Residency of white sharks, *Carcharodon carcharias*, at the Neptune Islands Group Marine Park (2023–24)

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Photo: Andrew Fox

SOUTHERN SHARK ECOLOGY GROUP

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4. ACKNOWLEDGEMENTS

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5. EXECUTIVE SUMMARY

- This report provides updated estimates of residency of tagged white sharks (*Carcharodon carcharias*) and a summary of electronic logbook data describing cage-diving activities at the Neptune Islands Group (Ron and Valerie Taylor) Marine Park between 1 July 2023 and 30 June 2024.

- Fourteen sharks ranging 2.2–4.0 m total length (TL) were tagged at the Neptune Islands Group Marine Park (*n* = 9), Pages Islands (*n* = 1), Greenly Island (*n* = 1), and Dangerous Reef (*n* = 3) between 04 November 2023 and 13 June 2024, 10 of which were detected within the array (nine tagged at the Neptune Islands and one at the Greenly Island). Fifteen sharks tagged in previous years at the Neptune Islands, including one of which was tagged in 2019–20, one in 2020–21, five in 2021–22, and eight in 2022–23, were also detected.

- Grand mean residency ± standard deviation from the 25 sharks detected within the 2023–24 monitoring period at the North and South Neptune Islands was 8.09 ± 10.70 days (median = 5.24) and 4.70 ± 5.97 days (median = 1.8), respectively. The grand mean of the $\log_{10}$ mean residency at North Neptune Islands ± standard deviation was 0.51 ± 0.42 and is within the Target range (≤ 0.7).

- E-logbook recorded 548 entries between 1 July 2023 and 29 June 2024 for 283 days of operations at the Neptune Islands Group. Reported daily sightings ranged 0–14 white sharks (mean ± standard error = 2.09 ± 0.17), while no white sharks were sighted on 47.0% of the days when boats were present. Compared to the last monitoring period, this period represents a ~50% decrease in the average number of sharks sighted (2.09 ± 0.17 *versus* 4.0 ± 1.7) and a three-fold increase in the number of days without shark sighted (47.0% *versus* 14.2%).

6. INTRODUCTION

The white shark (*Carcharodon carcharias*) occurs worldwide in coastal temperate and subtropical regions (Klimley & Ainley 1996, Domeier 2012). White sharks are long-lived, relatively slow growing, late in maturing, and low in reproductive potential (Cailliet et al. 1985, Wintner & Cliff 1999). This combination of life history traits, and worldwide concerns regarding their population status, has prompted their protection across many jurisdictions. This includes listings under the International Union for the Conservation of Nature (IUCN – 'Vulnerable'), the Convention on International Trade in Endangered Species (CITES – Appendix I + II), and the Convention on Migratory Species (CMS – Appendix I + II), of which Australia is a signatory country. White sharks are listed as 'Vulnerable' under the Australian Commonwealth Government's *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* and are protected in all Australian and Commonwealth waters. However, as identified by the *National Recovery Plan for White Sharks*, the Australian white shark population is still threatened by interactions with commercial and recreational fishing, shark control activities, illegal trade in body parts, and the potential impacts of ecotourism and cage-diving operations (DEWHA 2010). Sites where white sharks aggregate can be targeted by wildlife tourism operators where industries have developed around cage-diving activities. These sites are also areas where white sharks can be exposed to a large amount of interactions and interference from human activities.

In Australia, the white-shark cage-diving industry began in the late 1970s in waters off the Eyre Peninsula in South Australia. The industry is now restricted in operations to the Neptune Islands Marine Park located 60–70 km south of Port Lincoln (Figure 1), with most cage-diving activities focussed at the North Neptune Islands Group (Ron and Valerie Taylor) Marine Park (64% of operating days between 2013 and 2024). The locality is the only place where cage-diving with white sharks is permitted in Australia. After 2007, the industry expanded from two to three operators and the mean annual number of days when tours operated rose from 124 (2000–2006) to 265 (2008–2011) (Bruce & Bradford 2013). Studies showed that the residency of white sharks at the Neptune Islands changed between these periods and that the spatio-temporal distribution of white sharks is affected by the cage-diving industry (Bruce & Bradford 2013, Huveneers et al. 2013). As a result, DEW developed and implemented a new policy to improve management of white shark tourism at the site. The policy limits the number of commercial tour operator licences (currently three), number of days of operation (currently 12 per fortnight), and the amount of food-based attractant that can be used (currently 100 kg day^{-1}). The policy also sets a framework for the adaptive management of the cage-diving industry and decision ranges when changes in licensing arrangements should be considered. Since 2013–14, the effects of the cage-diving industry

on white sharks has been monitored annually using estimates of residency as defined in Bruce and Bradford (2013) and compared to the decision ranges set in Annexure A to the South Australian White Shark Tour Licensing Policy.

This report provides residency estimates of white sharks at the Neptune Islands (Ron and Valerie Taylor) Marine Park for 2023–2024 and compares them to previous years and to decision ranges set in Annexure A to the South Australian White Shark Tour Licensing Policy. This report also summarises cage-diving activities and number of sharks sighted reported via a daily electronic logbook to put residency estimates in context of cage-diving activities.

7. METHODS

7.1 Geographical area

The Neptune Islands Group (Ron and Valerie Taylor) Marine Park (referred to as the Neptune Islands hereafter) is located near the approach to Spencer Gulf, ~30 nautical miles from Port Lincoln, South Australia and 14 nautical miles from the southern Australian mainland. This offshore island complex of limestone-capped granite mounds comprises the North and South Island groups, which are ~12 km apart (Figure 1). The Neptune Islands comprise a Sanctuary Zone (North Neptune Islands), Habitat Protection Zone (South Neptune Islands), and Restricted Access Zones (North and South Neptune Islands) (http://www.environment.sa.gov.au/marineparks/find-a-park/eyre-peninsula/neptune-islands). At the North Neptune Islands, cage-diving operators mostly anchor in the bay on the southeast side of the largest islands and on the northern side of the two islands. At the South Neptune Islands, operators mostly anchor on the eastern side of the northern island.

