can impact the conservation status of these species, in particular those that are long-lived such as marine mammals, seabirds, sharks and turtles. For fisheries, interactions with TEPS can result in loss of catch or bait, damage to fishing gear and changes in management and / or

fishing operations to avoid interactions. Depending on the level of interaction, this can result in substantial economic cost to industry.

This is the eighth report to PIRSA Fisheries and Aquaculture on TEPS interactions within South Australian commercial fisheries and presents data submitted by fishers in logbooks between 1 July 2007 and 30 June 2017 (see Knight and Vainickis 2011a, b; Tsohos and Boyle 2012; 2013; McLeay et al. 2015; Mackay et al. 2016; Mackay 2017). This report extends previous versions by further exploring data submitted in logbooks to analyse temporal patterns in TEPS interactions by fishery and taxonomic group.

2. METHODS

Interactions between TEPS and commercial fishing operations are recorded by fishers on a South Australian Managed Fisheries Wildlife Interaction Form (WIF) (Appendix 6). Forms are required to be filled out on the day the interaction occurred, signed as accurate by the licence holder and submitted each month to SARDI (Aquatic Sciences) where data are entered into an Oracle database (SARDI). Information that is required by fishers on the WIF includes: the fisher's licence number, managed fishery name, date and time that the interaction occurred, gear type used, if an observer was on-board, and the species and number of individuals involved in each interaction. The nature of the TEPS interaction is recorded as 'caught', 'entangled', 'impact / collision' (subsequently referred to as 'impact') or 'other'. The nature of the 'other' can be determined if comments are provided regarding the interactions. The observed status of the TEPS individual(s) as a consequence of the interaction is categorised as 'alive', 'injured' or 'dead', and the fate of the individual is also recorded as 'released', 'retained', or 'discarded'. Space is provided to record additional comments or information about the interaction. Once submitted to SARDI, WIF are manually error-checked during the data-entry phase, and further validated with catch and effort data.

Data were aggregated by financial year, fishery and taxonomic group to investigate patterns in temporal trends in reported interaction rates and number of TEPS individuals. Spatial data relating to interactions are displayed as latitude and longitude for the South Australian Sardine Fishery (SASF) and three SA commercial prawn fisheries. For all other fisheries, spatial data are reported by area code and fishery block number. The location of interactions and fate of individuals were mapped in ArcMap™ 10.3.1.

Patterns in temporal trends of reporting were investigated by calculating interaction rates for the main taxonomic groups, fisheries and / or gear types with highest number of reported interactions. Interaction rates were calculated as number of interactions divided by fishing effort, expressed using the metric of effort associated with each fishery. With the exception of the SASF, fishery-independent data to validate the accuracy of reporting of TEPS interactions in South Australian commercial fisheries are either limited or not available.

3. RESULTS

3.1. Overview of reported TEPS interactions

During 2016/17, 498 interactions, involving 2,059 individuals listed as TEPS, were reported from six South Australian managed fisheries. Two fisheries, the Lakes and Coorong Fishery (LCF) and South Australian Sardine Fishery (SASF), reported 78% and 12%, respectively, of all interactions. The majority (92%) of individual TEPS were recorded as interacting in the 'other' category with the remaining 8% of individuals (163 individuals) reported in the 'caught', 'entangled' or 'impact' categories. The fate of 99% of individuals was reported as either 'alive' or 'alive / injured' with 1% (21 individuals) reported as dead. The mortalities in 2016/17 comprised 12 cormorants, six syngnathids, two dolphins and one great white shark. The total number of interactions and number of TEPS individuals were 16% and 23% lower, respectively, than reported in 2015/16.

The nature of the interaction for the majority (87%) of interactions with TEPS individuals reported in WIF logbooks since 2007/08 was reported in the 'other' category with the other 13% reported as 'caught', 'entangled' or 'impact' (Figure 1). Since 2013/14 the ratio between the two categories (i.e. 'other' vs. 'caught', 'entangled', or 'impact') has varied by year, with the 'other' category being between 12 to 38 times higher than the 'caught, entangled and impacted' categories. This increase is due to high numbers of interactions reported with long-nosed fur seals (*Arctocephalus forsteri*) in the LCF. The fate of most (98%) individuals between 2007/08 and 2016/17 has been recorded as either 'alive' or 'alive / injured'. On average each financial year, 33 TEPS individuals were reported as dead, with the lowest number of deaths reported in 2009/10 (9) and highest number in 2011/12 (85) (Figure 1). Further details on the nature and outcomes of interactions are provided by fishery (Section 3.2) and taxonomic group (Section 3.3).

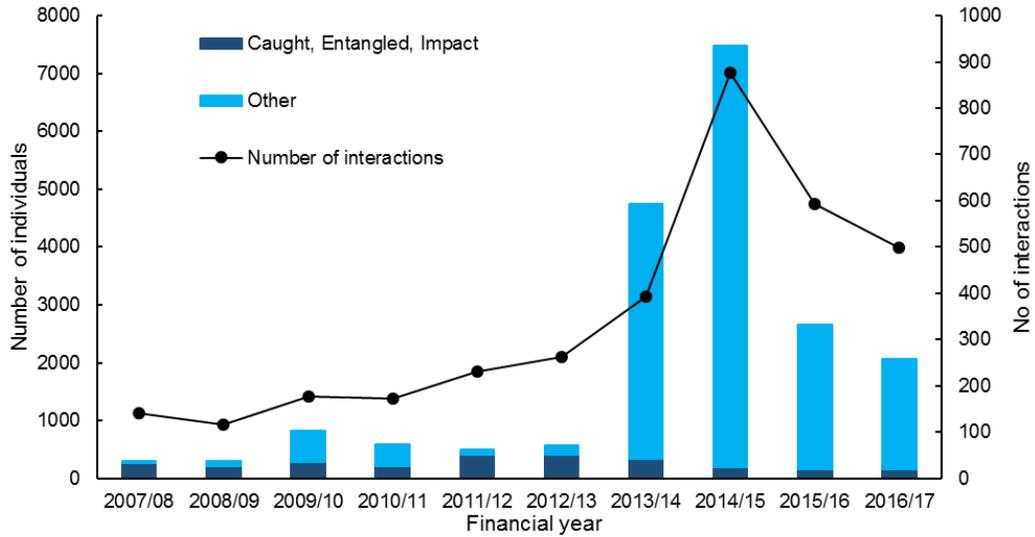


Figure 1. Number of reported interactions and nature of interactions for individual TEPS in South Australian commercial fisheries between 2007/08 and 2016/17.

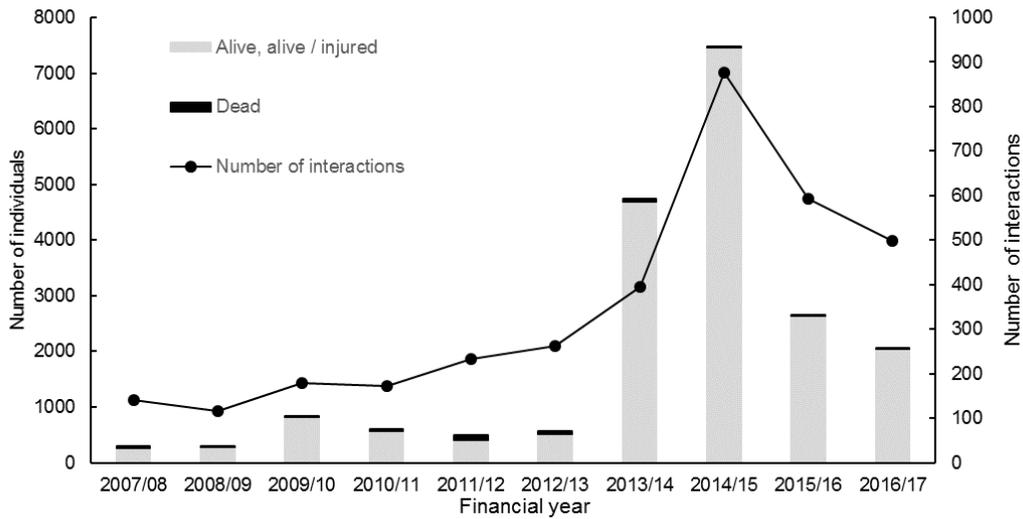


Figure 2. Number of interactions and fate of TEPS reported in South Australian commercial fisheries between 2007/08 and 2016/17.

The total number of interactions reported from 2007/08 to 2016/17 varied between commercial fisheries (Figure 3). Of the eight managed commercial fisheries, or fishery groupings, four have reported ≤ 16 interactions in total. The lowest total number of TEPS interactions (three) was

recorded in the Blue Crab Fishery (BCF) and in the two South Australian rock lobster fisheries combined, and the highest number of interactions (2,058) have been recorded in the LCF. The SASF is the only SA managed fishery that, since 2004, has a dedicated fishery-independent observer program recording interactions with TEPS (see Mackay and Goldsworthy 2017; Section 3.2.2). Fishery-independent observers aboard other South Australian managed fisheries collect data required for stock assessments and management, or conduct dedicated research projects.

The following sections synthesise WIF data reported by fishery and TEPS taxonomic group. In 2016/17, TEPS interactions were reported in six fisheries: Abalone Fishery (AF), LCF, Marine Scale Fishery (MSF), SASF, Spencer Gulf Prawn Fishery (SGPF) and West Coast Prawn Fishery (WCPF).

3.2. Interaction by managed fishery

3.2.1. Lakes and Coorong Fishery

The Lakes and Coorong Fishery (LCF) is a multispecies, multi-gear fishery that operates in the Coorong, Lake Albert and Lake Alexandrina and averages 7,000 boat days of fishing effort per financial year.

In 2016/17, there were 36 licence holders in the fishery, and 388 wildlife interactions reported with 1,797 individuals from 6,848 boat days of fishing effort. Ten different licence holders reported TEPS interactions, with three licence holders reporting the majority of interactions (79%) and individual TEPS (81%). The majority of interactions (96%) and individuals involved (99%) were long-nosed fur seals reported in the “other” category. The remaining 14 wildlife interactions reported in the LCF in 2016/17 were with 21 individual birds.

Interactions with pinnipeds

In 2016/17, most interactions (84%) involved five or fewer seals, with the majority of interactions and individual fur seals (61% and 62%, respectively) reported with large mesh gillnets. Almost half (46%) of interactions were reported between July and September 2016. Overall, there was a 30% decrease in the interaction rate and 26% decrease in the number of individual fur seals reported to interact with the fishery between 2015/16 and 2016/17 (Figure 3).

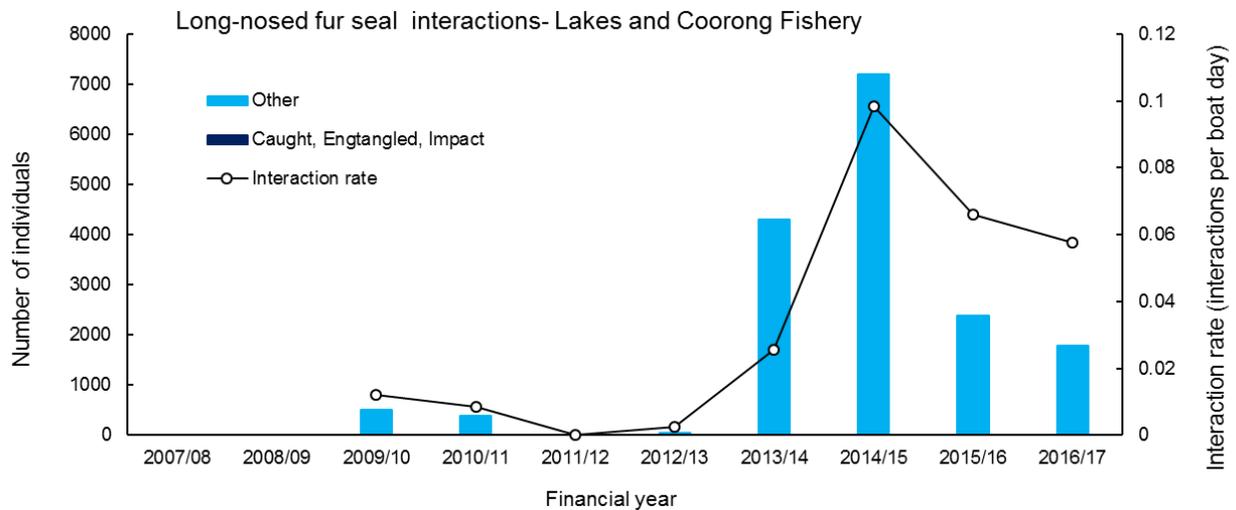


Figure 3. Interaction rates, number of individual long-nosed fur seals interacting, and nature of interaction in the Lakes and Coorong Fishery between 2007/08 and 2016/17.

In 2016/17, industry provided information that due to an error in the gear code used in previously submitted WIFs, a number of gillnet operations had been mislabelled as ring-net operations. The following information provides a summary of the corrected dataset. Since 2007/08, the majority (99%) of interactions with long-nosed fur seals have occurred with gillnet operations (large and small mesh). Six interactions involving 27 long-nosed fur seals were reported in swing net operations in 2014/15, and a further two interactions with four individuals were reported in 2015/16. One interaction with a haul net operation involving a single seal was reported in 2009/10, and a further two interactions involving a total of three individuals were recorded in haul net operations in 2015/16. Most (75%) interactions reported with long-nosed fur seals in the LCF have involved five individuals or less (Figure 4). The spike in the total number of individuals reported to interact with the fishery in 2015/16 is mainly driven by 48 separate interaction reports where the estimated number of seals present during an interaction was 75.

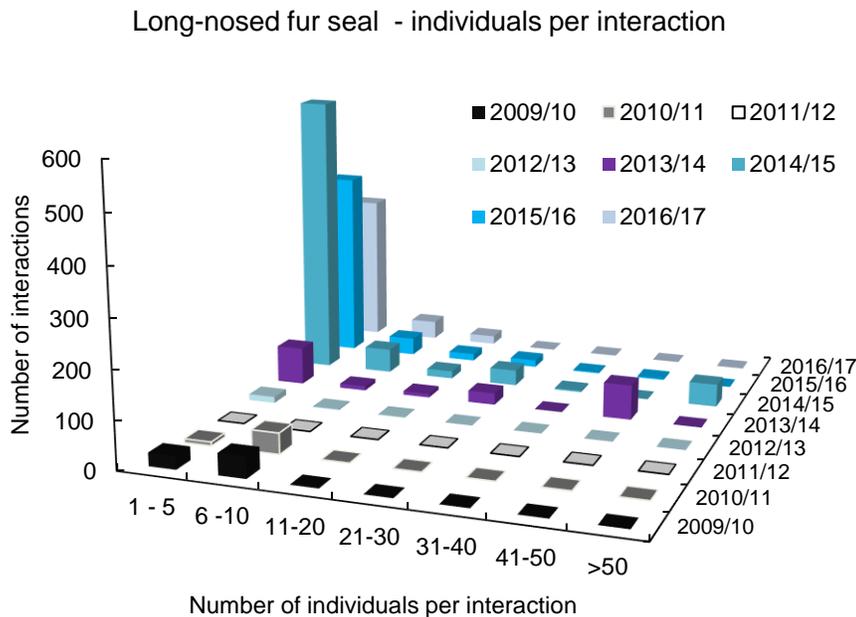


Figure 4. Number of individual long-nosed fur seals per interaction reported in the Lakes and Coorong Fishery between 2007/08 and 2016/17. Note, no interactions were reported in 2011/12.

Overall, since 2009/10, reported interaction rates with long-nosed fur seals and nets in the LCF have been highest in the Austral winter months (Figure 5). However, this pattern has not been consistent in all years, with the highest interaction rates in 2014/15 reported in January. Operations with small and large mesh gillnets account for 95% of fishing effort in the LCF since 2009/10. Reported interaction rates were highest between May and September with small mesh gillnets, and highest in May to July, then January in large mesh gillnets (Figure 6).

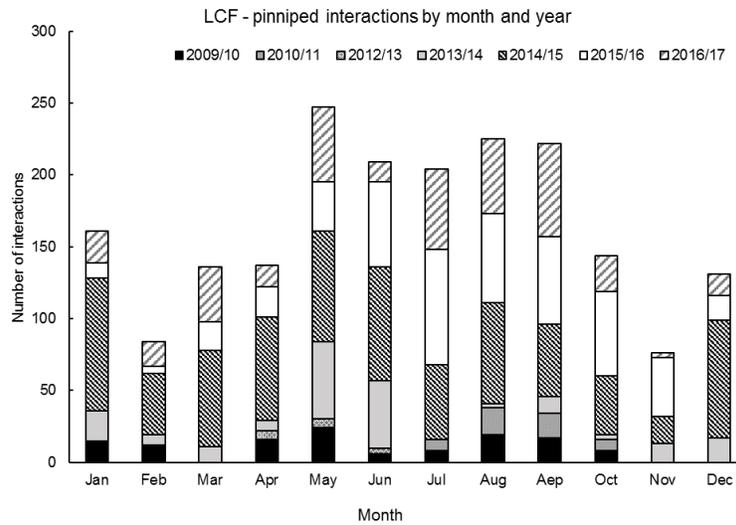


Figure 5. Number of interactions with long-nosed fur seals reported by financial year and month in the Lakes and Coorong Fishery between 2009/10 and 2016/17. Note, no interactions were reported in 2011/12.

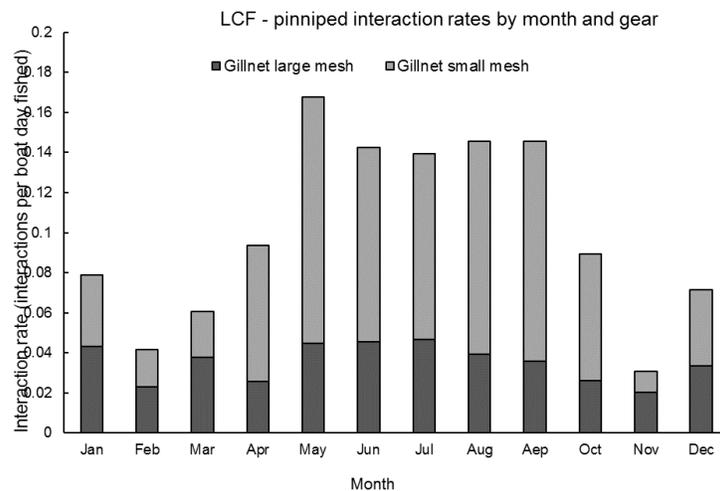


Figure 6. Interaction rates with long-nosed fur seals per month reported by gear type in the Lakes and Coorong fishery between 2009/10 and 2016/17.

Interactions with birds

In 2016/17, 14 interactions with birds were recorded. All occurred with large mesh gillnets; nine interactions involved cormorants (n = 16), four involved Australian pelicans (n = 4) and one involved a single grebe. All 16 cormorants were recorded as either “caught” or “entangled”, of which 12 were reported as dead. All four interactions with pelicans involved a single individual recorded as being “caught” or “entangled”, and each individual was released alive. The single grebe was recorded caught in the net above the waterline and was released alive. There was a 53% decrease in the interaction rate and 50% decrease in the number of individual birds reported to interact with the fishery between 2015/16 and 2016/17 (Figure 7).

Since 2007/08, 6% of interactions and 1% of TEPS individuals reported by the LCF have been birds. The number of individual birds reported interacting with the fishery has varied between years, with a maximum of 63 individuals reported in 2013/14 (Figure. 7). Of the eight species that have been reported, cormorants comprise 73% of interactions (Table 1), and 91% of individuals (Table 2). The nature of all but one interaction with birds have been recorded as caught or entangled, with 96% occurring in large mesh gillnets and the remainder in small mesh gillnets. The remaining reported interaction was an observation of a dead grebe that floated into a fishers net.

