

TĀKOKETAI/BLACK PETRELS



*Preliminary report for at-sea capture work for tākoketai/black petrels
2022*



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Preliminary report for at-sea capture work for tākoketai/black petrels 2022

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Cover image: *Tākoketai/black petrel (Procellaria parkinsoni) at sea* © Dan Burgin

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EXECUTIVE SUMMARY

This preliminary report covers the results from the at sea capture work targeting tākoketai/black petrels (*Procellaria parkinsoni*) (Threat Classification: Nationally Vulnerable) for research under the Department of Conservation's Conservation Services Programme project *POP2021/01-Black petrel research – at-sea component*. Here we report on the two catching trips undertaken in January and March 2022, and present the results in relation to previous work undertaken in April 2021. One further trip is planned in November 2022 under this contract, the results of which will be added to this report after the trip has been completed. Key results are presented, as well as a discussion on the findings and key recommendations are provided for future work.

In January 2022 WMIL staff were only able to undertake a one-day catching trip out in the waters north-east of the Marotere (Chicken) Islands group, and north of the Mokohinau Islands group. Poor weather prevented a longer trip. A total of 17 black petrels were caught from the back of the boat using a hand cast net. Additional species caught were 18 toanui/flesh-footed shearwater (*Ardenna carneipes*) (Threat Status - At Risk: Relict).

In March 2022 WMIL staff were able to undertake a longer three-day catching trip, targeting the same areas, but particularly north of the Mokohinau Islands group. A total of 130 black petrels were caught from the back of a boat using the same hand cast net method. This total includes 5 already banded birds from WMIL study colonies on Aotea/Great Barrier Island and Te Hauturu-o-Toi/Little Barrier Island, as well as 3 banded birds from the at-sea capture work. Additional species caught and banded were 78 flesh-footed shearwater, two New Zealand storm petrel (*Fregetta maoriana*) (Threat Classification: Nationally Vulnerable) and one rako/Buller's shearwater (*Ardenna bulleri*) (Threat Classification: At Risk: Declining), none of which were already banded.

Over all trips undertaken by WMIL (April 2021, January 2022 and March 2022), a total of 313 seabirds were captured altogether (April 2021: $n=67$, January 2022: $n=35$, March 2022: $n=211$). A total of 139 (January 2022: $n=17$, March 2022: $n=122$) black petrels were newly banded over both 2022 trips. Including the April 2021 preliminary trial captures, a total of 202 black petrels have been caught (April 2021: $n=55$, January 2022: $n=17$, March 2022: $n=130$). Of these, 6 were previously banded at a terrestrial colony, representing 3% of total captures. The average daily capture rate of tākoketai/black petrel for each trip is highly variable; 18 per day in April 2021, 17 per day in January 2022 and 43 per day in March 2022, with the average daily capture rate for all trips being 67. The highest average catches were in the first and last light periods of the day (7-9am and 5-7pm).

Key recommendations are:

- Trips need to be undertaken earlier in the breeding season, i.e., November through to January, with several trips throughout the breeding season to allow WMIL staff to capture more birds.
- A large amount of bait should be taken to facilitate creating more feeding frenzies and theoretically more birds behind the back of the boat for capture.
- Future work should be clarified much further in advance to increase the success of this work particularly dealing with ever changing weather and swell conditions, COVID restrictions, and aligning the WMIL team and the skipper's schedules.
- Undertake future work around the dimmest phases of the moon.
- Undertake a trial on the Far Out Ocean Research Collective vessel, as whilst we are unsure as to how capture will work off the boat of a much larger vessel, or indeed a small dinghy vessel, it will be good to test out different vessels to better understand suitability for this type of work in the future.

- Future work should budget for a team of three (minimum) to have flexible flying and accommodation costs, as well as the rising costs of diesel fuel for boat charters and covering the cost of higher bait use.