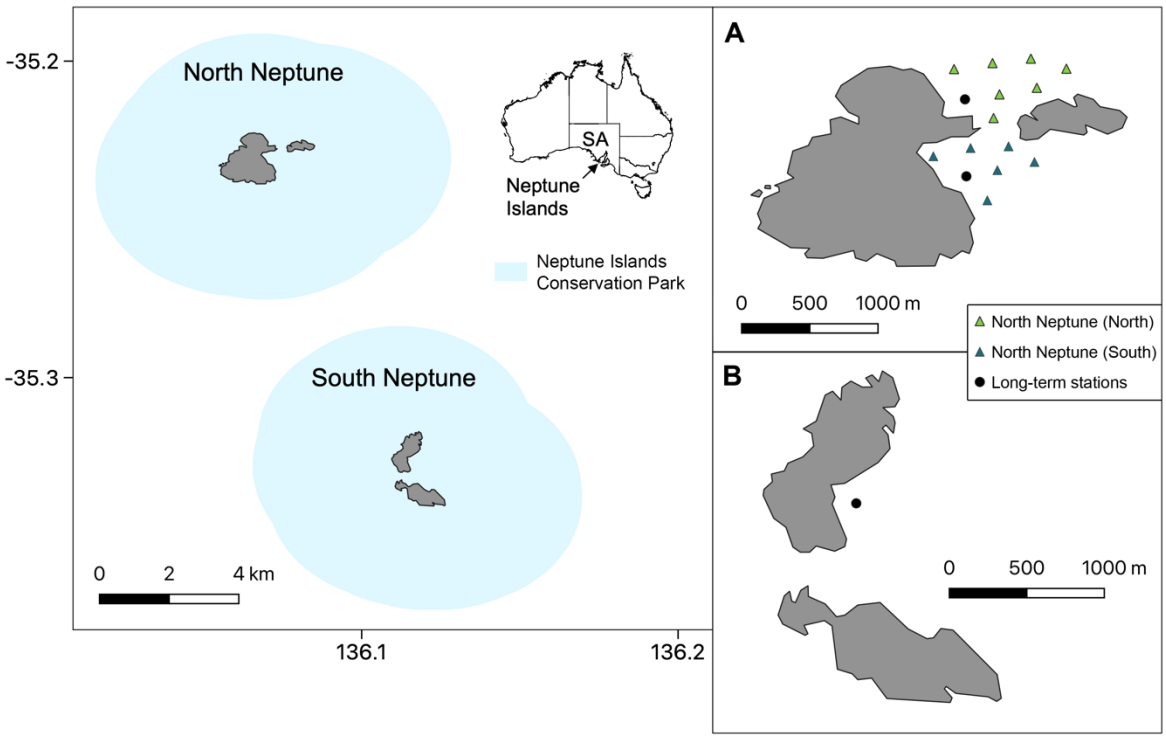

Figure 1. Map of the Neptune Islands Group (Ron and Valerie Taylor) Marine Park with deployment locations of acoustic receiver stations within **(A)** the North Neptune Islands and **(B)** the South Neptune Islands. Stations with a black point represent long-term stations that have been present since the start of the monitoring in 2013, with coloured positions denoting the fine-scale positioning system deployed in 2018.

7.2 Acoustic telemetry

7.2.1. Receiver deployments

Three VR2AR acoustic receivers (Innovasea Systems Inc., Halifax, Canada) were deployed within the Neptune Islands using a low-profile sub-surface mooring system that reduces interactions with operators' anchors and chains, and white sharks. One VR2AR was deployed at each of the main berleying sites at the North Neptune Islands group and one at the South Neptune Islands group and have been maintained at those locations since 2013 (Figure 1; black points). Between 2018–2022, a fine-scale positioning system (VPS Vemco Positioning System, Innovasea, Halifax, Canada) consisting of an additional array of 13 VR2AR receivers was deployed and expanded the acoustic coverage at the North Neptune Island (Figure 1; coloured points). The deployment of these receivers provided the opportunity to investigate the positioning of sharks at the Neptune Islands in relation to cage-diving vessels, and to investigate the potential associative behaviour of white sharks in relation to cage-diving operations (see Niella et al. 2024).

7.2.2. Tag deployments

Fourteen white sharks were tagged in the 2023–24 financial year with V16-6H acoustic transmitters, adding to the 192 sharks during the previous 10 years of monitoring periods (2013–2023). Acoustic transmitters are programmed to send signals at random interval of 70–150 seconds (VEMCO Ltd., Halifax, Canada). Tags were tethered to a plastic umbrella dart head using a 10- to 15-cm-long stainless wire trace (1.6 mm diameter). Tags were implanted in the dorsal musculature of sharks using a modified spear-gun applicator. Biases in residency estimates can be introduced by targeting specific sharks (e.g., sharks likely to remain in the Neptune Islands) or due to temporal variations in residency (e.g., sharks are more likely to remain within Neptune Islands during weaning of long-nosed fur seals). To minimise the potential impacts of these biases, tags were opportunistically deployed throughout the monitoring period.