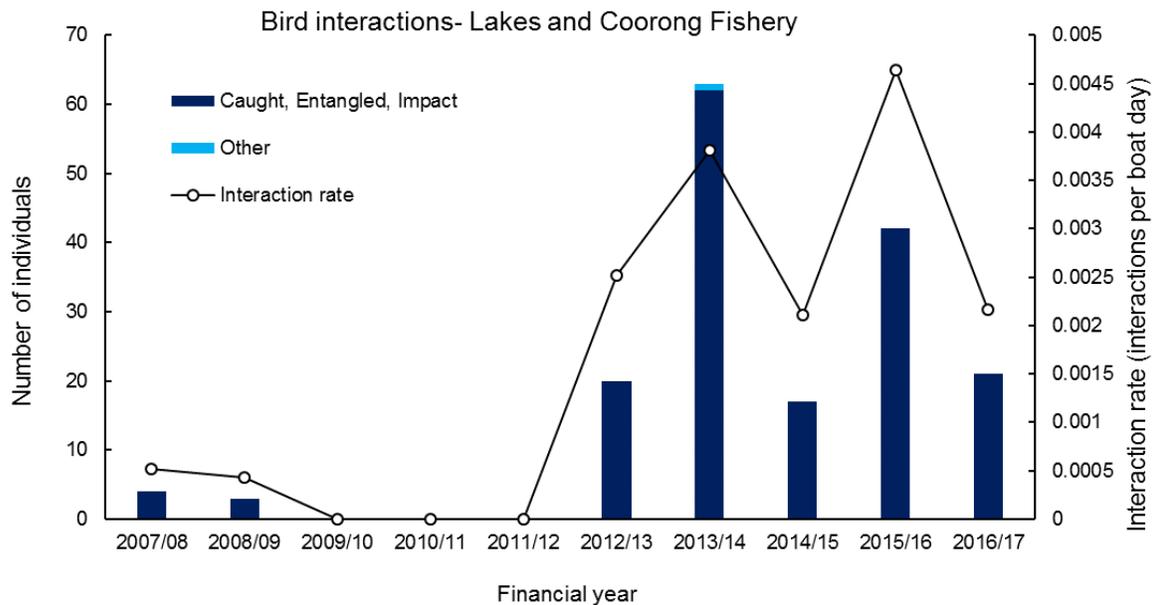


Figure 7. Interaction rates, number of individual birds, and nature of interaction in the Lakes and Coorong Fishery between 2007/08 and 2016/17.

Interactions with reptiles

No interactions with reptiles were reported in the LCF in 2016/17. Since 2007/08, 17 interactions with turtles involving 79 individuals and one mortality have been recorded in the LCF. Of these, 13 interactions, involving 19 individual freshwater turtles, have been recorded in large mesh gillnets. A further three interactions, totalling 40 individuals, were reported in hauling nets and one interaction, involving 20 individuals, was reported with a drum net. No interactions with reptiles were reported in 2010/11, 2011/12 or 2012/13.

Table 1. Number of interactions reported with birds and the Lakes and Coorong Fishery 2007/08 to 2016/17. No interactions were reported in 2009/10 to 2011/12 inclusive.

	Australian Pelican	Blue billed duck	Cormorant	Dusky moorhen	Great crested grebe	Grebe	Musk duck	White-eyed duck
2007/08			4					
2008/09			2		1			
2009/10								
2010/11								
2011/12								
2012/13	1	1	9	1		3	2	
2013/14	2		24			3		
2014/15	4		10			1		1
2015/16	2		27		2		1	1
2016/17	4		9			1		
Total	13	1	85	1	3	8	3	2

Table 2. Number of individual birds interacting with the Lakes and Coorong Fishery 2007/08 to 2016/17. No interactions were reported in 2009/10 to 2011/12 inclusive.

	Australian Pelican	Blue billed duck	Cormorant	Dusky moorhen	Great crested grebe	Grebe	Musk duck	White-eyed duck
2007/08			4					
2008/09			2		1			
2009/10								
2010/11								
2011/12								
2012/13	1	1	11	2		3	2	
2013/14	2		55			6		
2014/15	4		11			1		1
2015/16	2		36		2		1	1
2016/17	4		16			1		
Total	13	1	135	2	3	11	3	2

3.2.2. South Australian Sardine Fishery

To minimise wildlife interactions the SASF implements an industry Code of Practice (CoP) developed by the South Australian Sardine Industry Association (SASIA) that is assessed annually using observer data (e.g. Mackay and Goldsworthy 2017). In 2016/17, 977 net-sets were undertaken in the fishery and a total of 60 interactions, involving 202 TEPS individuals were reported. An observer was present during 15% of reported interactions. All interactions involved dolphins, except for one interaction, which involved a single Australian sea lion (*Neophoca cinerea*). While the species of dolphin is not always reported, it is assumed, based on long-term observer monitoring in this fishery that all were short-beaked common dolphins (*Delphinus delphis*).

The interaction rate between dolphins and the fishery in 2016/17 was 8 interactions per 100 purse seine shots. In total, 201 individuals were encircled, of which 200 were released and one was reported dead. In 2016/17, the nature of the interactions reported for 56% of dolphins was in the 'other' category which relates to dolphins becoming encircled, but not entangled, in purse seine nets after they are set. The number of dolphins reported during an encirclement in 2016/17 ranged from 1-12 individuals.

Since 2007/08, the highest interaction rates were reported in 2013/14, while the highest number of individuals in interactions (303) were reported in 2011/12 (Figure 8). The maximum number of dolphins reported in an encirclement was 15 in 2007/08 and 2011/12. In 2016/17, the proportion of dead dolphins from all encircled dolphins was 0.005 (1 of 197), while the maximum was 0.09 (15 of 159) in 2007/08 and the minimum was 0.004 (1 of 240) in 2013/14 (Figure 9).

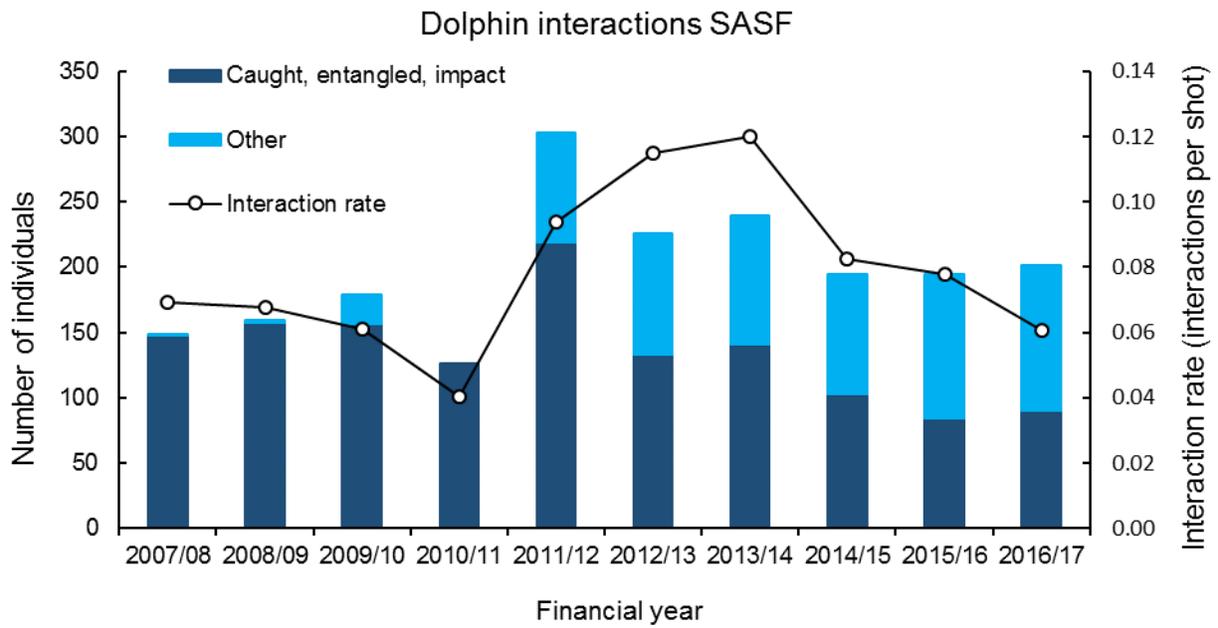


Figure 8. Interaction rates and nature of interactions for individual dolphins reported in the SASF between 2007/08 and 2016/17.

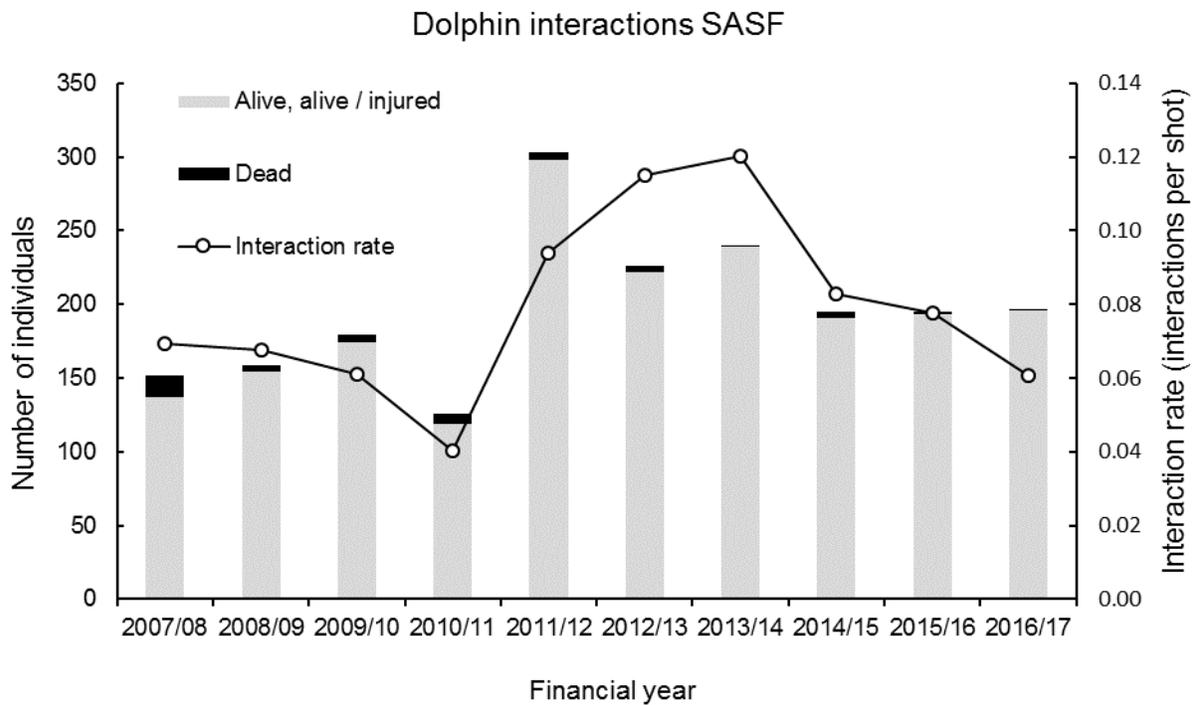


Figure 9. Interaction rates and fate of individual dolphins reported in the SASF between 2007/08 and 2016/17.

Interactions with pinnipeds

The second highest TEPS group reported to interact with the SASF since 2007/08 has been pinnipeds, which make up 7% of interactions and 7% of all individuals. In 2016/17, a single Australian sea lion was reported encircled and subsequently released. Nine of these interactions involved Australian sea lions (n = 31), six involved “fur seals” (n = 18) and four interactions where the species and / or number of seals present was not recorded. In addition, independent observers recorded 19 interactions with seals swimming freely in and out of the net after it had been set (SARDI unpublished data).

The largest number of interactions reported with pinnipeds in the fishery was 24 in 2007/08, while the largest number of individual seals reported to interact with the fishery was 75 in 2008/09 (Figure 10). Since 2007/2008, 59% of individual seal interactions have been reported in the ‘other’ category. Comments provided on WIFs, and by independent observers, indicate that in most cases seals repeatedly swim in and out over the purse seine net during fishing operations.

Of the 142 pinnipeds that have been reported to interact with the SASF, three were reported as dead in 2007/2008, with no further mortalities reported since (Figure 11). With the exception of 30 individuals recorded in a single interaction in 2008/09, group size ranged from 1–6 with 78% of interactions involving 1–2 individuals. Since 2007/08, the majority of pinnipeds (95%) have been reported in WIF as unidentified seal species, with species level reports of three Australian sea lions, two long-nosed fur seals and one Australian fur seal (*Arctocephalus pusillus doriferus*) interacting with the fishery over this period.

Other species

No interactions between TEP fish species and the SASF were reported in 2016/17. A total of 14 interactions with 14 individual TEP fish species were reported since 2007/08. All interactions have involved a single white shark. Comments indicate that most interactions happened when a shark was incidentally encircled in the net during fishing operations and subsequently released.

One report of a single interaction that resulted in the mortality of two shearwaters (species unknown) was reported in 2008/09. No further interactions with seabirds have been reported since.

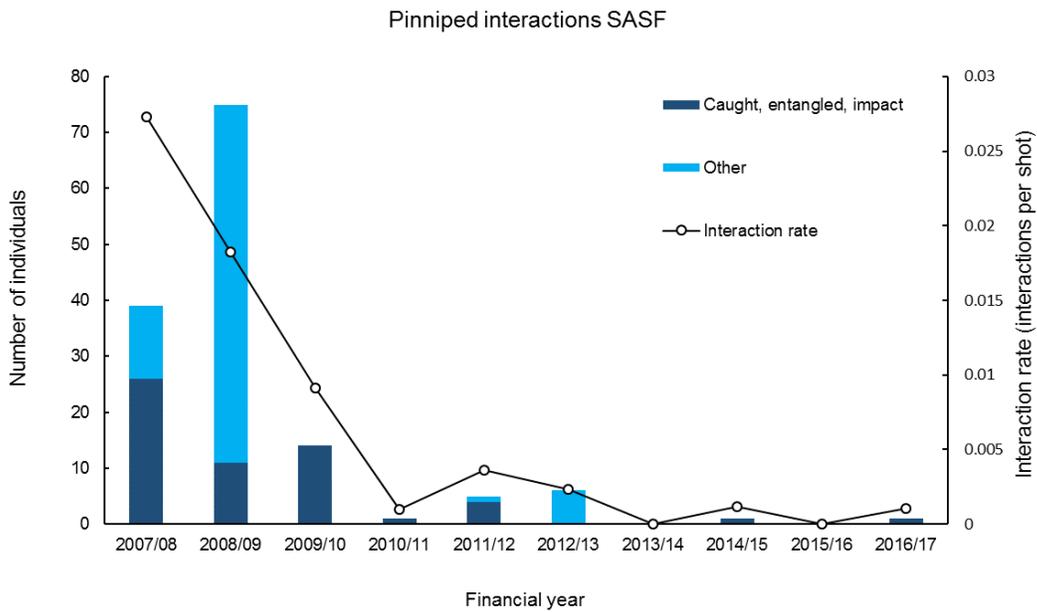


Figure 10. Interaction rates, number and nature of interactions for individual pinnipeds reported on WIFs in the SASF between 2007/08 and 2016/17.

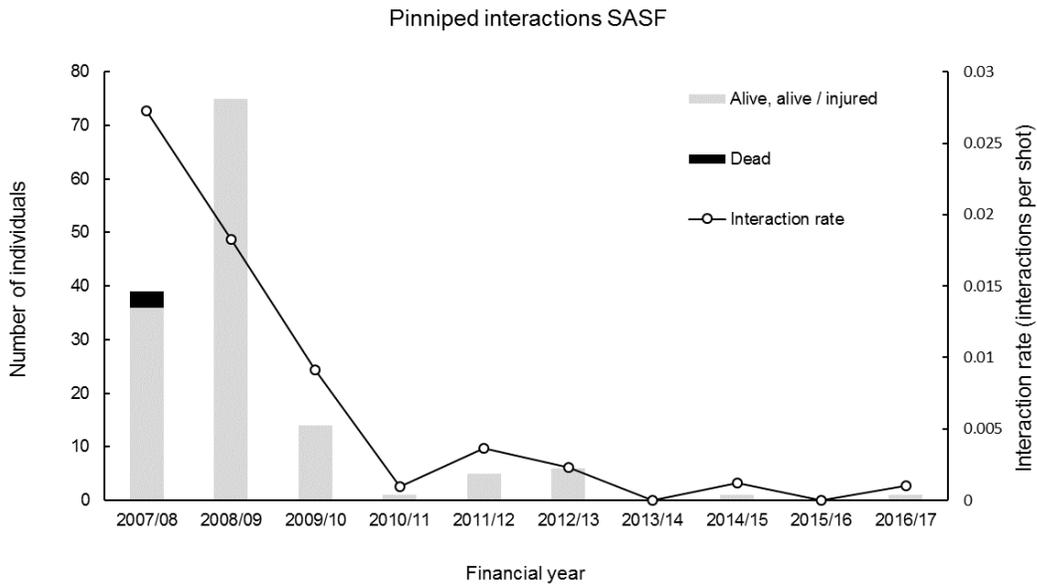


Figure 11. Interaction rates, number and fate of individual pinnipeds reported on WIFs in the SASF between 2007/08 and 2016/17.

3.2.3. Prawn Fisheries

Three commercial prawn fisheries operate in South Australia; the Spencer Gulf Prawn Fishery (SGPF), West Coast Prawn Fishery (WCPF) and Gulf St Vincent Prawn Fishery (GSVPF). The SGPF is the larger of the three both in terms of number of licence holders and catch. In 2016/17, there were 39 licence holders in the SGPF, 10 in the GSVPF and three in the WCPF. Effort in each fishery has remained relatively stable between 2007/08 and 2016/17 (Figure 12), with the SGPF accounting for 83% of total prawn trawl effort (number of shots) between 2007/08 and 2016/17. The GSVPF was closed in 2012/13 and 2013/14.

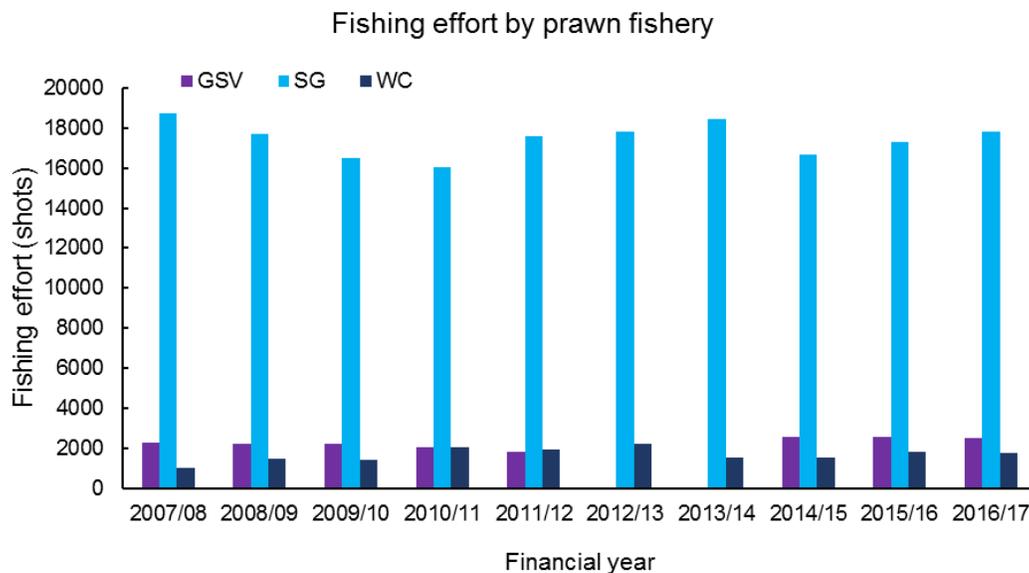


Figure 12. Fishing effort in trawl shots recorded in the Gulf St Vincent (GSV), Spencer Gulf (SG) and West Coast (WC) prawn fisheries between 2007/08 and 2016/17

In 2016/17, a total of 23 interactions involving 30 TEPS individuals were reported in the SGPF, and 16 interactions with 19 individuals were reported in the WCPF. No interactions were reported in the GSVPF. All but one interaction with the SGPF involved protected fish species (common seadragons (*Podiceps cristatus*), pipefish or seahorses). The remaining interaction involved a single dolphin, species not recorded, that hit the propeller of the vessel and was reported to have been killed instantly. Nine of the 23 interactions in the SGPF occurred during survey shots in the fishery. All interactions in the WCPF involved pipefish or seahorses.