At-Sea Capture work for tākoketai/black petrels 2022

1. INTRODUCTION

In 2022 Wildlife Management International Ltd. (WMIL) staff undertook two at-sea catching trips targeting tākoketai/black petrels (*Procellaria parkinsoni*) in the waters north-east of the Marotere (Chicken) Islands group, and north of the Mokohinau Islands group (Figure 1). Black petrels have a Threat Classification of Nationally Vulnerable (Robertson et al. 2021) and have been monitored continuously by WMIL since 1995/1996 at their primary breeding colony on Aotea/Great Barrier Island (Bell et al. 2022).

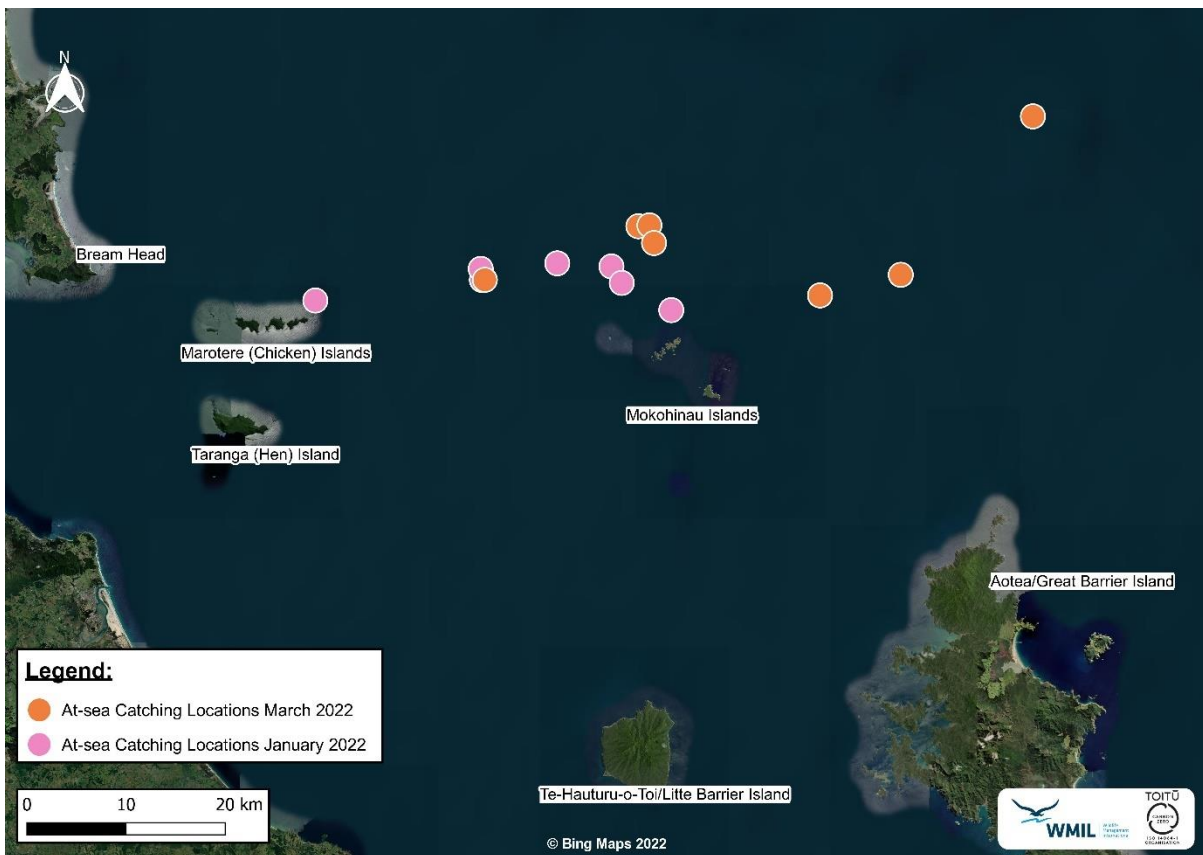


Figure 1. At-sea catching locations for January and March 2022 within the waters north of the known breeding sites of tākoketai/black petrels on Te Hauturu-o-Toi/Little Barrier Island and Aotea/Great Barrier Island.