7.2.3. Detection summary and residency periods

Daily detection summaries were plotted to examine the pattern of overall presence of tagged sharks during the study period. For each tagged white shark, the number of consecutive days that individuals were present was calculated each time they entered the study area. A residency period was defined as the number of days between the first and last detection of a tagged shark, without any gaps in consecutive days of detection exceeding 5 days. A five-day period was selected on the basis of estimated transit times between the North and South Neptune Islands (Bruce and Bradford 2013). Where sharks were not detected over periods of >5 consecutive days, individuals were assumed to have left the Neptune Islands

and any subsequent return was considered to represent a new residency period. Residency period was estimated for each tagged shark and for each North and South Neptune Island Groups. We conducted a sensitivity analysis to investigate possible differences in shark residency as a function of number of acoustic receivers used and their corresponding distances to long-term monitoring stations. Similar residency patterns were observed independently of the number of receivers used or their deployment locations, suggesting that the monitoring design was adequate to monitor shark residency (Niella et al. 2023). We also assessed the sensitivity of the residency estimates used to manage the cage-diving industry to break size. While residency time was affected by break size, trends in residency over time remained consistent (Niella et al. 2023). Therefore, the selected break size is unlikely to change the current residency of white sharks being considered within the Target range.

The residency of white sharks is reported for the period between 1st July 2023 and 30th June 2024.

7.3 Electronic logbooks

Since 01/03/2020, operators used a new custom-designed application developed to record operator activity (i.e. time of arrival at and departure from the Neptune Islands Group, quantity or type of attractant used, anchoring location), number of passengers, and number of shark sighted (with sex and estimated total length when known). The new application does not change the metrics collected by operators but provides a more streamlined and efficient way to record and report information. Data collected by operators since the new update is compatible with the older version. The e-logbook was used to collect data on daily activities and sighting frequency of white sharks between 1 July 2023 and 30 June 2024.

8. RESULTS

We tagged 14 white sharks ranging 2.7 – 4.1 m total length (TL) between 4 November 2023 and 13 June 2024 (North Neptune Island: *n* = 3; South Neptune Island: *n* = 6; Dangerous Reef: *n* = 3, Greenly Island: *n* = 1, The Pages: *n* = 1). Table 1 provides a detection summary for the 25 white sharks that were detected at the Neptune Islands during the 2023–24 monitoring period. Fifteen sharks (60%) detected within the Neptune Islands in the 2023–24 monitoring period were tagged in previous years; one of which (4%) was tagged in the 2019–20 period, one (4%) in 2020–21, five (20%) in 2021–22, and eight (32%) in 2022–23 (Figure 2). A total of 37,431 acoustic detections was recorded from 25 sharks in the 2023–24 monitoring period (mean ± standard error = 1,497.24 ± 457.3 per shark). Tagged white sharks were detected for periods ranging between 1 and 95 days (mean ± standard error = 22.88 ± 5.2 days) (Table 1).

Table 1. Detection summary of white sharks (*n* = 25) at the Neptune Islands Group Marine Park between 1 July 2023 and 30 June 2024. Greyed out rows are white sharks tagged within the 2023–24 financial year. For location tagged, North = North Neptune Islands Group, South = South Neptune Islands Group, and Greenly = Greenly Island.

SharkID	Total length (m)	Sex	Date tagged	Location tagged	North Neptune Islands		South Neptune Islands	
					N detections	N days	N detections	N days
128	2.6	Male	21/05/2020	South	-	-	37	3
140	3.3	Female	8/12/2020	South	4358	40	-	-
147	3.1	Male	5/07/2021	North	5552	34	8	1
162	3.8	Male	5/02/2022	South	-	-	12	1
163	3.4	Male	6/02/2022	South	564	21	2103	45
170	3.8	Female	7/06/2022	North	-	-	5	1
179	3	Male	30/11/2022	North	1093	28	6488	71
181	2.8	Male	1/12/2022	North	1627	50	1088	24
182	2.8	Male	1/12/2022	North	7006	52	-	-
183	3.4	Male	10/12/2022	North	756	25	95	11
185	3.7	Male	14/12/2022	North	907	12	1801	40
187	3.7	Male	15/12/2022	North	158	8	-	-
191	2.8	Male	18/01/2023	North	-	-	12	1
196	3.1	Male	2/05/2023	South	152	5	973	21
198	2.4	Female	4/05/2023	South	144	2	115	2
200	4.1	Male	20/11/2023	South	-	-	186	2
201	3.8	Male	5/01/2024	North	8	1	-	-
202	3.4	Male	5/01/2024	North	571	19	295	14
203	4	Male	5/01/2024	North	12	2	3	1
204	2.7	Male	7/01/2024	South	310	11	108	5
205	3.4	Male	7/01/2024	South	-	-	78	2
206	3.9	Male	7/01/2024	South	80	4	122	8
207	3.8	Male	8/01/2024	South	-	-	31	3
208	3.8	Male	8/01/2024	South	222	9	78	4
209	3.3	Female	4/02/2024	Greenly	-	-	171	4