Interactions with protected fish species

Since 2007/08, the majority of TEPS interactions (64%) and individuals (69.8%) recorded in prawn fisheries have been reported in the SGPF. In total, the fishery has recorded interactions with eight species of protected fish, and with the exception of a single interaction with a white shark in 2011/12, all have been syngnathids. Of these, the majority of individuals have been pipefish (54%) and seahorses (43%) (Figure 13). The WCPF, which reported 35% of TEPS interactions and 30% of individuals from prawn trawl fisheries, has recorded interactions with four protected fish species, all Syngnathidae. The majority of individuals have been seahorses (Figure 13).

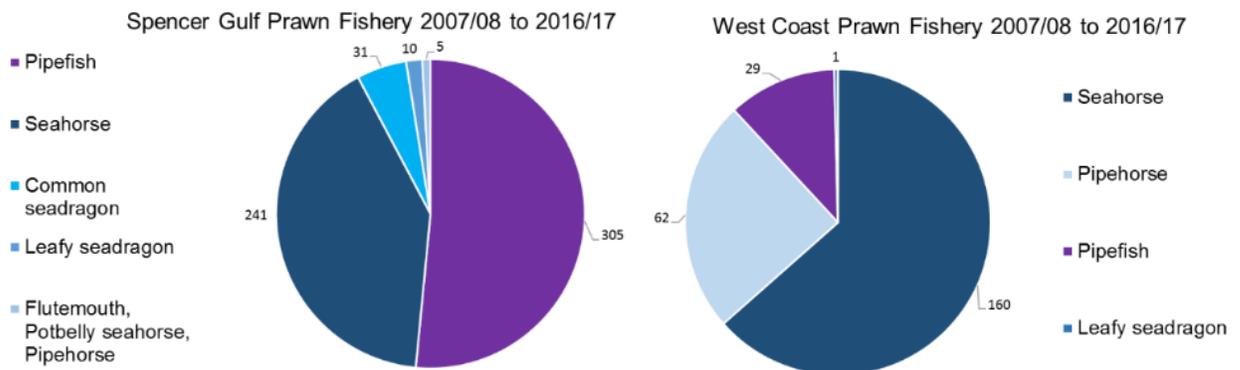


Figure 13. Number of syngnathids by species reported by the Spencer Gulf (left) and West Coast (right) prawn fisheries between 2007/08 to 2016/17.

Between 2007/08 and 2016/17, 14.5% of the 593 individual syngnathid interactions reported by the SGPF were recorded as dead (Figure 14). Of these, 79% were pipefish, 16% were seahorse and 5% were common seadragon. No mortalities were reported for leafy seadragons (*Phycodurus eques*) ($n = 10$), pipehorse ($n = 1$) or potbelly seahorse (*Hippocampus abdominalis*) ($n = 1$). In the WCPF, 45% of 254 individual syngnathid interactions were recorded as dead (Figure 14). Of these, 63% were seahorses, 21% were pipehorses and 16% were pipefish. One reported interaction with a leafy seadragon in 2010/11 resulted in the fish being released alive.

Other species

The report of an interaction with a dolphin in the SGPF in 2016/17 was the first reported interaction of a cetacean and a South Australian prawn fishery. Two interactions with pinnipeds and prawn trawls have previously been reported. The first was reported in the WCPF in 2009/10 and involved

two individuals recorded as “common seals”, which impacted with gear and were reported as dead. The second was in the SGPF and involved a single Australian fur seal which was reported as caught and subsequently released alive. In 2011/12, a white shark (~3 m in length) was caught in the SGPF and then released alive. In 2007/08, a single leatherback turtle (*Dermochelys coriacea*) was reported caught in the GSVPF, and subsequently released alive. This record is the only TEPS interaction that has been reported from the GSVPF since 2007/08.

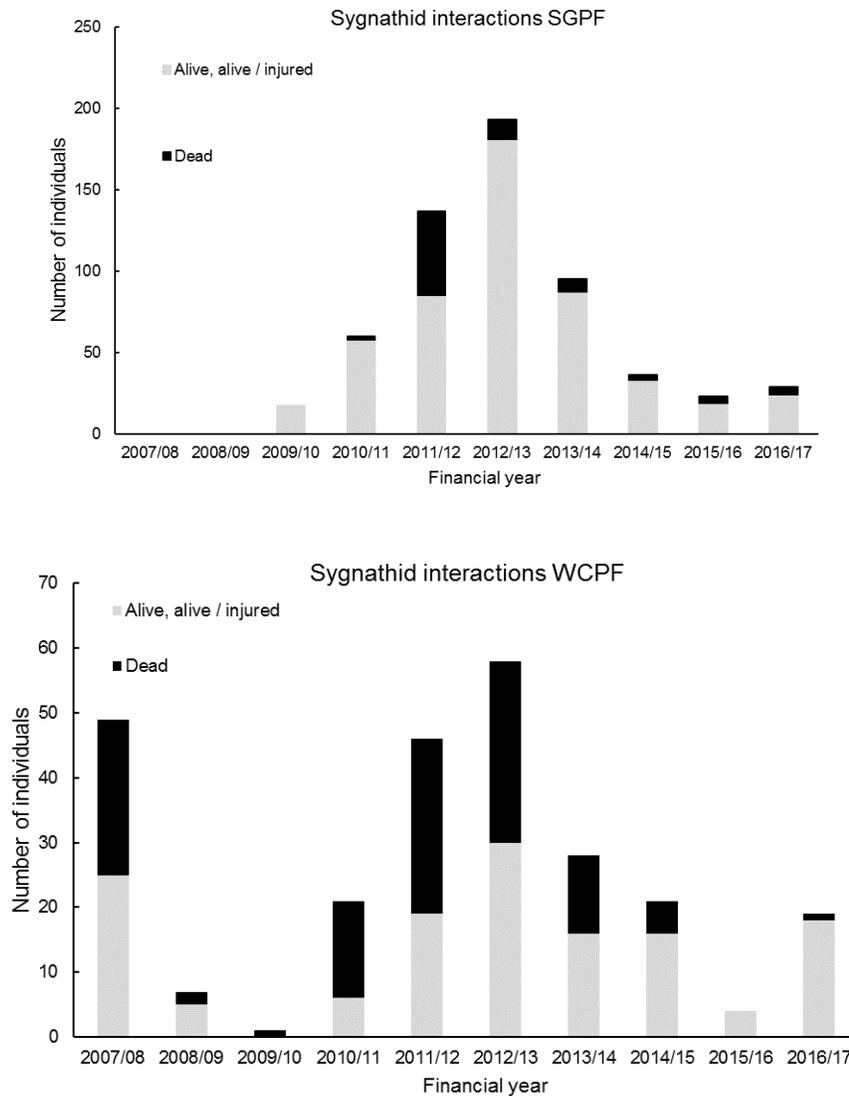


Figure 14. Fate of individual sygnathids after interactions with Spencer Gulf Prawn Fishery (top) and West Coast Prawn Fishery (bottom). Note different scales on y-axis

3.2.4. Marine Scalegfish Fishery

The Marine Scalegfish Fishery (MSF) is a multi-species fishery that uses up to 21 types of gear. In 2016/17, there were 309 licences, with a total fishing effort of 28,128 boat days. The majority (74%) of fishing effort occurred in the “line” gear category (Figure 15). This category includes longlines, handlines and poles / rod and lines, with 42% of “line” gear effort undertaken by handlines. In the nets category, which accounted for 16% of total fishing effort in the MSF in 2016/17, the majority of effort (73%) was with floating or sinking haul nets.

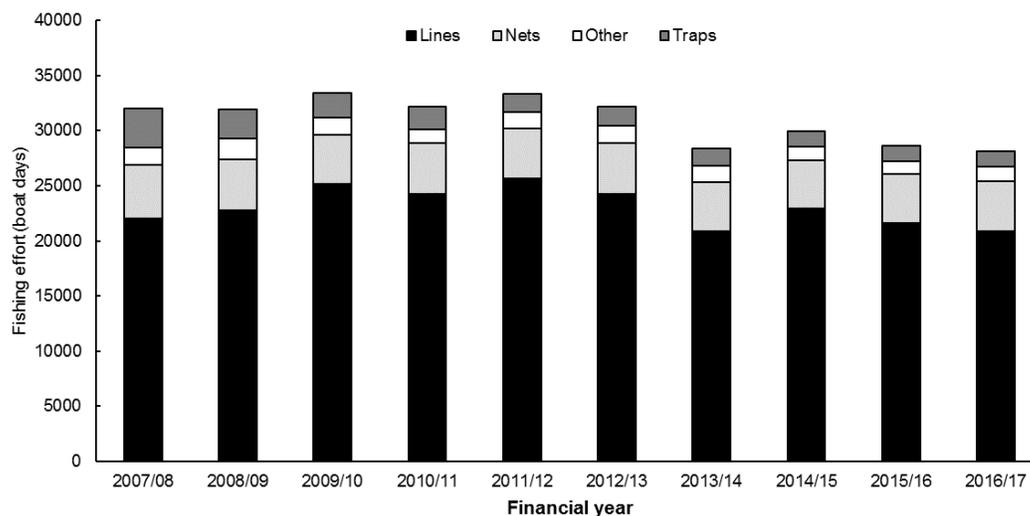


Figure 15. Fishing effort in the Marine Scalegfish Fishery aggregated by financial year and gear type.

In 2016/17, the MSF reported three interactions with TEPS, all involving individual white sharks, two with longline gear and one with a sinking haul net. One individual became hooked on bait but was released by the fisher, while the second longline interaction resulted in a mortality. The individual interacting with the sinking haul net became entangled in the net wing but was released unharmed. No interactions were reported in 7,705 days of combined fishing effort in other net, trap or “other” gear categories.

Since 2007/08 most (34%) interactions with TEPS have been reported with floating haul nets, 28% with sinking haul nets, 16% with handlines, poles / rod and 16% with longlines. The number of taxa and individuals reported to interact with the MSF have varied between years and have

been lower in recent years compared to 2007/08 – 2009/10 (Figure 16). Most individuals interacting with the MSF have been seabirds (70%) followed by protected fish species (16% - all great white sharks) and cetaceans (9%) (Figure 17). In total, ten mortalities have been reported since 2007/08: five seabirds, four protected fish and one cetacean.

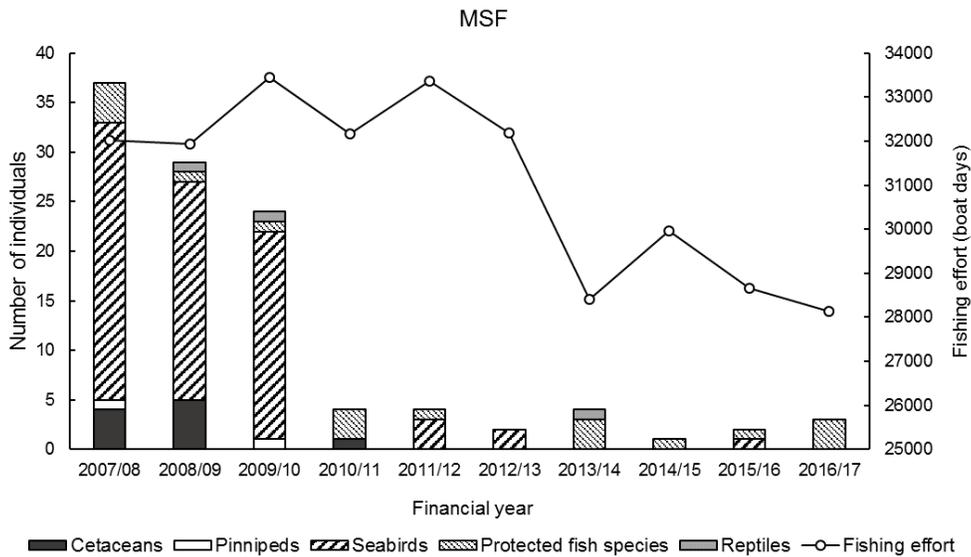


Figure 16. Number of individuals by taxa reported in MSF logbooks between 2007/08 and 2016/17.

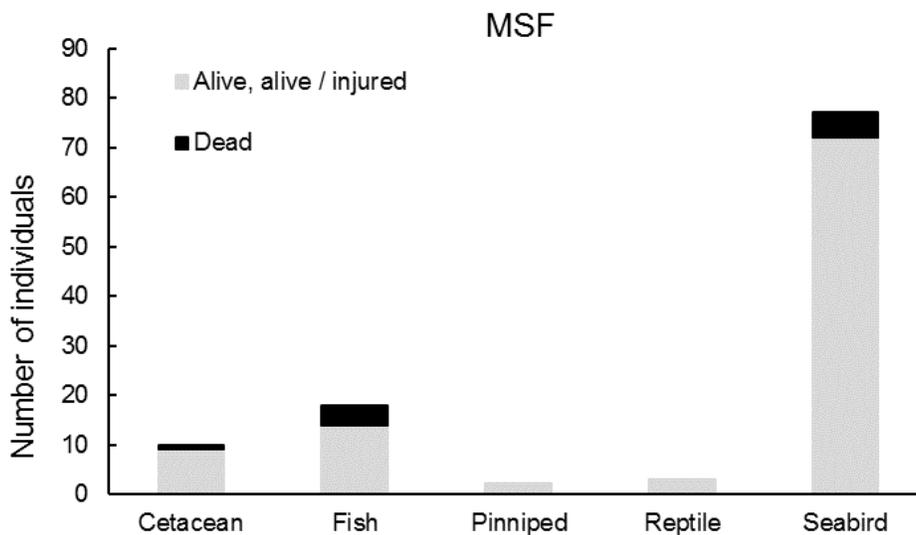


Figure 17. Number of individual TEPS by taxa, and fate of individuals reported interacting with the MSF between 2007/08 and 2016/17.

Seabirds

No interactions with seabirds were reported in the MSF in 2016/17. A total of five seabird species have been reported to interact with the MSF. The majority have been cormorants (not identified to species), which have been recorded in 36 interactions, involving 77 individuals since 2007/08. All cormorant interactions have occurred with floating or sinking haul nets, with two mortalities reported. Three pacific gull interactions with handlines have been reported with all individuals released from gear. An interaction between an albatross (species not recorded) and a longline was recorded in 2011/12; the individual was reported as dead. Finally, one record of a little penguin that was found dead and floating in the water, not associated with a fishing activity, was reported in 2007/08.

Protected fish species

Seventeen interactions with protected fish species and fishing gear have been reported since 2007/08, each one with a single white shark. Eleven white sharks have been reported in the caught, entangled, impact category and six in the other category. Of the ten entanglements recorded, six occurred with long line gear, two with handline, one with pole and line and one with a crab pot. Four white shark mortalities have been reported in the MSF since 2007/08, all associated with long line gear. An entanglement between a white shark and a crab pot was reported in 2011/12 where the shark was released but some rope and float was reported to have remained entangled on it. Of the five interactions with hand line gear, three interactions involved a shark depredating catch from the line, one interaction involved a shark bumping the fishing vessel and the fifth involved a shark in the vicinity of the vessel.

Other species

No interactions with cetaceans were reported in the MSF in 2016/17. A total of eight interactions with nine cetaceans, all recorded as “dolphins”, have been reported in the MSF since 2007/08, with no reports since 2010/11. Five of these interactions were with floating haul nets and three with sinking haul nets. The nine dolphins that interacted with haul nets were all reported as “caught” and released alive. No cetacean mortalities have been reported in the fishery.

Two interactions with pinnipeds have been reported in the MSF. The first was a “common seal” from 2007/08 in the ‘other’ category with a comment stating “passed dead penguin floating”. The

second was an interaction in 2009/10 between a long-nosed fur seal and a floating haul net where the seal entered the net after it was set and was released alive with the catch.

3.2.5. Other fisheries

Abalone Fishery

The commercial Abalone Fishery in South Australia targets greenlip (*Haliotis laevis*) and blacklip (*Haliotis rubra*) abalone that are collected by divers. In 2016/17, there were 32 licence holders operating in the fishery, and annual fishing effort between 2007/08 and 2016/17 is on average 1,897 days dived. In the instruction section of the Wildlife Interactions Reporting Logbook, abalone divers are requested to report all sightings of white sharks, both under and above the water. Eight interactions, each involving a single white shark, were reported in 2016/17 from 2,037 days dived. Updated interaction records were also provided for 2015/16, resulting in a total of 15 interactions with sharks in that financial years. All 31 TEPS interactions recorded in the fishery between 2008/09 and 2016/17 have involved sightings of white sharks, with one record involving two sightings in one day. No other TEPS have been reported to interact with this fishery.

Charter Boat Fishery

The Charter Boat Fishery comprises 100 licence holders. No TEPS interaction were reported in the fishery in 2016/17. Since 2007/08, 16 interactions with 22 TEPS individuals have been reported, of which 11 were white sharks. Average annual fishing effort since 2007/08 is 3,124 trips. Interactions with white sharks have involved individuals depredating gear and / or circling or colliding with vessels. Five of the interactions were reported by a single licence holder in 2008/09 where a white shark depredated catch from inshore scale fishing gear over five consecutive days. Three interactions with dolphins have also been reported: two in 2007/08 and one in 2008/09. During one interaction a common dolphin became tangled in fishing line but freed itself; another interaction occurred when a dolphin (species not recorded) took bait or got hooked but subsequently broke the line. The fisher reported that there was no apparent distress to the individual. No comments were provided with the third interaction that involved six dolphins, not recorded to species. Two interactions with seabirds have been reported: one involved a gannet (*Morus serrator*) taking a bait and hook and was released, and the second involved a pacific gull that became entangled by the leg in the fishing line and was released. In 2007/08, a sighting of a long-nosed fur seal was also recorded.

South Australian Rock Lobster Fishery

The South Australian Rock Lobster Fisheries (SARLF) consists of two fisheries, the Northern Zone Rock Lobster Fishery and the Southern Zone Rock Lobster Fishery with an average annual effort of 1,869,349 pot lifts. The Southern Zone Fishery has 180 licence holders and operates from October to May, whilst the Northern Zone Fishery has 63 licence holders and operates from November to May, with additional year round fishing access in an outer management zone. Sea lion excluder devices (SLEDs) have been mandatory in pots fished in waters less than 100 m depth in the Northern Zone Fishery since 1 November 2013, and mandatory in recreational rock lobster pots fished in waters less than 100 m depth in the Northern Zone since 1 November 2014. In 2007/08, three interactions with TEPS were recorded in the SARLF, with no further interactions recorded since then. Two of these involved direct entanglement with fishing gear. The first was a report from the Southern Zone Fishery of a single turtle that was entangled and released. The second was reported in the Northern Zone Fishery and involved a dolphin (species not recorded) that had become entangled in the gear and died. The third interaction occurred when 10 petrels (species not recorded) collided with the lights of an anchored boat. The lights were switched to “all round” red light and no further collisions were recorded.

Blue Crab Fishery

The Blue Crab Fishery (BCF) has nine licence holders and targets blue swimmer crab (*Portunus armatus*) using crab pots and bait nets. Average annual fishing effort is 1,254. boat days. No TEPS interactions were reported in 2016/17. Previous interactions have involved a mortality of a cormorant in a crab pot in 2015/16, and two interactions that occurred in 2008/09 and 2009/10 that involved single leatherback turtles that were entangled on the buoy line of the crab pot. Both turtles were released alive. No TEPS interactions were recorded in the BCF between 2010/11 and 2014/15.