1.1 Trip Dates

1.1.1 January 2022

A catching trip was undertaken on 26 January 2022 but was limited to just one day due to poor weather and swell conditions either side of this date. Personnel involved; Dan Burgin (WMIL), Keegan Miskimmin (WMIL), Lydia Titterton (WMIL) and Trevor Jackson (El Pescador Charters).

1.1.2 March 2022

A three-day catching trip was undertaken from 16 to 19 March 2022 and could not be extended due to poor weather and swell conditions the following day. Personnel involved; Dan Burgin (WMIL), Hinewai Bell (WMIL), Mike Bell (Toroa Consulting) and Trevor Jackson (El Pescador Charters).

1.1.3 November 2022

A further at-sea capture trip is scheduled for November 2022; this will be updated once completed.

2. METHODS

Seabirds were lured in initially using a mixture of fish burley which was sealed in a netted bag or plastic case and placed in the water off the back of the boat once the engine had been turned off. It was connected by a rope and left to create a 'slick' of fish oil as an attractant to seabirds in the area. This attracted not just black petrels, but other species (threat status from Robertson et al. 2021 and taxonomy from Checklist Committee OSNZ 2022) including:

- Toanui/flesh-footed shearwater (*Ardenna carneipes*) (Threat Status - At Risk: Relict),
- Takahikare-raro/New Zealand storm petrel (*Fregetta maoriana*) (Threat Classification: Nationally Vulnerable),
- Rako/Buller's shearwater (*Ardenna bulleri*) (Threat Classification: At Risk: Declining),
- Wilson's storm petrel (*Oceanites oceanicus*),
- Titi Wainui/Fairy prion (*Pachyptila turtur*) (Threat Status - At Risk: Relict),
- Titi/Cook's petrel (*Pterodroma cookii*) (Threat Status - At Risk: Relict),
- Ōi/Grey-faced petrel (*Pterodroma gouldi*) (Threat Status – Not Threatened) and,
- Campbell Island mollymawk (*Thalassarche impavida*) (Threat Status – Naturally Uncommon).

Once the birds were flying around the back of the boat chopped up pilchards, and small pieces of fish burley were then thrown on to the surface of the ocean. This allowed targeted throws to lure black petrels in closer to the back of the boat to ensure they were within range of the cast net thrower.

A hand cast net (6ft) was used as the primary method of catching birds. This was thrown by one person (Dan Burgin) from the back of the boat over the top of a black petrel, whilst the other team members threw bait and/or helped with processing the birds. One bird was targeted with bait luring it in until it was close enough in range of the cast net thrower. The cast net was pulled tight once over the bird(s) to seal them inside and pulled back on to the boat. The bird(s) was retrieved from the net by hand (Figure 2), and then each bird placed into an individual drawstring bag for processing later. Each bird was given a unique metal band if not already banded, marked with correction fluid to help distinguish it as a captured bird, and then carefully released over the side of the boat. Any banded birds had their unique band number taken, were marked with correction fluid, and released as above.



Figure 2. Tākoketai/black petrel in hand after retrieval from the cast net.

Accurate counts were taken of all bird species seen at all locations and entered as part of complete checklists via the eBird app. These were all uploaded to the [New Zealand Bird Atlas eBird portal online](#).

3. RESULTS

Key results are presented below for both trips with all bird checklists summarised online in this [eBird Trip Report](#).

3.1 Locations

Capture locations are summarised below in Table 1 with coordinates for each point for reference (WGS84 projection).

Table 1. Capture location ID and coordinates for both January and March 2022 trips.