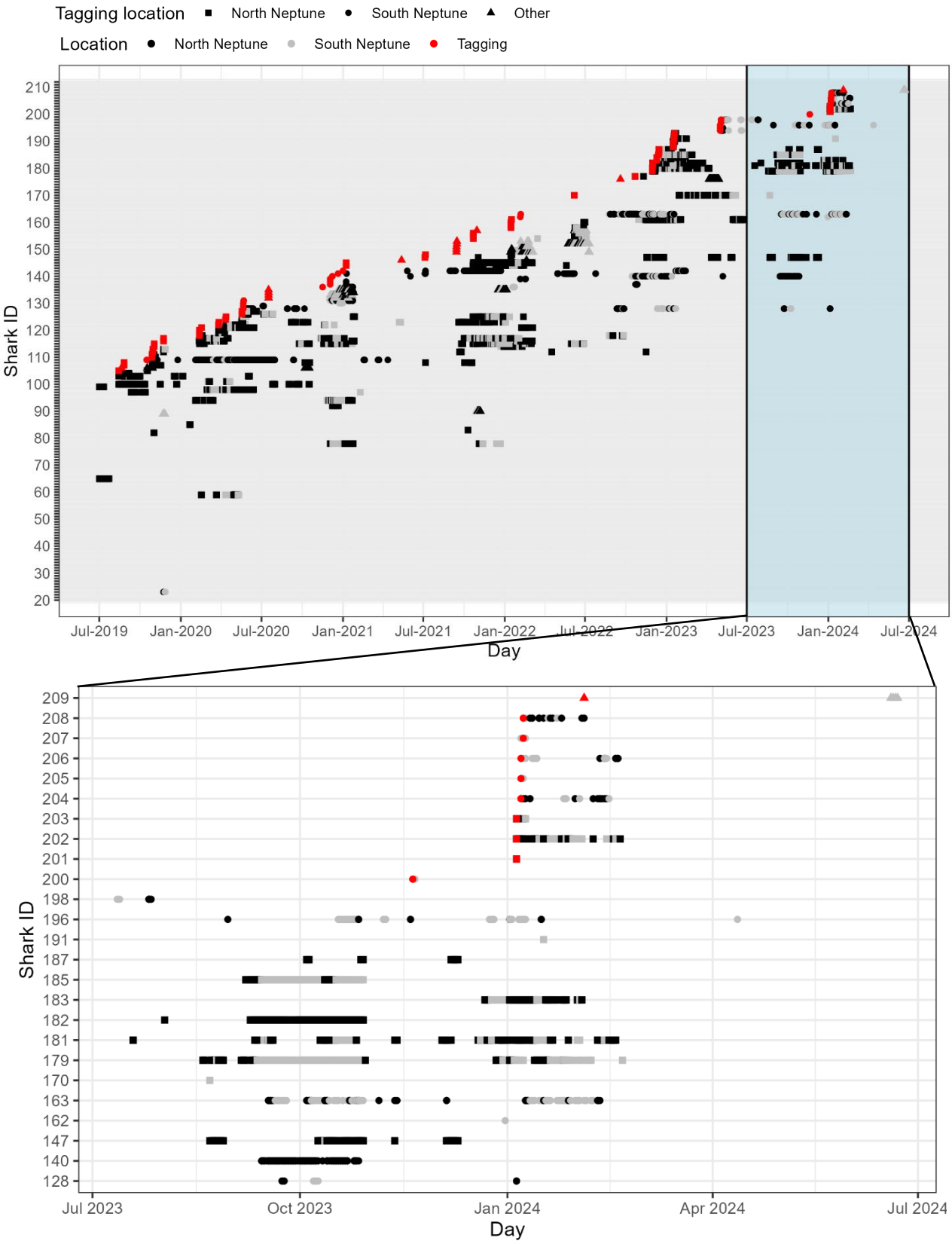

Figure 2. Top panel: Daily detections for white sharks between 1 July 2019 and 30 June 2024 at the North (black symbols) and South (grey symbols) Neptune Islands. Red symbols

represent dates when each shark was tagged. **Bottom panel**: Detection plot for white sharks detected at the Neptune Islands during the 2023–24 financial year (*n* = 25).

8.1 Residency

Residency periods exhibited by white sharks at the North and South Neptune Islands combined ranged from 1 to 50.4 days (Table 2). Across all sharks detected in 2023–24, maximum residency at the South Neptune Islands was slightly sorter (47.7 days) than at North Neptune Islands (50.4 days). Most shark detections (63%) occurred at North Neptune Islands where the grand mean residency ± standard deviation was 8.09 ± 10.70 days (grand median = 5.24). Most tagged white sharks had a mean residency at North Neptune Islands <10 days (83.3%), and only two individuals (ID 140 and 182) having a mean residency higher than 20 days (42.7 and 25.7 days, respectively). Maximum residency at North Neptune Islands was also mostly <10 days (61.1% of sharks), with 22.2% of sharks having maximum residency between 10 and 30 days. Three sharks had longer maximum residency visits, between 30 and 50 days.

Of the 25 white sharks detected at the Neptune Islands, 14 (56%) were detected at both North and South Neptunes. Four sharks were detected only at North Neptunes (16%), and 7 (28%) were detected only at South Neptunes. For those sharks that visited both island groups, mean residency was usually higher at North Neptunes (8 of 14 sharks; Table 2). Grand mean residency at the South Neptune Islands was 4.70 ± 5.97 days (grand median = 1.80 days). Long-term trends in detections across the eleven monitoring periods (2013–2024) show that sharks had elevated rates of detection at North Neptune Islands between October to February and in May, with low detection rates in March–April and between June and September (Figure 3). At the South Neptune Islands, however, detection patterns indicated an elevated visitation of sharks between November–January and a smaller peak during May–August periods (Figure 3).

Table 2. Summary statistics showing residency estimates (mean; N = number of visits) for white sharks (*n* = 25) at the Neptune Islands Group between 1 July 2023 and 30 June 2024. SD = standard deviation. Summary statistics were not provided when a shark only had a single residency period.