River Fishery

No TEPS interactions have been reported by The River Fishery since 2007/08. The fishery operates in the River Murray and mostly targets non-native species, using gear such as drum nets, hoop and drop nets, set lines and pots and traps. In 2016/17 there were 6 licence holders operating in the fishery.

3.3. Interaction by taxonomic group

Since 2007/08, interactions between TEPS and SA managed fisheries have been recorded for five broad taxa; cetaceans, pinnipeds, seabirds, protected fish species and reptiles (Table 3). The number of interactions by taxa, and individuals per taxa, has varied between years. Large increases have occurred since 2013/14 in both the number of interactions with pinnipeds (Figure 18) and number of individual pinnipeds (Figure 19). In 2016/17, the majority of interactions (75%) and individuals (86%) reported in WIFs were with pinnipeds.

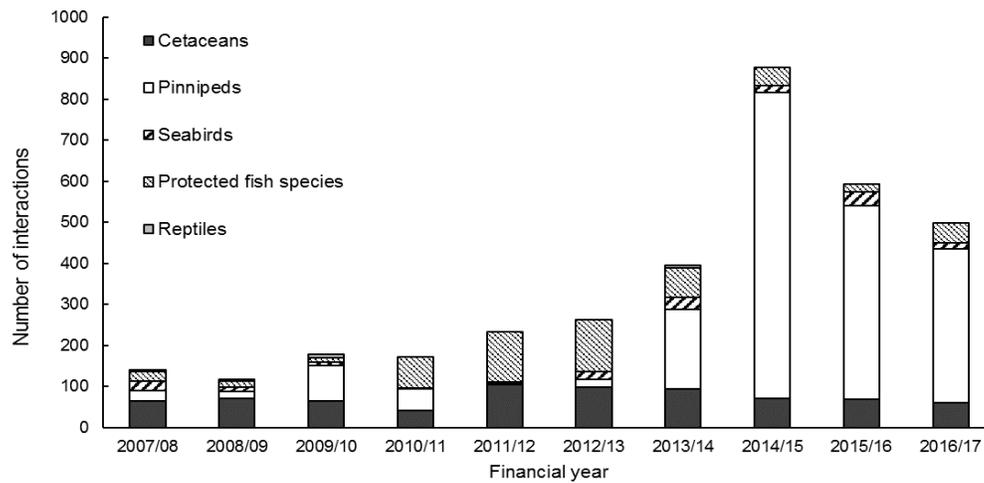


Figure 18. Number of interactions by taxa reported by South Australian commercial fisheries in Wildlife Interaction Logbooks (WIFs) between 2007/08 and 2016/17.

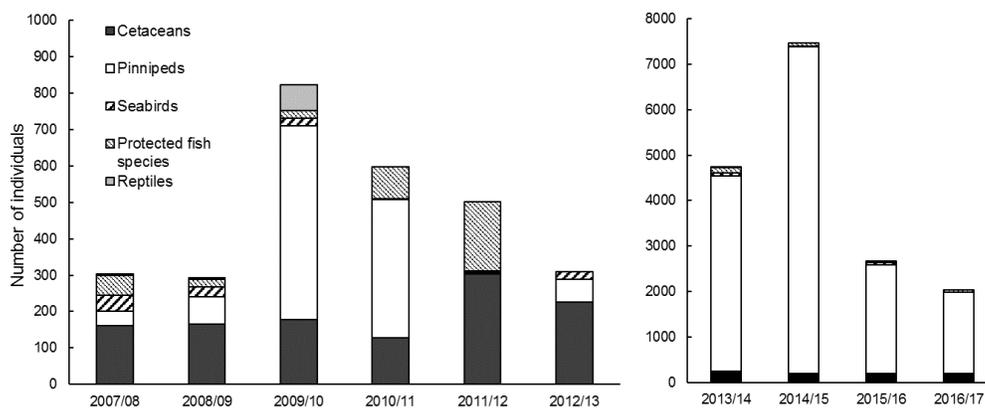


Figure 19. Number of individuals, by taxa reported by South Australian commercial fisheries in Wildlife Interaction Logbooks between 2007/08 and 2016/17. Note different scale of Y-axis for 2013/14 to 2016/17.

Table 3. Total interactions by TEPS taxonomic groups and species reported by South Australian commercial fisheries between 2007/08 and 2016/17. CEI represents ‘caught’, ‘entangled’ and ‘impact’ interaction categories.

Taxa	Species	No. of interactions	No. of individuals	CEI	Interaction Other	Alive, alive / injured	Dead	Released, discarded	Retain	Fate Other
Birds	Albatross	1	1	1	0	0	1	1	0	0
	Australasian gannet (<i>Morus serrator</i>)	1	1	1	0	1	0	1	0	0
	Australian pelican (<i>Pelecanus conspicillatus</i>)	13	13	13	0	11	2	11	0	0
	Blue billed duck (<i>Oxyura australis</i>)	1	1	1	0	1	0	1	0	0
	Cormorant	115	206	206	0	149	57	206	0	0
	Dusky moorhen (<i>Gallinula tenebrosa</i>)	1	2	2	0	0	2	2	0	0
	Great crested grebe (<i>Podiceps cristatus</i>)	3	3	3	0	3	0	3	0	0
	Grebe	8	11	10	1	7	4	11	0	0
	Little penguin (<i>Eudyptula minor</i>)	1	1	0	1	0	1	0	0	1
	Musk duck (<i>Biziura lobate</i>)	3	3	3	0	2	1	3	0	0
	Pacific gull (<i>Larus pacificus</i>)	4	4	4	0	4	0	4	0	0
	Petrel	1	10	0	10	10	0	10	0	0
	Shearwater	1	2	2	0	0	2	2	0	0
	Silver gull (<i>Chroicocephalus novaehollandiae</i>)	1	1	1	0	1	0	1	0	0
	White-eyed duck (<i>Aythya australis</i>)	2	2	2	0	2	0	2	0	0
Total	156	261	249	12	191	70	258	0	1	
Cetaceans	Common dolphin (<i>Delphinus delphis</i>)	214	541	403	138	532	8	533	7	0
	Unidentified dolphin spp.	522	1452	966	486	1412	40	1415	32	17
	Total	736	1993	1369	624	1944	48	1948	39	17
Fish	Common seadragon (<i>Phyllopteryx taeniolatus</i>)	14	31	31	0	27	4	31	0	0
	Flutemouth	1	3	3	0	3	0	3	0	0
	Great white shark (<i>Carcharodon carcharias</i>)	73	75	31	44	71	4	25	2	47
	Leafy seadragon (<i>Phycodurus eques</i>)	5	11	11	0	11	0	11	0	0
	Pipefish	142	336	336	0	250	86	336	0	0
	Pipehorse	48	63	63	0	39	24	63	0	0
	Potbelly seahorse (<i>Hippocampus abdominalis</i>)	1	1	1	0	1	0	1	0	0
	Sea horse	286	401	401	0	314	87	401	0	0
	Silver perch	1	12	12	0	12	0	12	0	0
Total	571	933	889	44	728	205	833	2	47	
Pinniped	Australian fur seal (<i>Arctocephalus pusillus</i>)	2	2	1	0	1	1	1	1	0
	Australian sea lion (<i>Neophoca cinerea</i>)	4	5	2	3	5	0	2	0	3
	Long-nosed fur seal (<i>Arctocephalus forsteri</i>)	1929	16611	4	16607	16610	1	3	1	16607
	Unidentified seal spp.	54	136	55	81	133	3	77	1	56
	Total	1989	16754	63	16691	16749	5	83	3	16666
Reptile	Freshwater turtle	12	74	74	0	73	1	73	0	0
	Leatherback turtle (<i>Dermochelys coriacea</i>)	3	3	3	0	3	0	3	0	0
	Loggerhead turtle (<i>Caretta caretta</i>)	1	1	1	0	1	0	1	0	0
	Unidentified turtle spp.	8	8	8	0	8	0	8	0	0
	Total	24	86	86	0	85	1	85	0	0
All taxa	3476	20027	2657	17372	19698	330	2977	44	16732	

3.3.1. Pinnipeds

In 2016/17, 375 pinniped interactions, involving 1,777 individuals, were reported. One interaction was reported in the SASF with an Australian sea lion, and all other interactions were reported in the LCF and involved long-nosed fur seals (see Section 3.2.1). Reports of interactions with pinnipeds in 2016/17 were 20% lower than 2015/16 and involved 26% fewer individuals (Figure 20). The number of interactions reported between pinnipeds and commercial fisheries have varied between years with lowest reports in 2011/12 and highest reports in 2014/15 (Figure 20; Table 4-5). In total, 1,989 interactions involving 16,754 individual pinnipeds have been reported between 2007/08 and 2016/17. The majority of individuals (99%) have been reported as long-nosed fur seals and then common seals (0.8%). Interactions with five Australian sea lions (all reported in the SASF) and two Australian fur seals (SPGF: 1 and SASF: 1) have also been reported.

Most interactions with individuals (99.6%) have been recorded in the 'other' category (Figure 20), with 99.97% of individuals reported as 'alive' or 'alive / injured' after an interaction (Figure 21). Interactions have occurred with gillnets (small and large), swing nets, purse seine nets and prawn trawls. Five pinniped mortalities have been reported since 2007/08. Three seals (Australia fur seal, long-nosed fur seal and a "common seal") were reported dead after interactions with the SASF and two "common seals" were reported dead after interactions with the WCPF. No pinniped deaths have been reported in any fishery since 2009/10.

The locations of most pinniped interactions are clustered in Spencer Gulf and the Coorong (Figure 22). The distribution of interactions reflects fishing effort in the LCF and SASF, the fisheries that have reported the majority of interactions.

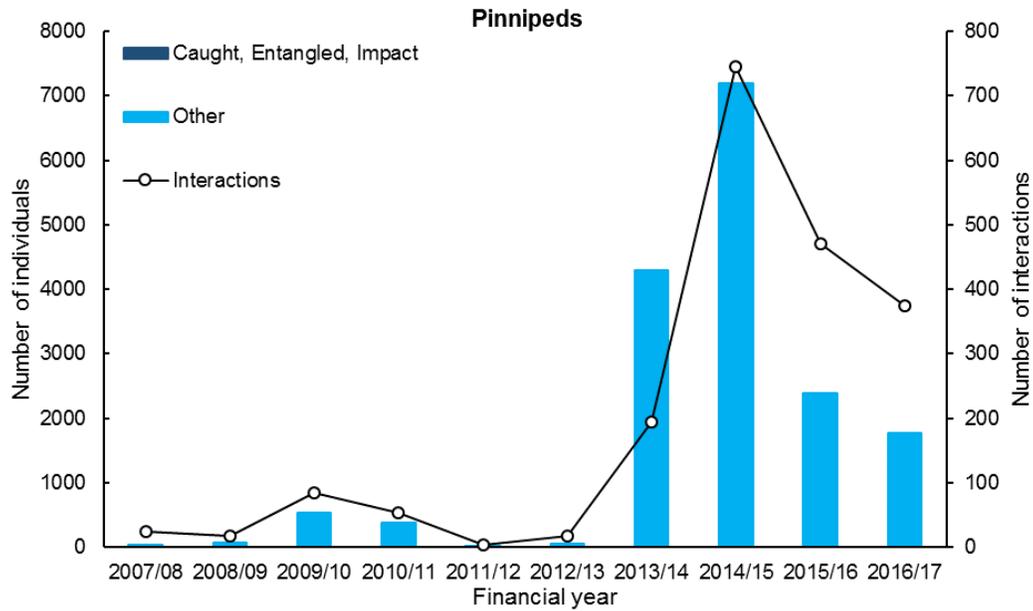


Figure 20. Number of reported interactions and nature of interactions between South Australian commercial fisheries and pinnipeds, 2007/08 to 2016/17.

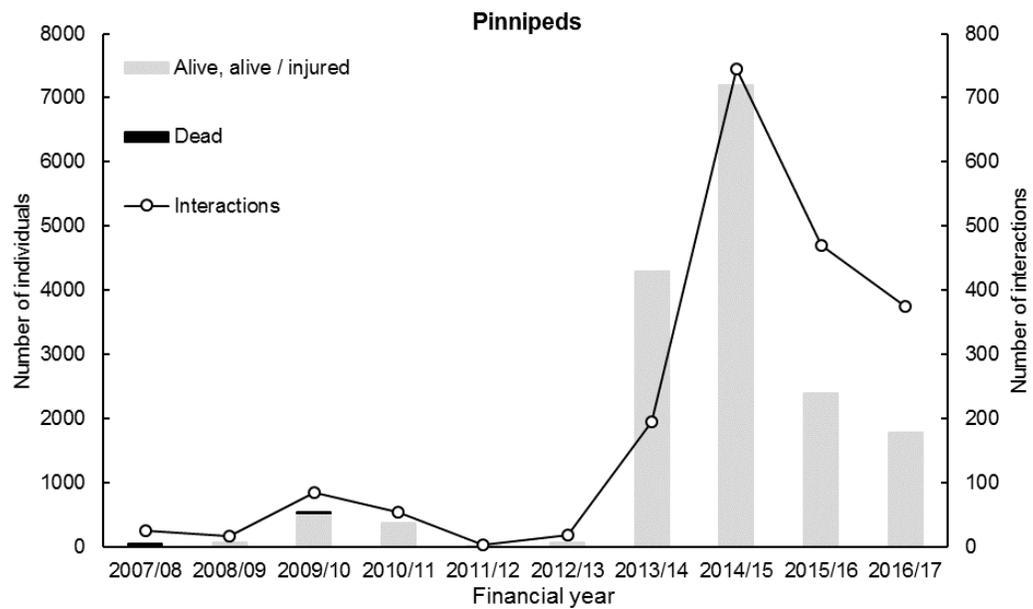


Figure 21. Number of reported interactions and fate of pinnipeds after interacting with South Australian commercial fisheries, 2007/08 to 2016/17.

Table 4. Number of interactions reported with pinnipeds in Wildlife Interaction Logbooks by fishery and financial year.

Fishery	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	Total
Charter Boat	1	0	0	0	0	0	0	0	0	0	1
Lakes and Coorong	0	0	73	52	0	16	195	745	470	374	1,925
Marine Scalefish	0	0	1	0	0	0	0	0	0	0	1
South Australian Sardine	24	17	10	1	4	2	0	1	0	1	60
Spencer Gulf Prawn	0	0	0	1	0	0	0	0	0	0	1
West Coast Prawn	0	0	1	0	0	0	0	0	0	0	1
Total	25	17	85	54	4	18	195	746	470	375	1,989

Table 5. Number of individual pinnipeds reported in Wildlife Interaction Logbooks by fishery and financial year.

Fishery	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	Total
Charter Boat	1	0	0	0	0	0	0	0	0	0	1
Lakes and Coorong	0	0	514	379	0	56	4298	7191	2393	1776	16607
Marine Scale	0	0	1	0	0	0	0	0	0	0	1
Pilchard	39	75	14	1	5	6		1		1	142
Spencer Gulf Prawn	0	0	0	1	0	0	0	0	0	0	1
West Coast Prawn	0	0	2	0	0	0	0	0	0	0	2
Total	40	75	531	381	5	62	4298	7192	2393	1777	16754

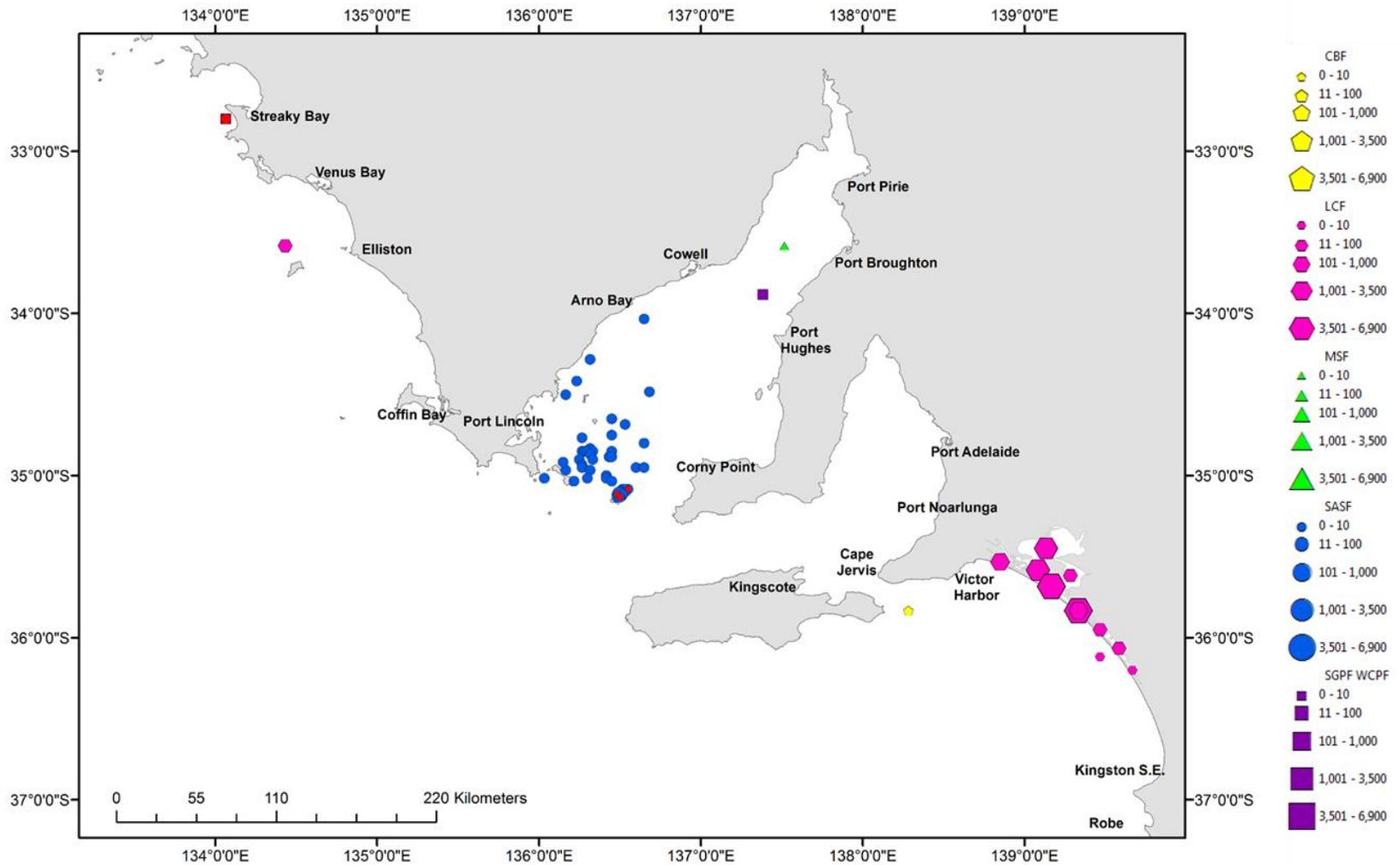


Figure 22. Location of pinniped interactions, by fishery, and number of individuals reported by SA commercial fisheries between 2007/08 and 2016/17. Red symbols indicate reported mortalities. CBF = Charter Boat Fishery, LCF = Lakes and Coorong Fishery, MSF = Marine Scalefish Fishery, SASF = South Australian Sardine Fishery, SGPF = Spencer Gulf Prawn Fishery, WCPF = West Coast Prawn Fishery.

3.3.2. Cetaceans

In 2016/17, 60 interactions with cetaceans, involving 202 individuals, were reported. All but one interaction was reported in the SASF (see Section 3.2.2 and section 3.2.3). The report of an interaction with a dolphin in the SGPF in 2016/17 was the first reported interaction of a cetacean and a South Australian prawn fishery. The comments accompanying the report state that the individual hit the propeller of the vessel and was killed instantly. The number of fishery interactions with cetaceans and of individuals has varied between years with the lowest numbers reported in 2010/11 and the highest in 2011/12 (Figure 23, Table 6 and 7). In total, 736 interactions with cetaceans (1,791 individuals) have been reported between 2007/08 and 2015/16, all with dolphins. Although 73% of individuals were not recorded to species level, given that 1,973 of these individuals were recorded in the SASF, and common dolphins are the only dolphin species that have been recorded to interact with the fishery by independent observers, it is likely that 99% of all dolphins reported in WIFs have been common dolphins.