Location ID	Latitude	Longitude	Date Utilised
21	-35.873	174.789	January 2022
22	-35.858	174.94	January 2022
23	-35.88	175.112	January 2022

24	-35.86	175.067	January 2022
25	-35.848	175.058	January 2022
26	-35.845	175.009	January 2022
27	-35.849	174.939	January 2022
29	-35.857	174.943	March 2022
31	-35.818	175.082	March 2022
32	-35.869	175.247	March 2022
33	-35.854	175.32	March 2022
34	-35.817	175.092	March 2022
35	-35.83	175.096	March 2022
36	-35.737	175.44	March 2022

3.2 January 2022

Catch totals are summarised in Table 2 below for black petrels and flesh-footed shearwaters. Black petrel captures are presented in Figure 3, which shows the locations overlaid on a map of the surrounding area. No previously banded birds were captured on this trip, and no additional species were caught.

Table 2. Capture totals for tākoketai/black petrels and toanui/flesh-footed shearwaters in January 2022.

Location ID	Number of tākoketai/black petrels caught	Number of toanui/flesh-footed shearwaters caught
21	0	0
22	13	15
23	0	0
24	1	1
26	2	2
27	1	0
TOTAL	17	18

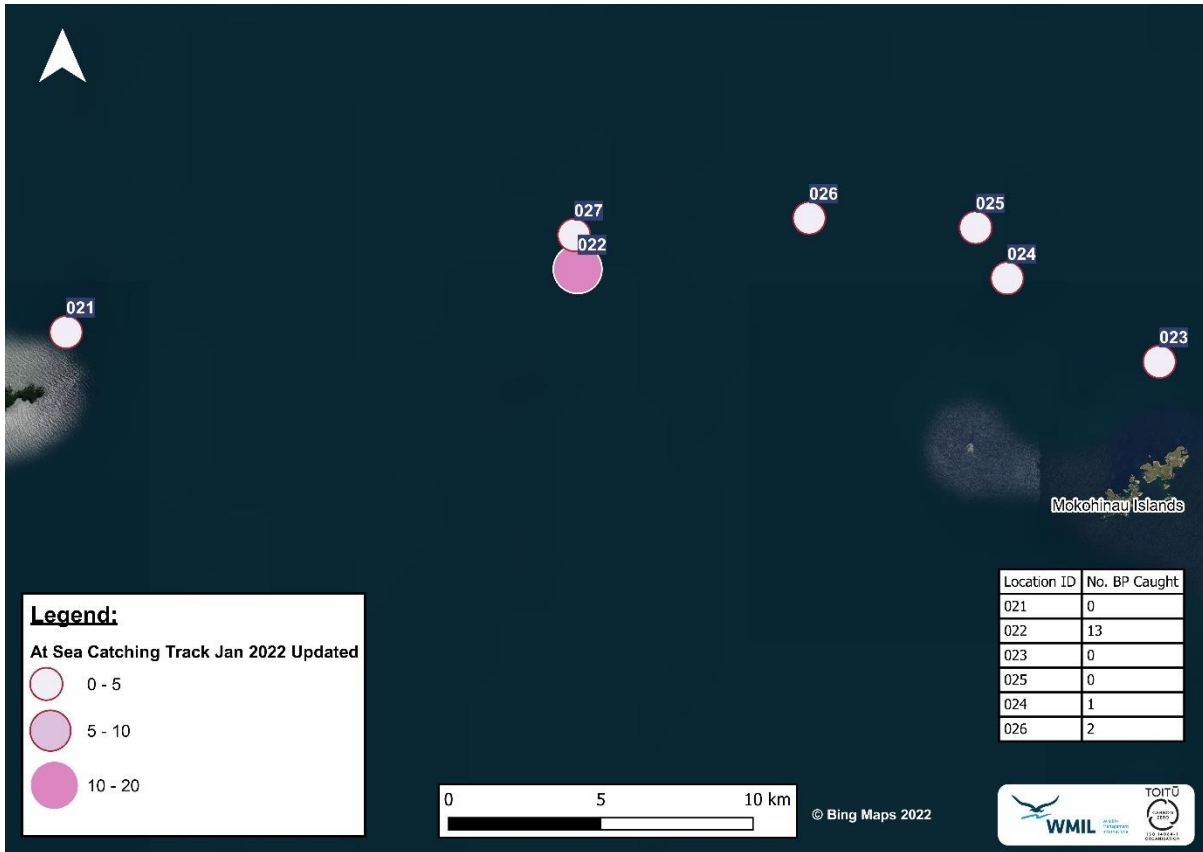


Figure 3. Total tākoketai/black petrel captures in January 2022. Circles are labelled, and their size reflects the number of birds caught. Capture values are presented in the table for each location point.

3.3 March 2022

Catch totals are summarised in Table 3 below for black petrels and flesh-footed shearwaters, including totals for previously banded birds captured on this trip. Total black petrel captures are presented in Figure 4, which shows the locations overlaid on a map of the surrounding area. Note that locations ‘28’, ‘29’ and ‘30’ were all merged into one as ‘29’ as they were so close together.

Table 3. Capture totals for tākoketai/black petrels and toanui/flesh-footed shearwaters in March 2022.

Location ID	Total number of tākoketai/black petrels caught (including recaptures)	Total number of previously banded tākoketai/black petrels caught (not including those banded on this at-sea trip)	Total number of toanui/flesh-footed shearwaters caught	Total number of previously banded toanui/flesh-footed shearwaters caught
29	17	0	46	0
31	65	3 (1 on 16/3/22 and 2 on 18/3/22)	18	0
32	14	1 (17/3/22)	3	0
33	1	0	0	0
34	7	0	0	0
35	15	0	4	0
36	11	1 (17/3/22)	5	0
TOTAL	130	5	78	0