ID	Sex	North Neptune Island						South Neptune Island					
		N	Mean	Log_{10} (mean)	SD	Min	Max	N	Mean	Log_{10} (mean)	SD	Min	Max
128	Male	2	1	0	0	1	1	1	1.7	0.23	-	1.7	1.7
140	Female	1	42.7	1.63	-	42.7	42.7	-	-	-	-	-	-
147	Male	4	8.23	0.7	8.54	1	20.6	1	1*	0	-	1	1
162	Male	-	-	-	-	-	-	1	1*	0	-	1	1
163	Male	11	1.45	0.11	0.85	1	3.8	3	18.57	1.16	12.35	4.7	28.4
170	Female	-	-	-	-	-	-	1	1*	0	-	1	1
179	Male	6	5.12	0.56	3.47	1	9.4	5	15.3	0.77	19.44	1	47.7
181	Male	10	5.63	0.47	7.26	1	24.5	6	3.75	0.43	2.92	1	7.7
182	Male	2	25.7	0.85	34.93	1	50.4	-	-	-	-	-	-
183	Male	2	17.05	0.89	21.43	1.9	32.2	3	3.03	0.31	3.35	1	6.9
185	Male	2	5.65	0.74	2.05	4.2	7.1	2	19.55	1.26	9.69	12.7	26.4
187	Male	3	1.67	0.16	1.15	1	3	-	-	-	-	-	-
191	Male	-	-	-	-	-	-	1	1*	0	-	1	1
196	Male	5	1	0	0	1	1	5	3.74	0.41	3.35	1	8
198	Female	1	1.2	0.08	-	1.2	1.2	1	1*	0	-	1	1
200	Male	-	-	-	-	-	-	1	1.5	0.18	-	1.5	1.5
201	Male	1	1*	0	-	1	1	-	-	-	-	-	-
202	Male	4	5.35	0.54	5.77	1	13.8	2	11.2	0.94	9.9	4.2	18.2
203	Male	1	3.3	0.52	-	3.3	3.3	1	1*	0	-	1	1
204	Male	3	3.47	0.44	2.45	1	5.9	4	1	0	0	1	1
205	Male	-	-	-	-	-	-	1	1.4	0.15	-	1.4	1.4
206	Male	1	8.6	0.93	-	8.6	8.6	2	4.15	0.43	4.45	1	7.3
207	Male	-	-	-	-	-	-	1	1.8	0.26	-	1.8	1.8
208	Male	2	7.55	0.57	9.26	1	14.1	2	2.95	0.43	1.63	1.8	4.1
209	Female	-	-	-	-	-	-	1	3	0.48	-	3	3
Grand Mean			**8.10**	**0.51**					**4.70**	**0.35**			
Grand Median			**5.24**	**0.53**					**1.8**	**0.26**			
Grand SD			**10.70**	**0.42**					**5.97**	**0.39**			

(*) Sharks with a single visit of less than 24-hours residency were rounded up to 1 day.

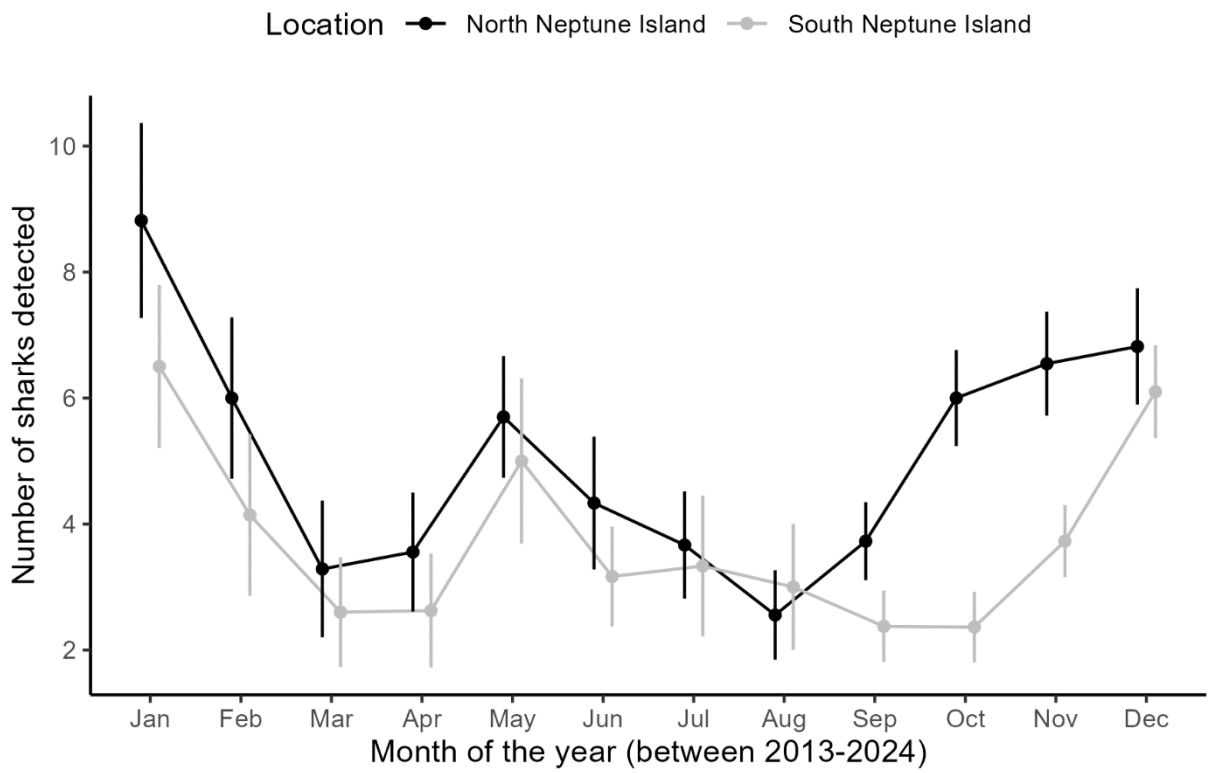

Figure 3. Seasonal pattern in shark detections between North and South Neptune Islands across the full monitoring period between July 2013 and June 2024. Points represent mean numbers of sharks detected per calendar month at North (black) and South (grey) Neptune Islands, with bars representing standard error of the mean across the eleven financial years.

8.2 Electronic logbook

Number of sharks sighted

E-logbook describing cage-diving industry activities comprised records for 283 days out of the 365 days (78.6%) between 1 July 2023 to 30 June 2024. Reported daily sightings ranged from 0–14 white sharks (mean ± standard error = 2.09 ± 0.17; Figure 4a). On days when sharks were sighted (i.e. excluding days with no sharks), mean ± standard error number of sharks sighted by operators was 3.94 ± 0.22. No sharks were sighted from tourism vessels on 133 days when operators visited the islands (47% of days). A further 32 days (11%) only had a single shark sighted. The number of sharks sighted peaked between December–February 2024, with a smaller peak in September–October 2023 (Figure 4b). Only one shark was sighted over a 91-day period between 23rd February and 23rd May 2024.