The majority (69%) of individuals have been recorded in the 'caught', 'entangled', 'impact' category (Figure 23), with the fate of 98% of individuals reported as 'alive' or 'alive / injured' (Figure 24). In addition to dolphin interactions with the SASF and the single interaction reported with the SGPF in 2016/17, nine interactions with dolphins have been reported with the MSF, three with the CBF and one with the NZRLF. A total of 48 mortalities have been reported since 2007/08. A single mortality was reported in the NZRLF in 2007/08, the MSF in 2008/09, and the SGPF in 2016/17. All other mortalities have been reported in the SASF.

The locations of reported cetacean interactions are mostly clustered in Spencer Gulf, reflecting fishing effort in the SASF which has reported the majority of interactions (Figure 25).

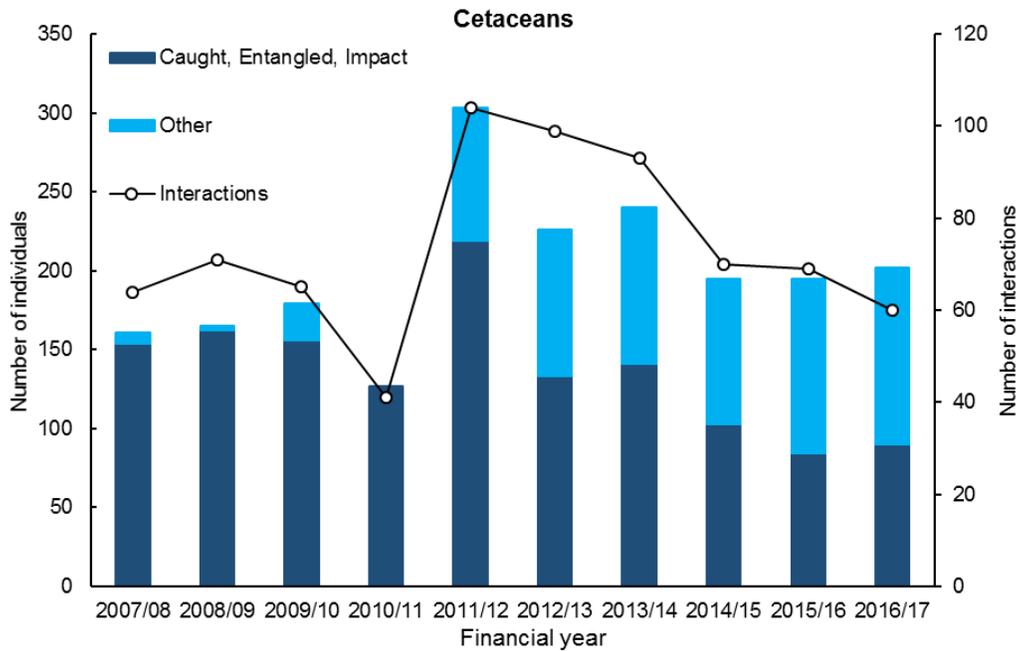


Figure 23. Number of reported interactions and nature of interactions between South Australian commercial fisheries and cetaceans, 2007/08 to 2016/17.

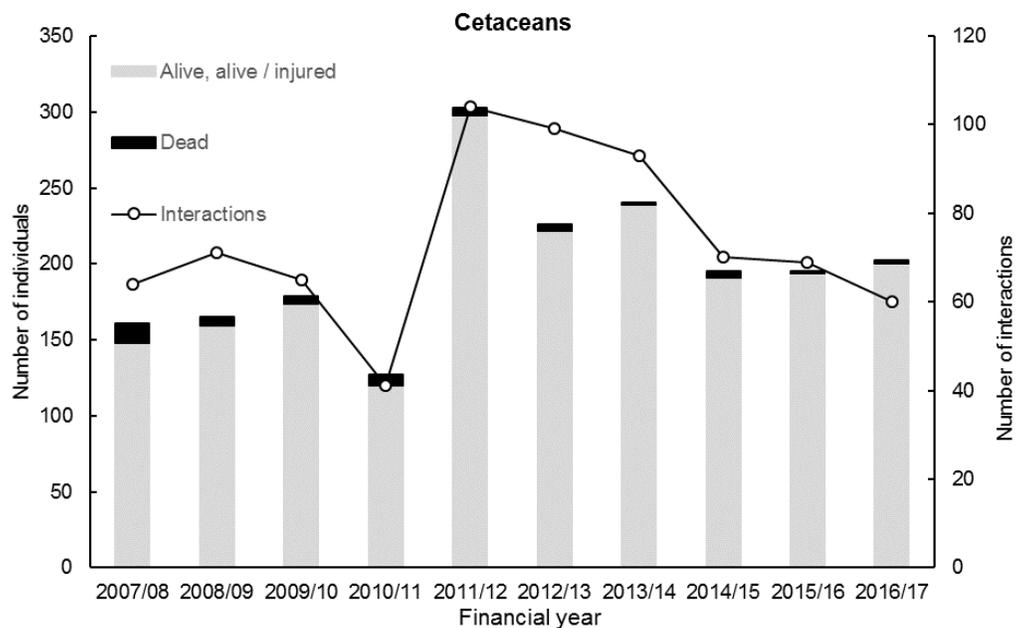


Figure 24. Number of reported interactions and fate of cetaceans after interacting with South Australian commercial fisheries, 2007/08 to 2016/17.

Table 6. Number of interactions with cetaceans reported in Wildlife Interaction Logbooks by fishery and financial year.

Fishery	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	Total
Charter Boat	2	1	0	0	0	0	0	0	0	0	3
Marine Scalefish	3	5	0	1	0	0	0	0	0	0	9
Northern Zone Rock Lobster	1	0	0	0	0	0	0	0	0	0	1
South Australian Sardine	58	65	65	40	104	99	93	70	69	59	722
Spencer Gulf Prawn	0	0	0	0	0	0	0	0	0	1	1
Total	64	71	65	41	104	99	93	70	69	60	736

Table 7. Number of individual cetaceans reported in Wildlife Interaction Logbooks by fishery and financial year.

Fishery	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	Total
Charter Boat	7	1	0	0	0	0	0	0	0	0	8
Marine Scalefish	4	5	0	1	0	0	0	0	0	0	10
Northern Zone Rock Lobster	1	0	0	0	0	0	0	0	0	0	1
South Australian Sardine	149	159	179	126	303	226	240	195	195	201	1,973
Spencer Gulf Prawn	0	0	0	0	0	0	0	0	0	1	1
Total	161	165	179	127	303	226	240	195	195	202	1,993

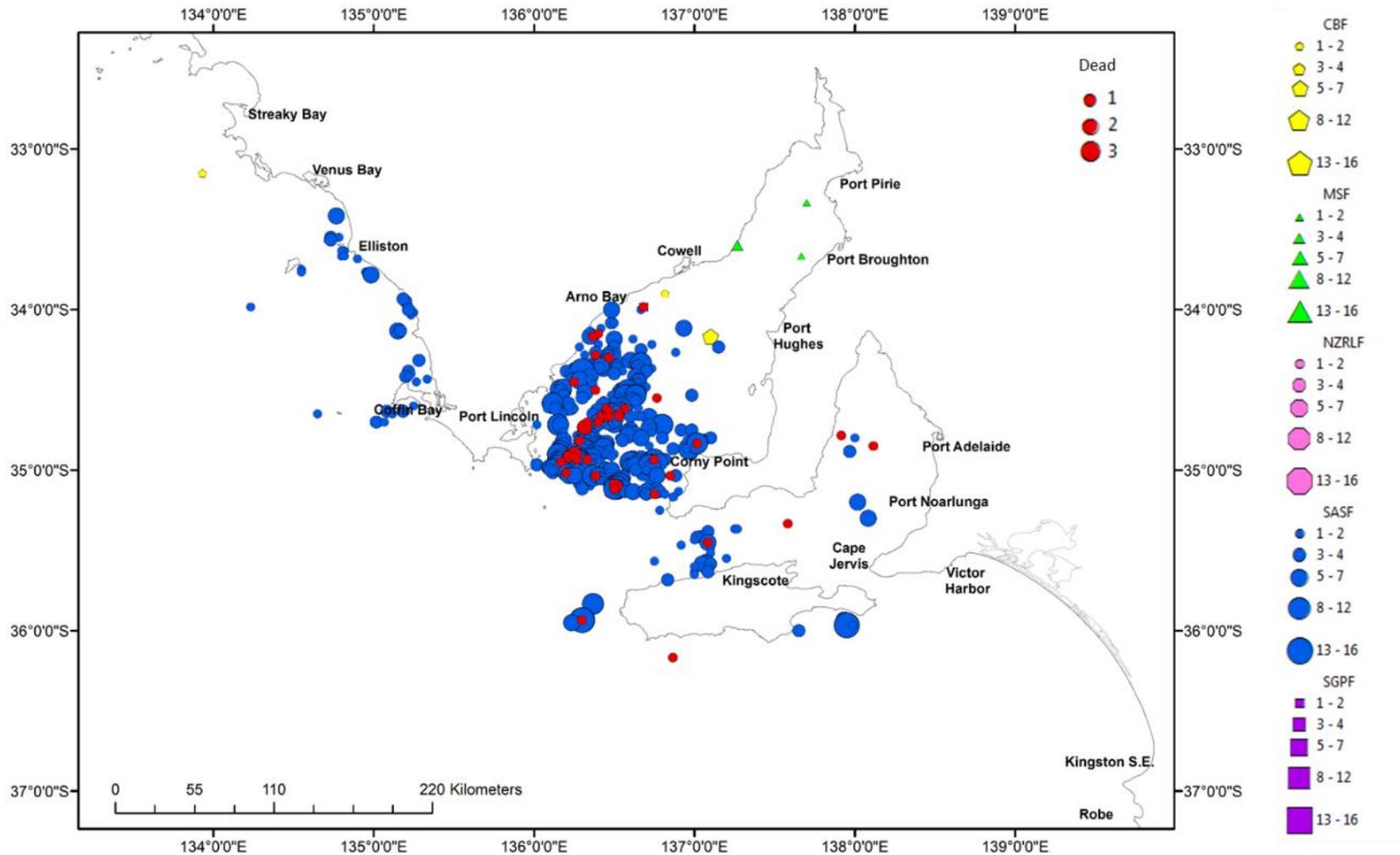


Figure 25. Location of cetacean interactions, by fishery, and number of interactions reported by South Australian commercial fisheries between 2007/08 and 2016/17. Red circles indicate reported mortalities. CBF = Charter Boat Fishery, LCF = Lakes and Coorong Fishery, MSF = Marine Scalefish Fishery, NZRLF = Northern Zone Rock Lobster Fishery, SASF = South Australian Sardine Fishery, SGPF = Spencer Gulf Prawn Fishery.

3.3.3. Protected fish species

In 2016/17, 49 interactions with protected fish species, involving 59 individuals were reported (Table 8 and 9). Most interactions occurred in the SGPF (45%) and WCPF (33%) and all involved syngnathids, of which 88% were reported as alive following the interaction. The remaining eleven interactions with protected fish species in 2016/17 each involved a single white shark, with eight reported in the Abalone Fishery, and three in the MSF (see section 3.25 and 3.24 respectively).

Between 2007/08 and 2016/17, 556 interactions with protected fish, involving 918 individuals, have been reported in WIFs. The number of interactions has varied between years with lowest numbers reported in 2009/10 and highest in 2012/13 (Figure 26). Most interactions with protected fish species are recorded in the caught, entangled, impact category, and predominantly involve syngnathids. The second most frequently interacting group is great white sharks, with most interactions (66%) involving shark sightings being reported by the Abalone fishery. The remaining interactions with great white sharks have involved individuals depredating catch from hooks or interacting with fishing gear. A total of 205 protected fish mortalities have been reported since 2007/08, with the highest number of mortalities relative to the number of individuals interacting occurring in 2007/08 (46%) and 2011/12 (42%) (Figure 27).

Since 2007/08, interactions with protected fish species have occurred mostly with seahorses (50%) and pipefishes (25%) (mortality of 22% and 26%, respectively; Figure 28). The next most frequently interacting species were great white sharks (75 individuals, four mortalities) followed by pipehorses (63 individuals, 24 mortalities) and common seadragons (31 individuals, 4 mortalities). All 11 leafy seadragons captured in prawn trawl fisheries were released alive. The four mortalities of white sharks were all reported from interactions with long-line gear in the MSF.

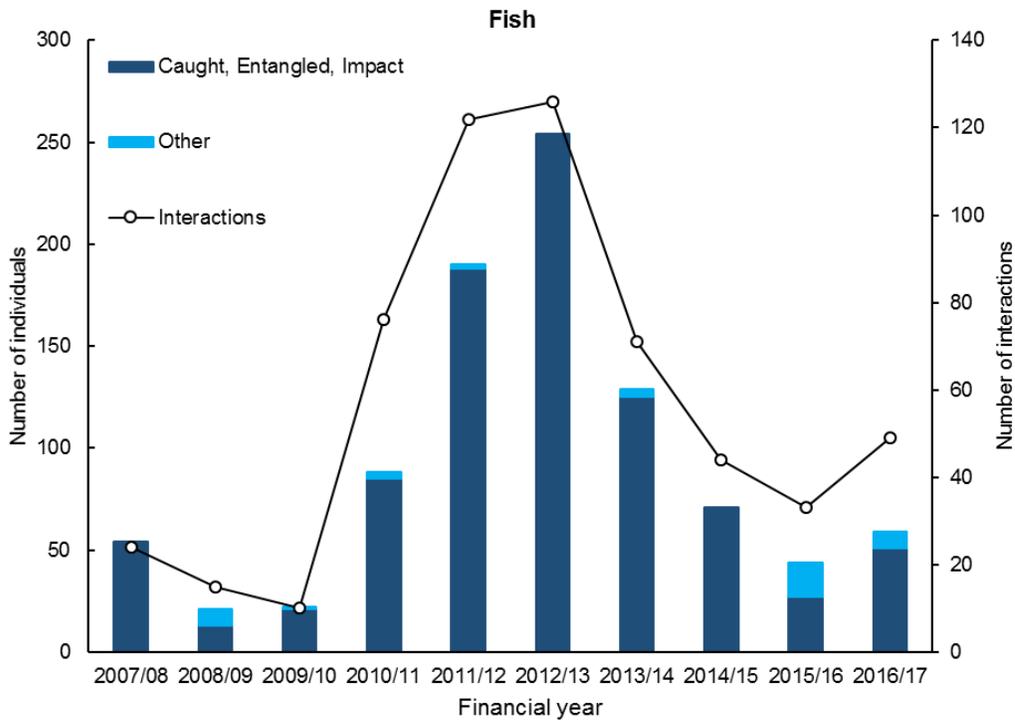


Figure 26. Number of reported interactions and nature of interactions between South Australian commercial fisheries and fish, 2007/08 to 2016/17.

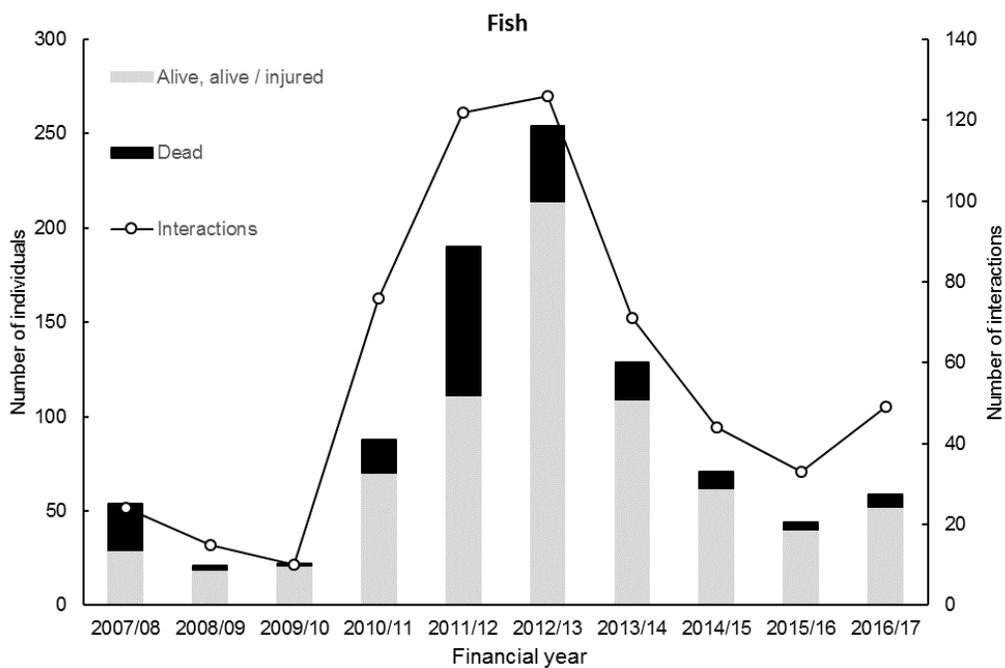


Figure 27. Number of reported interactions and fate of individual protected fish species reported by South Australian commercial fisheries between 2007/08 and 2016/17.

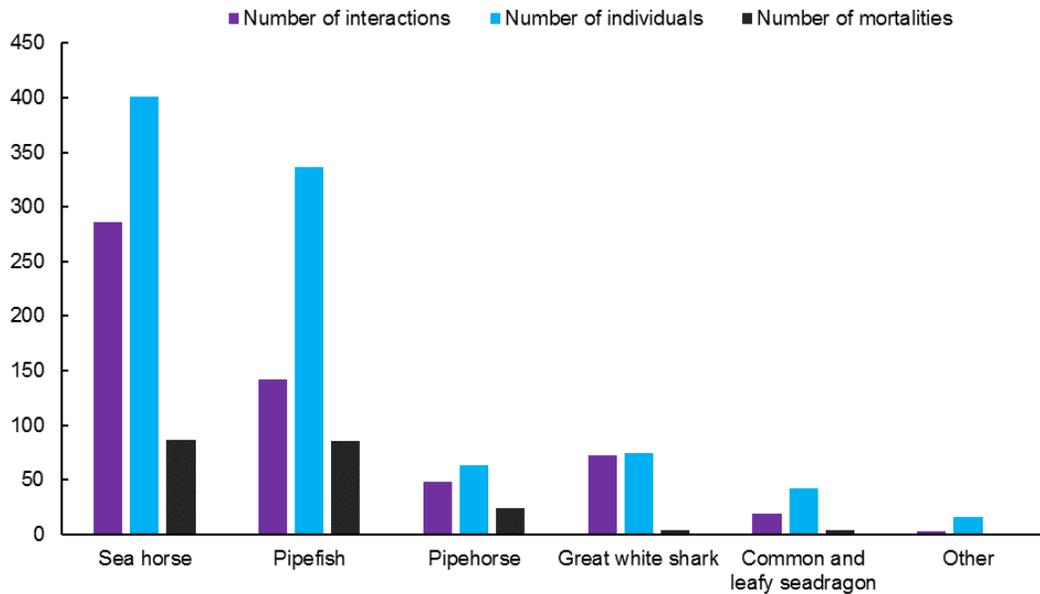


Figure 28. Number of protected fish interactions, individuals and mortalities by species reported in South Australian commercial fisheries between 2007/08 and 2016/17. The ‘other’ species category is comprised of one record of a potbelly seahorse, one interaction with three flutemouth, and one interaction with 12 silver perch.

The distribution of syngnathid interactions reflects the fishing areas of the WCPF and SGPF (Figure 29). The distribution of white shark interactions reflects the distribution of the Abalone Fishery (31 records), MSF (18 records), SASF (14 records), CBF (six records) and SGPF (one record) (Figure 29).

Table 8. Number of interactions with protected fish species reported in Wildlife Interaction Logbooks by fishery and financial year.