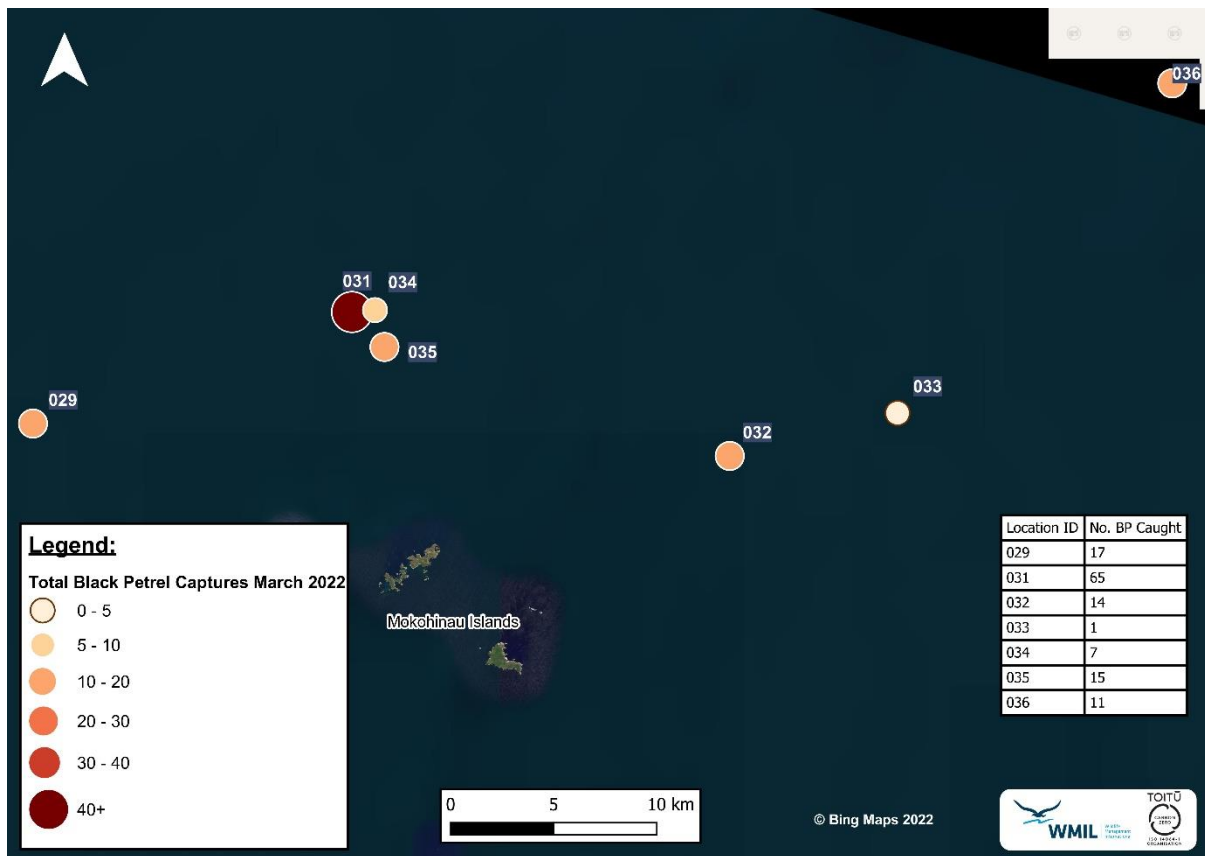


Figure 4. Total tākoketai/black petrel captures in March 2022. Circles are labelled, and their size reflects the number of birds caught. Capture values are presented in the table for each location point.

As part of the total capture value for black petrels, five birds were already banded previously at WMIL study colonies, and an additional three recaptures were banded during this at-sea trip, meaning 122 new birds were banded. Black petrel recaptures are summarised below:

- **H-41175** – This is a 6-year-old individual from Te Hauturu-o-Toi/Little Barrier Island (banded in April 2016 from a study burrow as a chick) and is the first recapture of this individual.
- **H-46254** – This is a newly banded adult non-breeder (sex unknown) from Te Hauturu-o-Toi/Little Barrier Island that was caught and banded by Auckland Council staff when undertaking study burrow monitoring in December 2021.
- **H-42021** – This is an 11-year-old adult breeding male from study burrow 212 on Aotea/Great Barrier Island, that was incubating an egg when WMIL staff were undertaking burrow monitoring on 25 January 2022.
- **H-44567** – This is a newly banded adult breeder (sex unknown) from study burrow 229 on Aotea/Great Barrier, that was with a chick when WMIL staff were undertaking burrow monitoring on 2 February 2022.