Male sharks were more frequently sighted than female across all months, except in March–June when female sharks were more prevalent than males (Figure 4c).

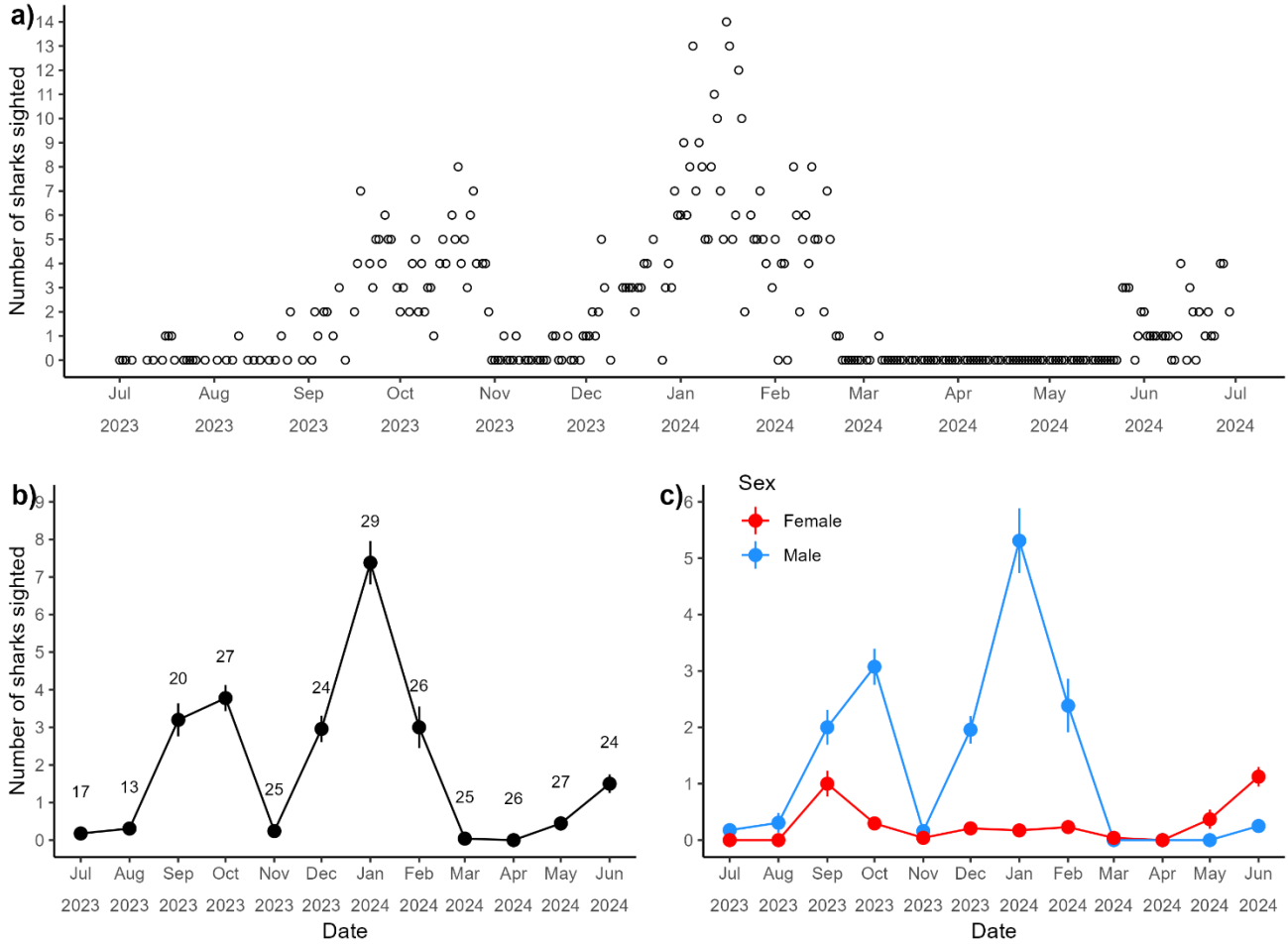

Figure 4. (a) Number of sharks sighted reported by the cage-diving operators through the e-logbook in the 2023–24 financial year. **(b)** Mean daily number of sharks sighted each month and **(c)** separated by sex for the 2023–24 financial year. Error bars represent standard error of the mean values. Number above to each point in plot b shows the number of days operators conducted diving activities at the Neptune Islands each month.

9. DISCUSSION

9.1 Residency

In 2001–02, prior to the cage-diving industry expanding, the grand mean residency ± standard deviation of white sharks at North Neptune Islands was 9.7 ± 13.7 days (Bruce et al. 2005; Figure 5). Based on this study, Annexure A to the South Australian White Shark Tour Licensing Policy was developed which includes decision ranges for the cage-diving industry:

- Target range: ≤ 0.70 $\log^{10}$ days
- Caution range: 0.70 – 1.20 $\log^{10}$ days
- Response range: ≥ 1.20 $\log^{10}$ days

Prior to the new policy and limits on number of days operators allowed at the Neptune Islands (2009–2011), residency and $\log_{10}$ increased to well-above the target range and within the response range. In the first year of the monitoring period (2013–14), residency and $\log_{10}$ decreased but was still within the caution range. Since then, residency and $\log_{10}$ has decreased further and has remained within the Target range (Figure 5; Table 3). Long-term trends since the 2015–16 financial year until present highlight a stabilisation of residency and $\log_{10}$ values to below 2001–02 baseline levels and within the Target range (Figure 5).

In 2023–2024, the grand mean residency of white sharks at North Neptune Islands was 8.09 days (log_{10} = 0.51) and is within the Target range.