Fishery	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	Total
Abalone Fishery	0	2	0	1	2	0	1	0	15	8	29
Charter Boat Fishery	1	7	1	0	0	0	0	0	1	0	10
Lakes and Coorong Fishery	0	0	0	0	0	0	0	1	0	0	1
Marine Scalefish Fishery	4	1	1	3	1		3	1	1	3	18
South Australian Sardine Fishery	0	2	2	3	3	1	2	1	0	0	14
Spencer Gulf Prawn Fishery	0	0	5	52	82	78	46	24	12	22	321
West Coast Prawn Fishery	19	3	1	17	34	47	19	17	4	16	177
Total	24	15	10	76	122	126	71	44	33	49	570

Table 9. Number of individual protected fish species reported in Wildlife Interaction Logbooks by fishery and financial year.

Fishery	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	Total
Abalone Fishery	0	3	0	1	2	0	1	0	15	8	30
Charter Boat Fishery	1	8	1	0	0	0	0	0	1	0	11
Lakes and Coorong Fishery	0	0	0	0	0	0	0	12	0	0	12
Marine Scalefish Fishery	4	1	1	3	1		3	1	1	3	18
South Australian Sardine Fishery	0	2	2	3	3	1	2	1	0	0	14
Spencer Gulf Prawn Fishery	0	0	17	60	138	195	95	36	23	29	593
West Coast Prawn Fishery	49	7	1	21	46	58	28	21	4	19	254
Total	54	21	22	88	190	254	129	71	44	59	932

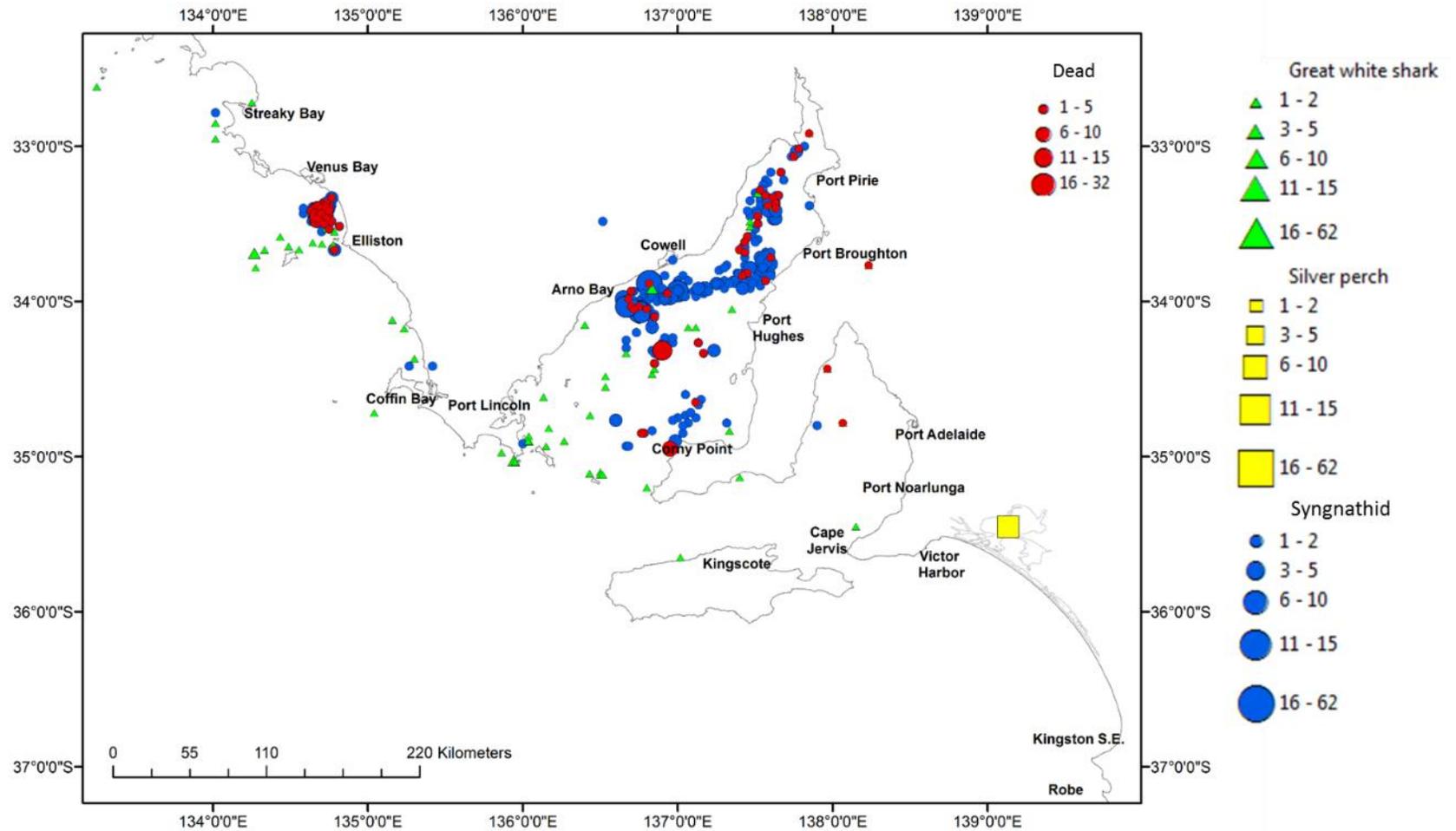


Figure 29. Location of interactions with protected fish species and number of individuals, by taxa or species, reported by South Australian commercial fisheries between 2007/08 and 2016/17. Red circles indicate reported mortalities.

3.3.4. Birds

In 2016/17, 14 interactions with birds were reported, with all 21 individuals recorded as 'caught', or entangled. All interactions were reported with large mesh gillnets in the LCF and involved 16 cormorants, four pelicans and one grebe. A total of 12 cormorant mortalities were reported, with all other birds released alive.

Fifteen bird groups have been reported in logbooks since 2007/08, the majority of individuals (74%) and mortalities (79%) involving cormorants. The next most frequently reported bird type in terms of individuals are pelicans, grebe and pacific gulls (Figure 32). In total, 156 bird interactions, involving 261 individuals, have been reported by commercial fisheries between 2007/08 and 2016/17 (Table 10 and 11). The number of interactions has varied between years being lowest in 2010/11 and highest in 2013/14 (Figure 30, Table 10). The majority (96%) of individuals have been recorded in the caught, entangled, impact category. The three interactions in the other category included an interaction with 10 storm petrels in the NZRLF (see Section 3.2.5) and two individual sighting records: one of a dead little penguin and the other of a dead crested grebe (*Podiceps cristatus*).

After cormorants, the highest number of mortalities were recorded for grebe followed by pelican and dusky moorhen. Interactions have mainly occurred in mesh net fishing gear, with 74% of interactions, 65% of individuals and 89% of mortalities recorded in gillnets. Six interactions between seabirds and lines have been reported, involving three pacific gulls, one silver gull (*Chroicocephalus novaehollandiae*), one Australasian gannet and one unidentified albatross species which was entangled in longline gear and reported as dead. Two shearwaters, species not identified, were reported as dead in the SASF, and a single mortality of a cormorant was reported in the BCF. Of the 70 mortalities that have been reported since 2007/08, the highest proportion, relative to the number of individuals interacting, were reported in 2016/17 (57%) (Figure 31). Overall, the distribution of interactions and mortalities reported for birds reflects areas where nets are fished in the LCF and MSF (Figure 33).

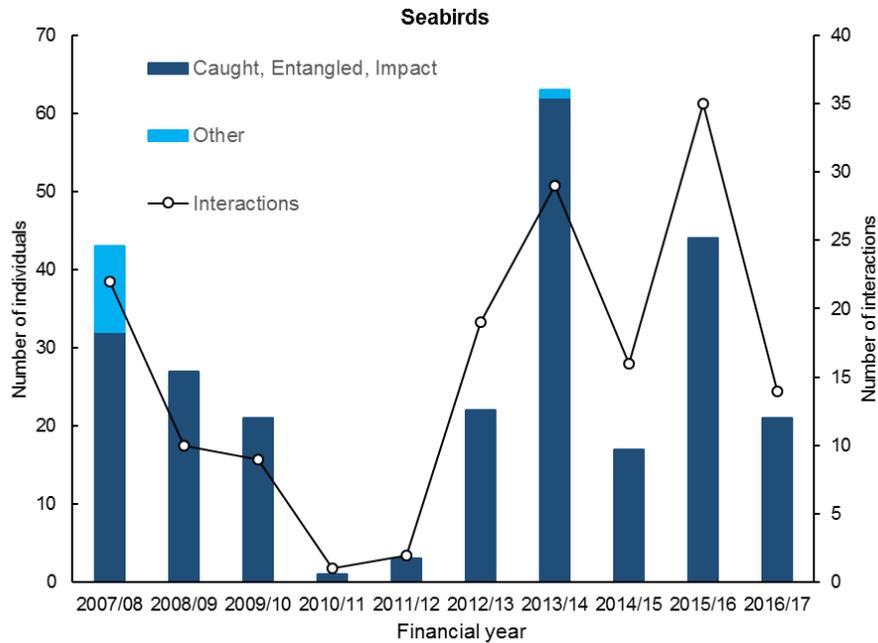


Figure 30. The number of individuals that interacted with the South Australian Commercial fisheries and seabirds from 2007/08 to 2016/17, and the number of reported interactions between the commercial fishery and seabirds (black line). Interactions grouped by the nature of interactions (caught, entangled impact or other).

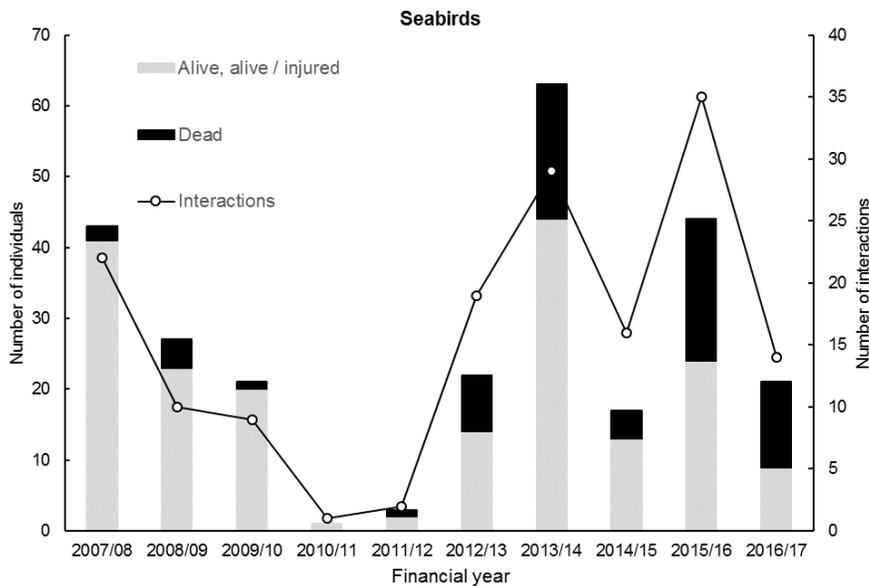


Figure 31. Number of reported interactions and the number of individuals and fate of seabirds (alive, injured or dead) after interacting with South Australian Commercial fisheries, 2007/08 to 2016/17.

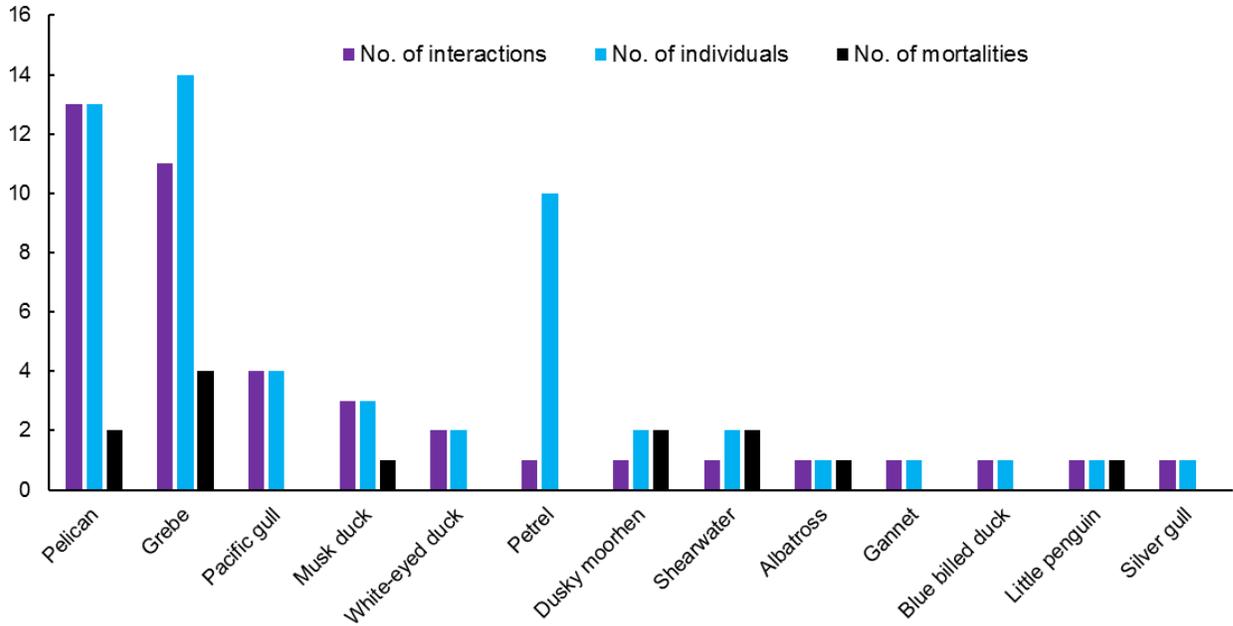


Figure 32. Number of interactions, individuals and mortalities, by bird species or groups where species was not recorded excluding cormorants, reported interacting with South Australian commercial fisheries between 2007/08 and 2016/17.

Table 10. Number of interactions with bird species reported in Wildlife Interactions Logs by fishery and financial year.

Fishery	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	Total
Blue Crab	0	0	0	0	0	0	0	0	1	0	1
Charter Boat	1	0	0	1	0	0	0	0	0	0	2
Lakes and Coorong	4	3	0	0	0	17	29	16	32	14	115
Marine Scalefish	16	6	9	0	2	2	0	0	1	0	36
Northern Zone Rock Lobster	1	0	0	0	0	0	0	0	0	0	1
South Australian Sardine	0	1	0	0	0	0	0	0	0	0	1
Total	22	10	9	1	2	19	29	16	34	14	156

Table 11. Number of individual birds reported in Wildlife Interaction Logbooks by fishery and financial year.

Fishery	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	Total
Blue Crab	0	0	0	0	0	0	0	0	1	0	1
Charter Boat	1	0	0	1	0	0	0	0	0	0	2
Lakes and Coorong	4	3	0	0	0	20	63	17	41	21	169
Marine Scalefish	28	22	21	0	3	2	0	0	1	0	77
Northern Zone Rock Lobster	10	0	0	0	0	0	0	0	0	0	10
South Australian Sardine	0	2	0	0	0	0	0	0	0	0	2
Total	43	27	21	1	3	22	63	17	43	21	261

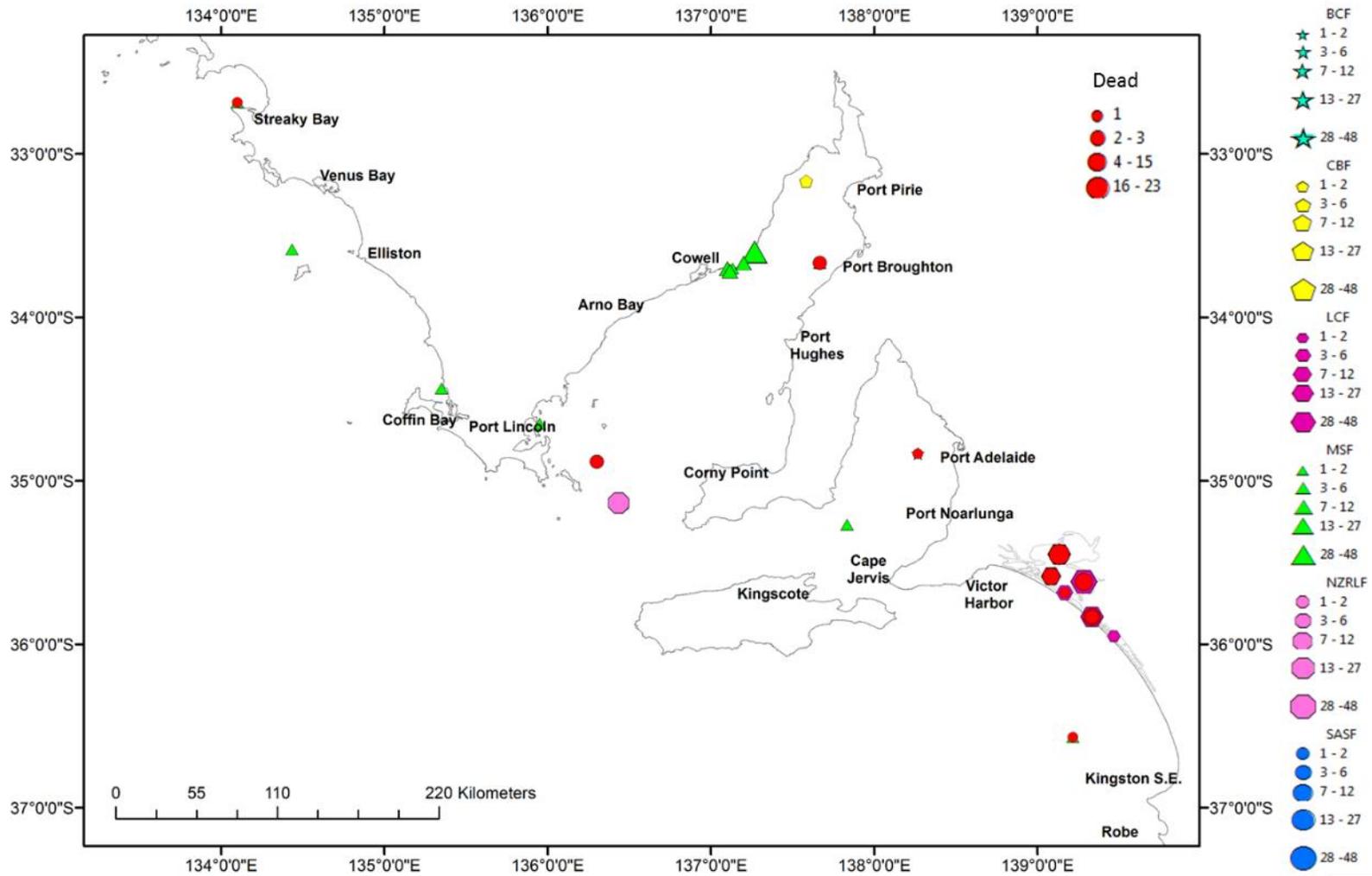


Figure 33. Location of interactions with seabirds and number of individuals, by fishery, reported by South Australian commercial fisheries between 2007/08 and 2016/17. Red symbols indicate reported mortalities. BCF = Blue Crab Fishery, CBF = Charter Boat Fishery, LCF = Lakes and Coorong Fishery, MSF = Marine Scalefish Fishery, NZRLF = Northern Zone Rock Lobster Fishery, SASF = South Australian Sardine Fishery.

3.3.5. Reptiles

No interactions with reptiles were reported in 2016/17. Since 2007/08, a total of 24 interactions involving 86 individual marine or freshwater turtles have been reported, with no interactions reported since 2013/14. The majority of interactions (71%) and individuals (92%) were recorded in the LCF in large mesh gillnet, drum net or large mesh hauling nets. Almost 80% of individual reptiles were reported from six interactions in the LCF in 2009/10. Comments entered in the logbook reports stated that the high number of individuals and interactions were a result of a fisher monitoring the number of turtles in the river while removing carp from a bund.