- **H-42733** – This individual was banded as a chick in April 2017 in a random burrow towards Kauri Dam colony on Aotea/Great Barrier Island.

3.3.1 Additional Species

In addition, 2 New Zealand storm petrels and 1 Buller’s shearwater were also caught during this trip.

3.4 Total captures of all species

Over all trips undertaken by WMIL (April 2021, January 2022 and March 2022), a total of 313 seabirds were captured altogether (April 2021: $n=67$, January 2022: $n=35$, March 2022: $n=211$) (Table 4). In March 2022, the 211 seabirds captured included four species of seabird, as detailed in Table 4.

Table 4. Total captures of all seabird species over all 3 at-sea trips undertaken by WMIL (April 2021, January 2022 and November 2022).

Species	April 2021	January 2022	March 2022	November 2022	TOTAL
Tākoketai/black petrel (<i>Procellaria parkinsoni</i>)	55	17	130	TBC*	202*
Toanui/flesh-footed shearwater (<i>Ardenna carneipes</i>)	11	18	78	TBC*	107*
Campbell Island mollymawk (<i>Thalassarche impavida</i>)	1	0	0	TBC*	1*
New Zealand storm petrel (<i>Fregetta maoriana</i>)	0	0	2	TBC*	2*
Rako/Buller's shearwater (<i>Ardenna bulleri</i>)	0	0	1	TBC*	1*
TOTAL	67	35	211	TBC*	313*

* To be updated once November 2022 trip has been undertaken.