Table 3. Estimates of overall grand mean of $\log_{10}$ residency of white sharks detected at North Neptune Islands between 2001 and 2024. Discrepancies with previous reports are due to annual reassessment of potentially shed tag and refinement of the methods with residencies less than one day now rounded up to one day.

Period	Grand mean residency (days)	Grand mean of $\log_{10}$ residency
2001–02 (baseline)	9.70 ± 13.70	0.65 ± 0.56
2009–2011	23.00 ± 18.20	1.24 ± 0.34
2013–2014	11.30 ± 16.50	0.67 ± 0.59
2014–2015	7.40 ± 8.00	0.61 ± 0.50
2015–2016	8.30 ± 9.50	0.62 ± 0.54
2016–2017	8.70 ± 10.90	0.61 ± 0.55
2017–2018	6.20 ± 9.30	0.54 ± 0.42
2018–2019	8.20 ± 16.70	0.59 ± 0.46
2019–2020	8.20 ± 9.30	0.64 ± 0.51
2020–2021	6.30 ± 5.10	0.62 ± 0.44
2021–2022	7.90 ± 11.60	0.53 ± 0.42
2022–2023	10.74 ± 14.93	0.56 ± 0.54
2023–2024	8.09 ± 10.70	0.51 ± 0.42

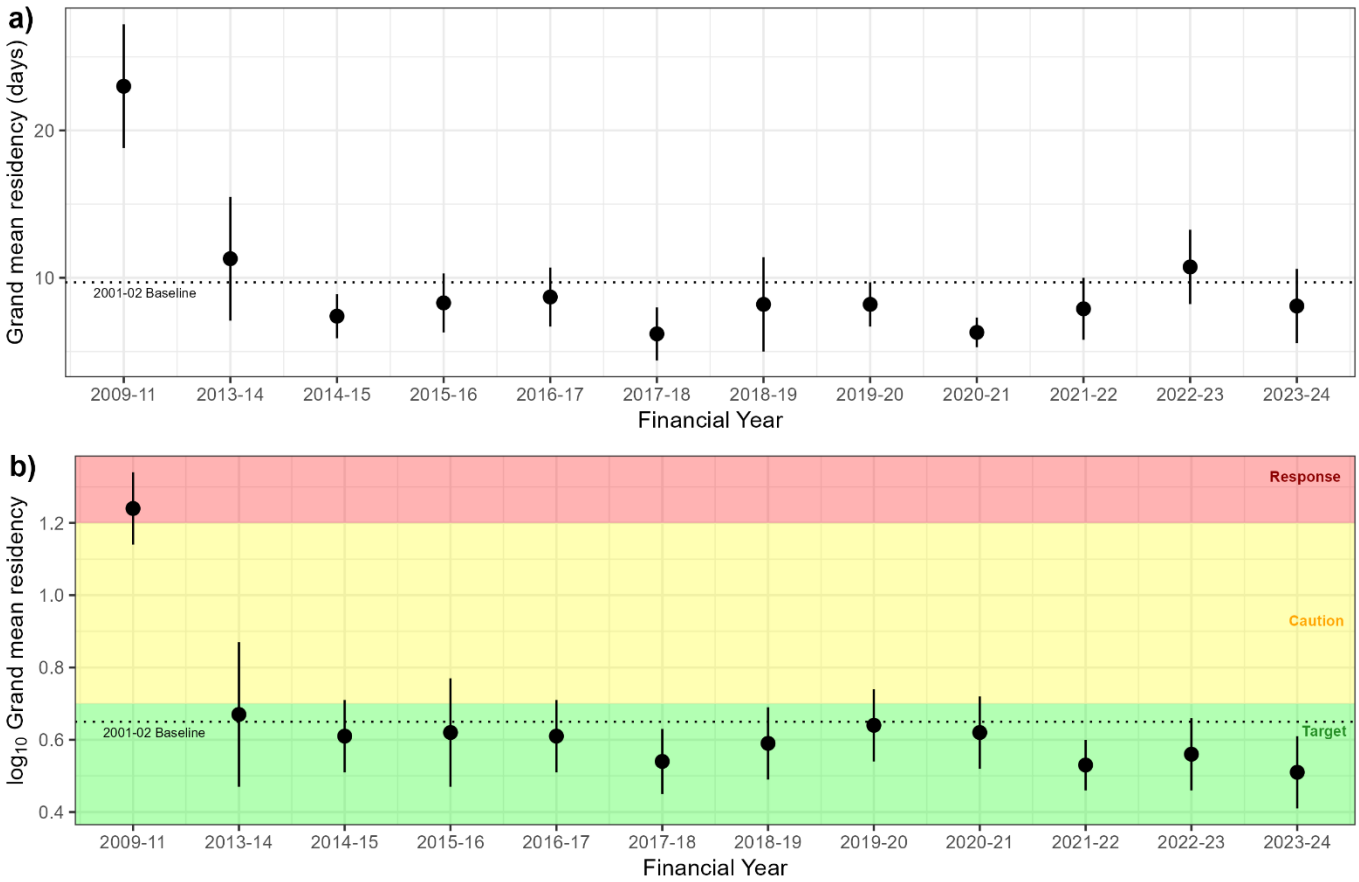

Figure 5. Change in **(a)** grand mean residency, and **(b)** grand mean of $\log_{10}$ residency of acoustically monitored white sharks at North Neptune Islands, across the 12 monitoring periods. Error bars represent standard error. Horizontal broken lines in plots represent the baseline values of grand mean residency and $\log_{10}$ transformed value calculated by Bruce et al. (2005) in 2001–2002. Shaded areas in panel **(b)** represent decision ranges developed for the cage-diving industry and described in Annexure A to the South Australian White Shark Tour Licensing Policy. Discrepancies with previous reports are due to annual reassessment of potentially shed tag and refinement of the methods with residencies less than one day now rounded up to one day.