In 2008/09 and 2009/10, the BCF reported a single leatherback turtle entanglement in rope. On both occasions the turtle was released alive. A single loggerhead turtle was hooked on a longline in the MSF in 2013/14 and released alive after the hook was removed. Eight interactions with turtles did not identify the species involved. A single turtle was recorded entangled by its flipper in the SZRLF in 2007/08 and was released but not all the gear could be removed successfully. Five interactions, each involving a single turtle, were recorded in the LCF in 2013/14, and a single interaction was recorded in the MSF in 2008/09 and 2009/10. No comments were provided with these reports regarding the nature of the interaction, but all turtles were recorded as being caught and released.

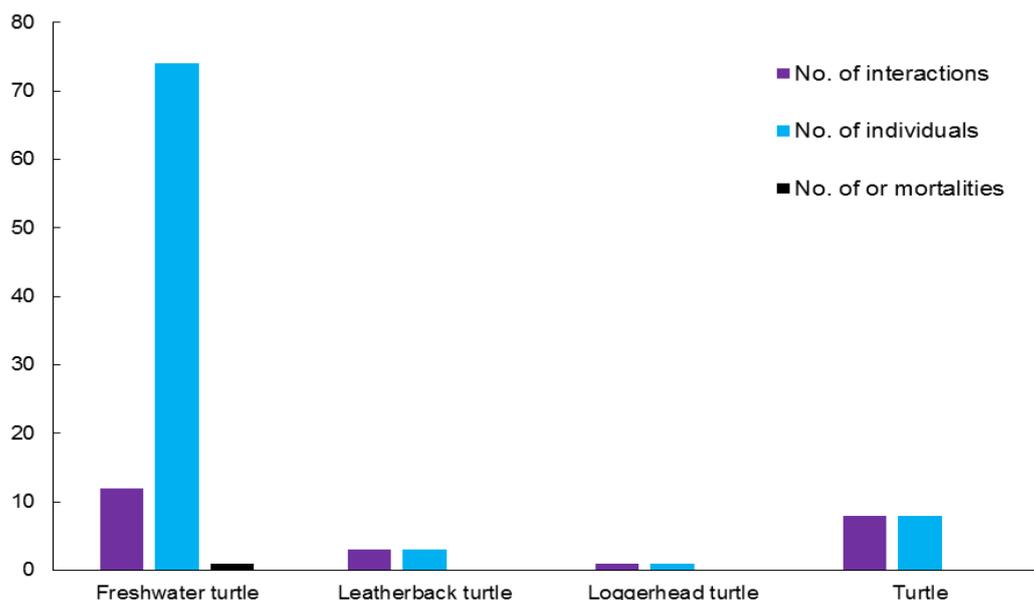


Figure 34. Number of interactions with reptiles, individuals and mortalities, by species and group when species was not recorded, reported interacting with South Australian commercial fisheries between 2007/08 and 2016/17.

4. DISCUSSION

This report summarises the 2016/17 TEPS interactions with South Australian managed fisheries and synthesises logbook reports of TEPS interactions submitted by South Australian commercial fisheries between 1 July 2007 and 30 June 2017, and builds on previous reports by assessing fishers' comments to gain an understanding of the nature of interactions.

Between 2007/08 and 2016/17, the total number of reported interactions, whether considered by taxonomic group or fishery, have varied widely between years, as have the categorised nature of interactions and fate of individuals. Between 2007/08 and 2011/12, the total number of interactions reported each year was relatively consistent (range 117 -232), before increasing to a maximum of 876 interactions in 2014/15. This large increase was due to a rise in the number of interactions reported with long-nosed fur seals in the LCF.

In 2016/17, the total number of interactions with South Australian commercial fisheries and number of TEPS individuals involved were 16% and 23% lower, respectively, than reported in 2015/16. This decrease was due to a 20% reduction in the number of interactions reported with seals in the LCF and a 26% reduction in the total number of individual seals recorded. Although lower than in 2015/16, interactions with long-nosed fur seals in the LCF accounted for 75% of the reported interactions and 86% of the TEPS individuals reported by South Australian managed fisheries in 2016/17. Comments provided on WIFs indicate that interactions with long-nosed fur seals involve seals depredating fish from nets and damaging nets. Industry representatives from the LCF estimate that a significant portion of catch is being taken by fur seals. Interactions between long-nosed fur seals were first reported with small mesh gillnets in 2009/10 and totalled 72 interactions. While the number of interactions between this species and the LCF has increased more than sixfold between 2009/10 and 2015/16, no long-nosed fur seal mortalities have been reported in this fishery.

An assessment of seasonal patterns show an overall increase in interaction rates with pinnipeds reported for both small and large mesh gillnets in the LCF during the winter months. Monthly counts of long-nosed fur seals, since August 2015 in the Northern lagoon of the Coorong, show a general pattern of increased numbers during winter (DEWNR unpublished data). This pattern of higher numbers of individuals present at haul outs, as opposed to breeding colonies, during winter months reflects the pattern recorded at the Adelaide Outer Harbor breakwater (Shaughnessy et al. 2017). These seasonal patterns in coastal abundance are in part driven by changes in foraging behaviour of different age and sex classes of fur seals during the year.

Foraging by long-nosed fur seals occurs both in shelf waters and off-shelf waters, and foraging strategies and diets differ with the age and sex of the animal and the time of year (Page et al. 2006). Adult male long-nosed fur seals establish territories at breeding colonies from late November that they occupy for 30–50 days; prior to the breeding season both male and females go on extended

foraging trips (Kirkwood and Goldsworthy 2013). Adult females nurse pups for about 10 months (between December and October) and forage on shelf water between December and March before transitioning to oceanic water in April or May (Baylis et al. 2012, Kirkwood and Goldsworthy 2013). The foraging behaviour of juvenile and sub-adult males is less well understood, but there is an increase in foraging effort in coastal waters during winter months (Page et al. 2006, Kirkwood and Goldsworthy 2013, SARDI unpublished data). The closest breeding colonies to the Lakes and Coorong area are on Kangaroo Island, where almost half of all long-nosed fur seal pups in South Australia are born (Shaughnessy et al. 2015). Therefore, seasonal changes in the number of interactions between long-nosed fur seals and the LCF likely reflect changes in distribution and number of seals foraging in coastal and oceanic waters throughout the year.

In contrast to interactions with the LCF, there has been a decline in the overall number of reported interactions with pinnipeds in other fisheries since 2007/08. Over the ten-year reporting period, the number of pinniped interactions with purse seine operations has dropped from 24 in 2007/08 to one encircled and released Australian sea lion in 2016/17. Pinniped species that have been reported to interact with the SASF are the Australian sea lion, Australian fur seal and 'common' seal. Outside of these two fisheries, a further four interactions involving a total of five pinnipeds have been reported since 2007/08, with a single interaction occurring in each of the CBF, MSF, SGPF and WCPF. While populations of the two fur seal species that occur in South Australia are stable / increasing, ongoing declines in Australian sea lion populations are occurring (Goldsworthy et al. 2015). Current management strategies to mitigate interactions between Australian sea lions and fisheries include the mandatory use of a sea lion excluder device (SLED) in commercial and recreational lobster pots fished in waters less than 100 m depth in the Northern Zone of the South Australian Rock Lobster Fishery, and spatial closures and trigger limits that apply to the gillnet sector of the Commonwealth Southern and Eastern Scalefish and Shark Fishery (SESSF) (AFMA 2010).

In 2016/17, 12% of interactions and 10% of individuals reported in WIFs were recorded in the SASF. All but one interaction involved dolphins (assumed to be common dolphins), with one mortality reported. The other involved an Australian sea lion. Overall, the fishery has reported the second highest number of interactions since the logbooks began, accounting for 23% of TEPS interactions reported over the ten-year period. An independent on-board observer program has operated in the fishery since 2004, with the objective of monitoring dolphin interactions and mortality rates and assessing the effectiveness of a Code of Practice (CoP), developed by the South Australia Sardine Industry Association (SASIA), in mitigating interactions. Observer effort has generally been set at 10% of fishing operations, with the exception of the 2007-08 to 2009-10 fishing seasons when target coverage was set at 30%. In 2016/17, 85% of TEPS interactions were reported when no observer was on-board. This change likely reflects ongoing changes to the CoP that reduce the likelihood of an entanglement occurring. The current key components of the CoP include searching for wildlife as

soon as the net is pursed and initiating a release procedure as soon as possible if wildlife are detected (SASIA 2015).

The report in 2016/17 of a dolphin mortality after hitting the propeller of a vessel in the SGPF was the first cetacean interaction reported in any South Australian fishery other than the SASF since 2010/11 and the first record of a direct interaction between a cetacean and a prawn fishery. However, both bottlenose and common dolphins are observed to associate with prawn trawl operations in the SGPF, and have been recorded removing catch directly from the cod end or feeding on discards (Svane 2005). Since 2007/08, the majority of interactions with cetaceans (99%) have been reported in the SASF, and while these reports involve common dolphins that were encircled during purse seine operations, data collected by independent observers in the SASF also show that dolphins associate strongly with this fishery. For example, dolphins were recorded as being present in the vicinity of the nets after they were set in 57% of 117 observed shots in 2016/17 (Mackay and Goldsworthy 2017). The remaining twelve interactions between cetaceans and South Australian fisheries since 2007/08 involved 18 dolphins: nine that interacted with either floating or sinking haul nets in the MSF, eight that interacted with line gear in the CBF and a single dolphin that became entangled with a lobster pot in the Northern Zone Rock Lobster Fishery. As the species was not specified, these interactions could have involved either common dolphins or bottlenose dolphins (*Tursiops* sp.). Of the 1,993 dolphins that have been reported to interact with SA commercial fisheries since 2007/08, 48 mortalities have been reported. Interactions with common dolphins, and bottlenose dolphins (*Tursiops* sp.), are also recorded in the gillnet sector of the SESSF, and current management strategies to mitigate interactions include individual vessel trigger limits (AFMA 2017).

Protected fish species were the third most commonly reported taxa to interact with South Australian managed fisheries between 2007/08 and 2016/17. The vast majority of individuals are syngnathids (90%) that have all been reported from interactions with prawn trawl fishing operations. In 2007, the most frequently caught syngnathids were common seadragons, which accounted for 37% of all individuals while the spotted pipefish accounted for 32% of all individuals recorded in 2013 (Currie et al. 2009, Burnell et al. 2015). Burnell et al. (2015) also found that the majority of syngnathid captures occurred in areas of the fishery that were not frequently trawled. Interactions with syngnathids were not reported in WIFs in the SGPF in either 2007/08 or 2008/09, after which reported interactions increased to a maximum of 193 individuals in 2012/13. The increase in reporting of interactions over this period is thought to be as a result of an education program in the fishery (Mayfield et al. 2014). Overall, the highest number of interactions with the most individuals were reported by the SGPF. However, while annual trawl effort in the WCPF since 2007/08 has been, on average, ten percent of that in the SGPF, the fishery has reported almost a third of all individual syngathids since 2007/08. It is unclear what the reason for the higher interaction rate in the WCPF would be; however, there are a number of management strategies in the SGPF which likely reduce interaction rates and / or improve survival rates of syngnathids.

The SGPF obtained Marine Stewardship Council (MSC) certification in 2011, and as part of that certification has an ongoing ecological management plan. For example, one goal is to ensure that fishery impacts on TEPS are sustainable. Permanent closures have also been implemented to protect syngnathid populations and trawling is further prohibited in waters shallower than 10 m (Mayfield et al. 2014). The fishery has implemented a 'hopper system' and 'crab bags' which allow bycaught species to be maintained in a wet well until they are separated from catch and released, which may improve post-release survival rates (Mayfield et al. 2014). In addition, the fishery has trialed and continues to test a number of bycatch reduction devices which potentially could further reduce the bycatch of TEPS in the fishery. Furthermore, fishery-independent surveys are conducted in the fishery three times per year, and bycatch surveys are conducted approximately every five years. In 2007 and 2013, catch sampling was undertaken at 120 and 65 sites, respectively, and included areas closed to trawling (Currie et al. 2009, Burnell et al. 2015). Both surveys recorded seven species of syngnathids with 112 and 31 individuals reported in 2007 and 2013, respectively.

The next most frequently reported TEPS fish species are great white sharks. In 2016/17, eight interactions with single sharks were reported in the Abalone Fishery and predominantly involved in-water encounters with great white sharks by divers. The three interactions with single great white sharks in the MSF involved direct interaction with fishing gear. One interaction, with a longline, resulted in mortality of the individual. In total, 73 interactions with great white sharks have been reported since 2007/08, involving 75 individuals of which four were recorded dead and one injured. All mortalities were recorded in long-line fishing operations. While most reported interactions with great white sharks have been sightings by the Abalone Fishery (41%), almost a quarter have involved great white sharks depredating and / or becoming entangled in line fishing gear in the MSF or CBF. All interactions with the SASF (n = 14) have either involved sharks becoming encircled in purse seine nets or interacting with nets from the outside.

In 2016/17, 14 interactions with 21 seabirds were reported. All occurred with large mesh gillnets in the LCF, with most (n = 16) involving cormorants, twelve of which were reported as dead. No other bird mortalities were reported in 2016/17. The highest number of interactions were reported in 2015/16, the highest number of individuals interacting with commercial fisheries were reported in 2013/14. Interactions with seabirds have mainly occurred in mesh net fishing gear, with 74% of interactions, 65% of individuals and 89% of mortalities recorded in gillnets. Cormorants have been the most frequently reported bird species, and account for 74% of individuals out of the fifteen different bird species reported to interact with South Australian commercial fisheries since 2007/08. The majority of mortalities (79%) have also been reported for cormorants. Overall, 73% of interactions with cormorants have occurred in large mesh gillnets in the LCF, with the remainder occurring in sinking and floating haul nets in the MSF. No interactions with seabirds in net gear in the MSF have been reported since 2012/13, although fishing effort with nets has remained relatively constant since 2007/08. Diving seabirds are at risk of entanglements in gillnets, and globally, a high number of

seabird species have been reported as bycatch in this gear type (Žydelis et al. 2013). A seabird interaction was also recorded with a purse seine in the SASF in 2008/09 which resulted in the mortality of two shearwaters (species unknown). Interactions were also reported with hand line and longline gear where birds were hooked or entangled, and one mortality reported after an albatross (unidentified to species) became entangled in longline gear. Seabird bycatch in longline fisheries is well documented globally, particularly for albatrosses, petrels and shearwaters (Brothers et al. 2010). Interactions between albatross and petrels and oceanic longlines in Commonwealth fisheries are managed through the Seabird Threat Abatement Plan that specifies fishery specific minimum levels of observer coverage and mortality limits (Commonwealth of Australia 2014).

The definition of a wildlife interaction in the WIF is “any physical contact a fisher, boat or fishing gear has with wildlife and protected species”, although abalone divers are also requested to report all sightings of white sharks while under and above the water. While most interactions reported since 2007/08 fall within the “physical contact” definition, there are a number of interactions that do not. These include sightings of TEPS in the vicinity of the vessel and on a number of occasions have included fishers reporting TEPS carcasses at sea that are not associated with fishing operations. Therefore, changes in reporting rates can also be driven by information on TEPS that fishers want to share, but that do not fall within the “physical contact” category. As data presented in this report are fishery-dependent, it is not possible to determine what factors influence patterns of reported interaction rates. For example, an increase in interaction rates in a fishery may reflect: 1) a real increase in interaction rates, 2) an increase in reporting rates over time as a result of increased involvement of industry, 3) an increase in reporting of what are perceived to be problem interactions, or 4) it may reflect a mixture of all these factors. The nature of the interaction or fate of the individual may change over time as a result of changes in fishing and management practices and / or improvements in releasing individuals.

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APPENDIX**Appendix 1: Species Listed Under Part 13 of the EPBC Act as Threatened, Migratory Marine Species or Cetaceans**

Taxa	Family or species	EPBC Listing
Sharks	Grey Nurse Shark (<i>Carcharias runca</i>), , East Coast Population	Critically Endangered
	Grey Nurse Shark (<i>Carcharias runca</i>), , West Coast Population	Vulnerable
	Northern Rivers Shark (<i>Glyphis sp. C</i>)	Critically Endangered
	Spertooth Shark (<i>Glyphis sp. A</i>)	Endangered
	Great White Shark (<i>Carcharodon carcharias</i>)	Vulnerable
	Freshwater Sawfish (<i>Pristis microdon</i>)	Vulnerable
	Green sawfish (<i>Pristis zijsron</i>)	Vulnerable
	Whale Shark (<i>Rhincodon typus</i>)	Vulnerable
Syngnathids	Pipefish	Listed Marine Species (Part 13, Division 4)
	Seadragons	
	Seahorses	
Other fish	Spotted handfish (<i>Brachionichthys Hirsutus</i>)	Endangered
	Red handfish (<i>Brachionichthys politus</i>)	Vulnerable
	Water Fall Bay and Ziebels Handfish(<i>Sympterichthys sp.</i>)	Vulnerable
Seasnakes	Various	Listed Marine Species
Turtles	Olive Ridley Turtle (<i>Lepidochelys olivacea</i>)	Endangered
	Loggerhead Turtle (<i>Caretta caretta</i>)	Endangered
	Flatback Turtle (<i>Natator depressus</i>)	Vulnerable
	Green Turtle (<i>Chelonia mydas</i>)	Vulnerable
	Hawksbill Turtle (<i>Eretmochelys imbricata</i>)	Vulnerable
	Leatherback Turtle (<i>Dermochelys coriacea</i>)	Vulnerable
Crocodiles	Freshwater crocodile (<i>Crocodylus johnstoni</i>)	Listed Marine Species (Part 13, Division 4)
	Saltwater crocodile (<i>Crocodylus porosus</i>)	

Taxa	Family or species	EPBC Listing
Seabirds	Albatross	Various, all of class Aves (Birds) are Listed Marine Species (Part 13, Division 4)
	Cormorants	
	Gannets	
	Gulls	
	Muttonbirds	
	Noddies	
	Pelicans	
	Penguins	
	Petrels	
	Prions	
	Skuas	
	Terns	
	Other	
Cetaceans	Southern Right Whale (<i>Eubalaena australis</i>)	Endangered
	Blue Whale (<i>Balaenoptera musculus</i>)	Endangered
	Humpback Whale (<i>Megaptera novaeangliae</i>)	Vulnerable
	Sei Whale (<i>Balaenoptera borealis</i>)	Vulnerable
	Fin Whale (<i>Balaenoptera physalus</i>)	Vulnerable
	Sperm Whale (<i>Physeter macrocephalus</i>)	All Cetaceans are listed under Part 13, Division 3
	False Killer Whale (<i>Pseudorca crassidens</i>)	
	Killer Whale (<i>Orcinus orca</i>)	
	Pilot Whale (<i>Globicephala macrorhynchus</i> , <i>G. melas</i>)	
	Indo Pacific Humpback Dolphin (<i>Sousa chinensis</i>)	
	Australian snubnose dolphin (<i>Orcaella heinsohni</i>)	
	Spinner dolphins (<i>Stenella</i> sp.)	
	Bottlenose Dolphin (<i>Tursiops truncatus</i>)	
Other		
Dugong	Dugong (<i>Dugong dugon</i>)	Listed Marine Species
Pinnipeds	Australian sea lion (<i>Neophoca cinerea</i>)	Vulnerable
	Australian fur seal (<i>Arctocephalus forsteri</i>)	Vulnerable
	Southern elephant seal (<i>Mirounga leonina</i>)	Vulnerable
	Sub-Antarctic fur seal (<i>Arctocephalus tropicalis</i>)	Vulnerable
	Other	Listed Marine

Appendix 2: Marine species listed under National Parks and Wildlife Act 1972 - Schedule 7–Endangered Species

Taxa	Common name	Species
Mammals	Subantarctic Fur-seal	<i>Arctocephalus tropicalis</i>
	Blue Whale	<i>Balaenoptera musculus</i>
Birds	White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>
	Yellow-nosed Albatross (Indian Ocean subspecies)	<i>Diomedea chlororhynchos carteri</i>
	Yellow-nosed Albatross (Atlantic Ocean subspecies)	<i>Diomedea chlororhynchos</i>
	Royal Albatross (northern subspecies)	<i>Diomedea epomophora sanfordi</i>
	Sooty Albatross	<i>Diomedea fusca</i>
	Osprey	<i>Pandion haliaetus</i>
	Little Tern	<i>Sterna albifrons</i>
Fairy Tern	<i>Sterna nereis</i>	
Reptiles	Loggerhead Turtle	<i>Caretta caretta</i>

Appendix 3. Marine species listed under National Parks and Wildlife Act 1972 - Schedule 8–Vulnerable species

	Common name	Species
Mammals	Sei Whale	<i>Balaenoptera borealis</i>
	Fin Whale	<i>Balaenoptera physalus</i>
	Southern Right Whale	<i>Eubalaena australis</i>
	Humpback Whale	<i>Megaptera novaeangliae</i>
	Australian Sea-lion	<i>Neophoca cinerea</i>
Birds	Great Skua (Macquarie and Heard Island subspecies)	<i>Catharacta skua lonnbergi</i>
	Buller's Albatross	<i>Diomedea bulleri</i>
	Shy Albatross	<i>Diomedea cauta cauta</i>
	Salvin's Albatross	<i>Diomedea cauta salvini</i>
	Grey-headed Albatross	<i>Diomedea chrysostoma</i>
	Royal Albatross (southern subspecies)	<i>Diomedea epomophora epomophora</i>
	Wandering Albatross	<i>Diomedea exulans</i>
	Black-browed Albatross (Campbell Island subspecies)	<i>Diomedea melanophrys impavida</i>
	Light-mantled Sooty Albatross	<i>Diomedea palpebrata</i>
	Southern Giant-Petrel	<i>Macronectes giganteus</i>
Reptile	Green Turtle	<i>Chelonia mydas</i>
	Leathery Turtle	<i>Dermochelys coriacea</i>

Appendix 4. Marine species listed under National Parks and Wildlife Act 1972 - Schedule 9–rare species

	Common name	Species
Mammals	Australian Fur-seal	<i>Arctocephalus pusillus</i>
	Minke Whale	<i>Balaenoptera acutorostrata</i>
	Bryde's Whale	<i>Balaenoptera edeni</i>
	Arnoux's Beaked Whale	<i>Berardius arnouxii</i>
	Pygmy Right Whale	<i>Caperea marginata</i>
	Short-finned Pilot Whale	<i>Globicephala macrorhynchus</i>
	Risso's Dolphin	<i>Grampus griseus</i>
	Leopard Seal	<i>Hydrurga leptonyx</i>
	Southern Bottlenose Whale	<i>Hyperoodon planifrons</i>
	Pygmy Sperm Whale	<i>Kogia breviceps</i>
	Dwarf Sperm Whale	<i>Kogia simas</i>
	Andrew's Beaked Whale	<i>Mesoplodon bowdoini</i>
	Gray's Beaked Whale	<i>Mesoplodon grayi</i>
	Hector's Beaked Whale	<i>Mesoplodon hectori</i>
	Southern Elephant Seal	<i>Mirounga leonina</i>
	Sperm Whale	<i>Physeter macrocephalus</i>
	False Killer Whale	<i>Pseudorca crassidens</i>
	Shepherd's Beaked Whale	<i>Tasmacetus shepherdi</i>
Cuvier's Beaked Whale	<i>Ziphius cavirostris</i>	
Birds	Darter	<i>Anhinga melanogaster</i>
	Musk Duck	<i>Biziura lobata</i>
	Kelp Gull	<i>Larus dominicanus</i>
	Blue-billed Duck	<i>Oxyura australis</i>
	Great Crested Grebe	<i>Podiceps cristatus</i>
	Fleshy-footed Shearwater	<i>Puffinus carneipes</i>
	Common Tern	<i>Sterna hirundo</i>

Appendix 5. Fisheries Management Act 2007 (SA) Schedule 5 – Protected Species

Fisheries Management (General) Regulations 2007

Schedule 5—Protected species

- Murray River Crayfish (*Euastacus armatus*)
- South-east Crayfish (*Euastacus bispinosa*)
- Western Blue Groper (*Achoerodus gouldii*) in the waters of or near Spencer Gulf and Gulf St. Vincent contained within and bounded by a line commencing at Mean High Water Springs closest to 34°56'46.59" South, 135°37'33.92" East (Cape Carnot, Eyre Peninsula), then beginning north-easterly following the line of Mean High Water Springs to the location closest to 35°38'33.80" South, 138°31'20.83" East (Newland Head, Fleurieu Peninsula), then south-westerly to the location on Mean High Water Springs closest to 35°50'32.70" South, 138°08'03.59" East (Cape Willoughby, Kangaroo Island), then beginning north-easterly following the line of Mean High Water Springs to the location closest to 35°53'11.31" South, 136°32'03.88" East (Vennachar Point, Kangaroo Island), then north-westerly to the point of commencement.
- Scalefish of the Family Syngnathidae
- Scalefish of the Genus Ambassidae
- Scalefish of any species of *Mogurnda*
- Scalefish of any species of *Nannoperca*
- Scalefish of the following species:
 - River Blackfish (*Gadopsis marmoratus*)
 - Freshwater Catfish (*Tandanus tandanus*)
 - Trout Cod (*Maccullochella macquariensis*)
 - Silver Perch (*Bidyanus bidyanus*)
- White Shark (*Carcharodon carcharias*)

Appendix 6. The South Australian Managed Fisheries Wildlife Interaction Identification and Logbook

Wildlife interaction

Identification and log book



Government of South Australia
Primary Industries and Regions SA



REPORTING WILDLIFE INTERACTIONS IN SOUTH AUSTRALIAN MANAGED FISHERIES

All wildlife, including threatened, endangered and protected species provide an integral part of the ecosystems that support fisheries. Activities within these ecosystems, which include commercial fisheries, need to be managed to support all aquatic species.

As part of the requirement under the Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 (EPBC Act), fishers must report any wildlife interactions encountered within any of the assessed South Australian managed fisheries to PIRSA Fisheries and the Commonwealth Department of Environment and Heritage (DEH).

What is a wildlife interaction?

An “interaction” is any physical contact a fisher, boat or fishing gear has with wildlife and protected species. This includes any collision or capture (hooked, netted or entangled) of individuals of a species. All interactions that occur off the vessel (eg. a collision with a whale) as well as those that relate to a species actually being landed onboard a vessel during a fishing operation must also be reported.

Why should wildlife interactions be reported?

All interactions between commercial fishers and wildlife should be reported in order to:

- Gain a better understanding of the nature and extent of wildlife interactions in commercial fishing activity.
- Help industry develop effective measures and management policies to reduce or avoid interactions.
- Ensure that industry meets the data collection and reporting standards required under the *EPBC Act, 1999* through increased reporting and validation of the industry-based monitoring program.
- Assist in improving the perceptions of the community relating to this issue. It is in the interest of all SA managed fisheries that the general public are made aware that the industry is concerned and is addressing the problem of wildlife interactions.

What is a protected species?

There are many species of animals that are classified as protected. It should be remembered that all seabirds are protected and even though some may be considered common like gulls and cormorants, any interaction with a seabird species must be reported.

How does the law relate to wildlife interactions and reporting?

The main law relating to interactions with wildlife is the *EPBC Act, 1999* under which it is an offence to kill, injure, take, keep or move a protected species in a State or Commonwealth area. Sometimes wildlife protected under the *EPBC Act, 1999* may be killed or injured accidentally during fishing activity. This is not an offence, but it is a legal requirement that the interaction be reported. If the animal is still alive it should be returned to the water immediately.

Identifying wildlife and protected species

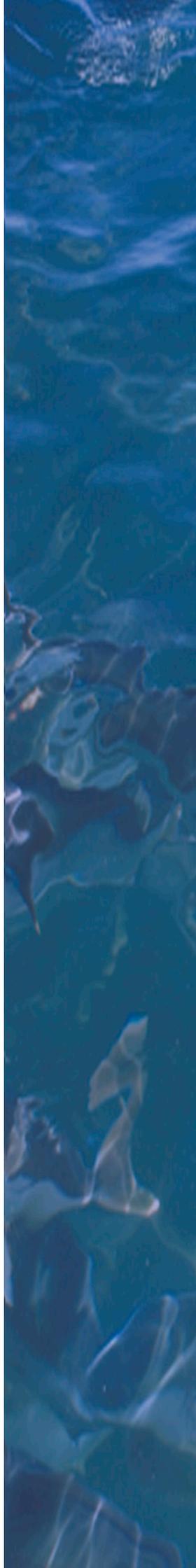
Following is a list of currently protected species likely to be encountered by commercial marine and inland waters fishers. If you have an interaction with any of these species it must be reported.

- **All species of seabirds**
- **All species of marine and freshwater reptiles** (turtles)
- **All species of seals and sea lions**
- **All species of cetaceans** (dolphins and whales)
- **Marine fish species** Great White Shark, Whale Shark, and all Syngnathids (Pipefish, Sea Horses and Sea Dragons).

When identifying a species being reported as a result of a wildlife interaction, be as specific as possible. If positive species identification cannot be made, the family or a description of the animal should be recorded.

As an example, if a fisher had an interaction with a bird that had become entangled in a net, they should record the name most commonly used for that bird. If the fisher does not know the common name, then a family or broad group name (ie. a type of shag, cormorant, gull, duck, etc) should be recorded. If the family group is unknown, provide a written description of the animal including details of colour and size.

Abalone divers should report all sightings of great white sharks while under and above the water.



FISH SPECIES (MARINE)



Great White Shark, *Carcharodon carcharias*: A massive shark that can attain a length of 6.4 m. Has a high first dorsal fin and very small second dorsal and anal fins. Very large mouth, teeth are broad, triangular and serrated. It has a pointed nose, blue-grey upper body, which changes abruptly to white on the underside.



All Syngnathids: Leafy sea dragon, common sea dragon, pipefish and seahorses.



Whale Shark *Rhincodon typus*: The world's largest fish growing to over 15 m in length. Easily recognisable due to its broad, flattened head, large mouth and pattern of light spots and stripes on a dark background. The ventral surface is typically whitish.

ALL SEABIRDS



Albatrosses: 10 species found in Australian waters. Medium to very large, long-winged, gliding, oceanic seabirds with webbed feet, small tubular nostrils at the side of large, hook-tipped bills.



ALL SEABIRDS

Australasian Gannet, *Morus serrator*: the only gannet species found in South Australia. Medium, pointed winged seabird with fully webbed black feet that indulges in spectacular plunge-diving. Has a grey bill, a short black stripe in centre of the throat, dark blue eye-ring, head is buff yellow, rest of the body white, white tail with a black centre.



Australian Pelican, *Pelecanus conspicillatus*: the only pelican species found in Australia. A very large (wingspan over 2 metres) white aquatic bird, with a long pink bill with a loose distensible throat pouch.



Cormorants (Shags): 5 species found in Australian waters. Medium aquatic bird that swims and dives for fish. Generally black, some have white fronts, black legs. Their feet are fully webbed and they often perch with outstretched wings.



Gulls: 2 species found in South Australian waters.

- **Silver Gull, *Larus novaehollandiae*:** red bill, body white and grey wing and back plumage, heavy bills and red legs, webbed feet. Juveniles mottled brown spots across back and wings, dark brown legs.
- **Pacific Gull, *Larus pacificus*:** larger than a silver gull, thick yellow bill with red tip, body white, wings and back black, black tipped white tail, yellow legs. Juvenile is brown all over, brown legs.



Little Penguin, *Eudyptula minor*: the only penguin species found in South Australia. A small (32 – 34 cm long) plump seabird with an upright stance and dense waterproof plumage. It has a white front, dark blue back and a greyish face. Wings modified as flippers for sustained swimming and diving.





White-bellied Sea Eagle, *Haliaeetus leucogaster*: a fishing bird of prey with broad wings, strong legs and talons. White, with grey back, rump, wings and base of tail. Bare whitish legs. Juvenile generally brownish all over.



Osprey, *Pandion haliaetus*: a fishing bird of prey, smaller than a sea eagle, dark brown upper parts; white head and underparts. Band of brown mottling across the chest. Barring on underwings and tail. Juvenile generally mottled brown all over.



Petrels and Shearwaters: 41 species found in Australia. Small to medium, long-winged, gliding, oceanic seabirds with webbed feet, tubular nostrils on top of stout hooked bills.



Plovers: 2 species of this group are beach-nesting shorebirds and listed as threatened. Their breeding success is extremely low due to human activities on ocean beaches.

- **Hooded Plover, *Thinornis (Charadrius) rubricollis*:** round black head, short red bill with a black tip, red eye-ring, white collar, pale orange legs, favours wide sandy beaches with beach-cast seaweed.
- **Red-capped Plover, *Charadrius ruficapillus*:** a small bird with a rufous crown, white forehead, nape and collar partly edged black, black eye-stripe, black bill and legs, brown upper body parts and wings, runs in short bursts.

ALL SEABIRDS

Terns: Approximately 7 species found in South Australian waters. Similar in size to gulls but have slender thin yellow-orange bills and narrow pointed wings. Some are crested. They dive into water for food or pick it off the surface. Generally white with grey wing and back plumage, black capped head, short legs.



ALL SEALS

Seals: 10 species of seals are found in Australian waters, of these only 3 are likely to interact with fishing operation;

- **Australian Fur Seal**, *Arctocephalus pusillus doriferus*
- **Australian Sea Lion**, *Neophoca cinerea*
- **New Zealand Fur Seal**, *Arctocephalus forsteri*.

It is difficult to differentiate between these species.



ALL MARINE REPTILES (TURTLES)

Leatherback Turtle, *Dermochelys coriacea*: The largest and most widely distributed turtle in the world, growing to a length of 2.8 metres. The adult shell is a thick, smooth, leathery skin, which is a uniform dark brown with white or pink splotches. Shell is elongated with 7 prominent narrow ridges running along the length.



ALL WHALES AND DOLPHINS



WILDLIFE INTERACTION REPORTING RETURNS FOR ALL SA MANAGED FISHERIES

INSTRUCTIONS FOR USE

These forms are only required to be filled out on the day an interaction with your fishing operations occurred.

The logs do not require carbon paper. The cardboard sheet should be placed under the following page to avoid entries onto the next set of forms. The yellow copy should be retained in the log book as a personal record and proof of completion.

Please send the completed form with your other catch and effort forms for the month to SARDI Aquatic Sciences.

EXPLANATORY NOTES

Managed Fishery: As this same form is being filled out by all licence holders in all SA Managed Fisheries, please record the Managed Fishery that you are licenced.

Date of interaction: Please record the date (day/month/year) that the interaction occurred.

Observer on board: Please tick the box Yes or No. If on board, the scientific observer can assist you in identifying the protected species, and collecting valuable biological information on the species.

Licence Number: Please record your licence number.

Corresponding Logbook No: To assist scientists in determining whether wildlife interactions have any effect on the catch rate of your target species, please record the corresponding catch and effort log book number.

Interaction Details

Gear Code: Please record the gear code (as listed in your catch & effort log book) that you were using when the interaction occurred.

Activity / Shot number: For all trawl and net fisheries, please record the shot number for that day/night. For the charter boat fishery please record your activity code. For all other fisheries, please record the pot, line, trap etc number. There may be occasions when an interaction occurred during different shots on the same day. Please record these separately on the one form.

Time (24:00 hr): The approx. time (eg 14:00 hrs) when the interaction occurred.

Location Lat & Long: Please record as accurately as possible, the lat. & long. where the interaction occurred. If details on lat. & long. are not available, please record the fishing block where the interaction occurred, as per your catch and effort log book.

Common Species Name: See the species list and Identification guide in this log book.

Number of animals: Please record the number of animals of that species which were involved in the interaction.

Nature of Interaction: Please tick one of the 4 boxes in this section.

Caught: Please tick if the wildlife species was caught in your fishing gear. (eg hooked, caught in net, pot, trap etc).

Entanglement: This relates to any part of the body of the protected species (eg flipper, tail, fins, wings or trunk) becoming entangled in fishing gear.

Impact / collision: The protected species may collide with the hull of the vessel, or a seabird may collide with the above-deck structures. Just a simple landing on the deck by the seabird is not regarded as an interaction.

Other: Please tick if there was product loss due to the interaction, eg loss of snapper on lines from white shark or killer whale “bite-offs”).

Status: Please tick one of the 3 boxes in this section.

Fate: Please tick one of the 2 boxes in this section. If the wildlife species was kept, please record in the comments section, where the protected species was transported, and its current location (eg SA Museum, SARDI, Local Processor etc).

Band or Tag No: Often protected wildlife are banded or tagged for the purposes of scientific research on their migratory habits. If the wildlife species which interacted with your fishing operations had a tag or band attached, please record the band / tag number in this section, and any other details (eg size, sex of the species) in the comments section.

Signature of Licence holder: This form must be signed by the licence holder.

Finally to assist you in completing these forms, an example sheet is included in the log book. If you require further assistance, please call 08 82075400.

South Australian Managed Fisheries Wildlife Interaction Form

Managed Fishery

Date of Interaction

24/02/07

Observer On Board

Yes No
Tick Yes or No

Licence Number

X043

Corresponding Logbook No.

G6051

Interaction Details

Gear Code	Activity/ Shot Number	Time (24:00 hr)	Location		Common Species Name (see species list and identification guide)	Number of Animals	Nature of Interaction			Status			Fate		Band or Tag #	
			Latitude	Longitude			Caught	Entangle ment	Impact/ collision	Other	Alive	Dead	Injured	Released		Kept / Retained
LL	3rd SET	1400	35°30'S	137°45'E	White shark	1	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		
HN	Shut No. 2	0700	32°59'S	137°45'E	Cormorants	3		<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>			
RL	Pot No. 8	0630	36°10'S	136°40'E	Leatherback turtle	1			<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>			
TN	Shut No. 5	2215	34°05'S	136°48'E	Sea Horses	10	<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>			

Comments: Is there any other information you believe to be important? For example:

Where was the animal entangled (flipper, mouth, wing, tail, etc)?

Where in the gear was the animal entangled (pot, pot-rope, cod-end/net pocket, net wing, mainline of long or drop line, hook)?

How was the animal released (lowered by hand, lowered by net into water, cut out of net, line cut)?

If the animal was kept/retained, where was the animal transported? Who has the animal now?

Cut trace on longline to release white shark. Approx. 1.8m long, male.

Wings of cormorants entangled in cork-line. Released by hand.

Vessel collided with a leatherback turtle when retrieving pot No. 8. Un-injured.

Sea-horses retained for research. Sent to SABON West Beach

Example Sheet

for 4 different fisheries

I certify this form to be complete and accurate:

A. Fisher
(Signature of Licence Holder / Master)

South Australian Managed Fisheries Wildlife Interaction Form

Managed Fishery

Date of Interaction

Observer On Board Yes No

Licence Number

Corresponding Logbook No.

 Yes No
Tick Yes or No

Interaction Details

Gear Code	Activity/ Shot Number	Time (24:00 hr)	Location		Common Species Name (see species list and identification guide)	Number of Animals	Nature of Interaction				Status		Fate		Band or Tag #	
			Latitude	Longitude			Caught	Entanglement	Impact/collision	Other	Alive	Dead	Injured	Released		Kept / Retained

Comments: Is there any other information you believe to be important? For example:

Where was the animal entangled (flipper, mouth, wing, tail, etc)?

Where in the gear was the animal entangled (pot, pot-rope, cod-end/net pocket, net wing, mainline of long or drop line, hook)?

How was the animal released (lowered by hand, lowered by net into water, cut out of net, line cut)?

If the animal was kept/retained, where was the animal transported? Who has the animal now?

I certify this form to be complete and accurate:

(Signature of Licence Holder)