9.2 Cage-diving activities

The e-logbook is an important tool to record cage-diving activities and the number of white sharks frequenting the Neptune Islands Group. The e-logbook revealed that the proportion of days without any shark sighted increased three-fold during this monitoring period compared to the previous 2022–23 period (14 vs. 47% of days with no sightings). Low abundance or lack of sharks occurred during similar months as observed in the previous monitoring periods, i.e. July–August (2020–21, 2021–22, 2022–23), but lower number of sharks were also sighted

during the November 2023 and February–May 2024 compared to the last financial year. Peak in shark sighting in 2023–24 occurred in similar months as in the previous monitoring periods, i.e. December–February. The increased frequency of days when sharks were not sighted led to a ~50% decrease in the mean number of sharks sighted per day from 4.0 in 2022–23 to 2.1 in 2023–24, which represents the second lowest mean number of shark sighted since 2019–20, (Figure 6). On days that sharks were sighted, number of sharks also decreased from 4.85 ± 0.16 in 2022–23 to 3.94 ± 0.22 in 2023–24 (mean ± standard error).

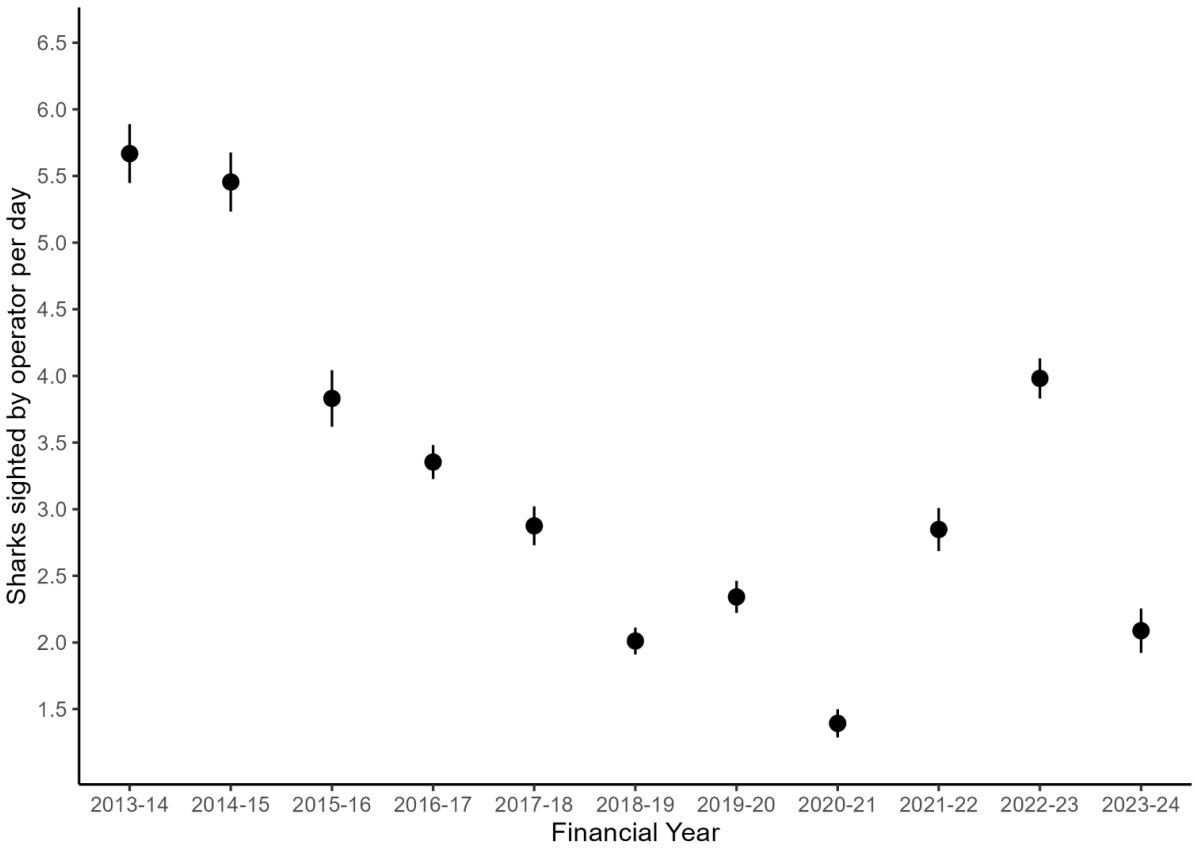

Figure 6. Trend in annual sighting rate since 2013–14 recorded by operators using the e-logbook tool. Error bars represent standard errors

10. CONCLUSION

The 2023–24 residency of white sharks at North Neptune Islands (log_{10} residency of 0.51) continues to be within the Target range for the eleventh consecutive year of monitoring. Individual variation, however, remains high with shark residency ranging from less than one day to 50.4 days. Residency estimates should, therefore, be interpreted with caution, especially if originating from a low number of individuals. The March–April period has previously been characterised by low shark abundance, which was again perpetuated in 2023–24. However, the duration and intensity of this typical reduction in the number of sharks sighted at the Neptune Islands exceeded that seen in previous years, with no sharks being sighted for 79 operating days between 23rd of February and 23rd of May 2024. The number of sharks sighted were also much lower in November–December compared to previous years. This inter-annual variability in shark abundance, again highlights the complexity of understanding what drives white sharks to visit and reside at the Neptune Islands Group. With the number of sharks sighted having been recorded on each operator days since 1999, there is 24 years of daily shark sightings available to assess the factors that might influence shark abundance at the Neptune Islands Group Marine Park. Future opportunities to analyse this data will enable to better understand the processes affecting shark numbers at the Neptune Islands Group and will help predicting shark abundance, allowing cage-diving operators to plan their activities accordingly.

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