3.5 Total captures of tākoketai/black petrels from the four at-sea trips

A total of 139 (January 2022: $n=17$, March 2022: $n=122$) black petrels were newly banded over both 2022 trips. In March 2022 a total of 130 black petrels were caught altogether (recaptures included).

Including the April 2021 preliminary trial captures, a total of 202 black petrels have been caught (April 2021: $n=55$, January 2022: $n=17$, March 2022: $n=130$) (Table 5). Of these, 6 were previously banded at a terrestrial colony, representing 3% of total captures. For reference, the single black petrel recaptured during the April 2021 trip was H-41287. This individual was banded on Te Hauturu-o-Toi/Little Barrier Island as a non-breeder in 2017 in study burrow L04 by WMIL.

Table 5. Total captures for tākoketai/black petrels and toanui/flesh-footed shearwaters during all at-sea capture trips (April 2021 to November 2022).

At-sea trip	Number of tākoketai/black petrels caught		Number of toanui/flesh-footed shearwaters caught	
	Previously Banded	Unbanded	Banded	Unbanded
April 2021	1	54	0	11
January 2022	0	17	0	18
March 2022	5 (3 banded on this at-sea trip not included)	122	0	76

At-sea trip	Number of tākoketai/black petrels caught		Number of toanui/flesh-footed shearwaters caught	
	Previously Banded	Unbanded	Banded	Unbanded
November 2022	TBC*	TBC*	TBC*	TBC*
TOTAL	6*	193*	0*	105*

* To be updated once November 2022 trip has been undertaken.

3.6 Daily Capture Rates from the four at-sea trips

Table 6 summarises the daily capture rates of tākoketai/black petrel and the averages from all trips undertaken (April 2021, January 2022 and March 2022).

The average daily capture rate of tākoketai/black petrel for each trip is highly variable; 18 per day in April 2021, 17 per day in January 2022 and 43 per day in March 2022, with the average daily capture rate for all trips being 67 (Table 6).

Table 6. Average daily capture rates for tākoketai/black petrels during all at-sea capture trips (April 2021 to November 2022).

Day	April 2021	January 2022	March 2022	November 2022**	TOTAL**	4-trip average**
Day 1	3	17	38	TBC**	58**	TBC**
Day 2	7	N/A*	48	TBC**	55**	TBC**
Day 3	45	N/A*	44	TBC**	89**	TBC**
Day 4	N/A*	N/A*	N/A*	TBC**	N/A**	TBC**
TOTAL	55	17	130	TBC**	202**	TBC**
Trip average	18	17	43	TBC**	67**	TBC**

* No catching was undertaken on this day

** To be updated once November 2022 trip has been undertaken.

3.6.1 Capture Rate on March 2022 trip

Data on the success rate of net throws was also collected during the March 2022 trip (Table 7). A tally of successful throws, how many birds were caught in each throw, and the number of missed throws was noted to help calculate a success rate as well as get a gauge on the total number of throws over the majority of the trip. Data was collected over the first, second and the first half of the final day's catching, and so reflects the majority of the capture work. Table 7 summarises these capture rates.

Table 7. Throw Catch Rate Analysis for March 2022 Trip.

Calculation	Value
Total Throws	192
Throw Success Rate (%)	75.0
Bird Catch per Throw Average	1.65

3.6.2 Time of Capture

Data on what time birds were captured was collected during the April 2021 and March 2022 trips and is summarised in Table 8 and Figure 6. Capture times are merged into hourly brackets and averaged

across all days of the 3-day trip duration. The highest average catches were in the first and last light periods of the day (7-9am and 5-7pm).

Table 8. Average tākoketai/black petrels capture times for April 2021 and March 2022 trips.

Time Period	April 2021	March 2022
6am	3	0
7am	11	17
8am	0	11
9am	6	4
10am	3	4
11am	5	3
12pm	1	9
1pm	2	7
2pm	3	8
3pm	2	6
4pm	4	12
5pm	10	12
6pm	5	19
7pm	0	18

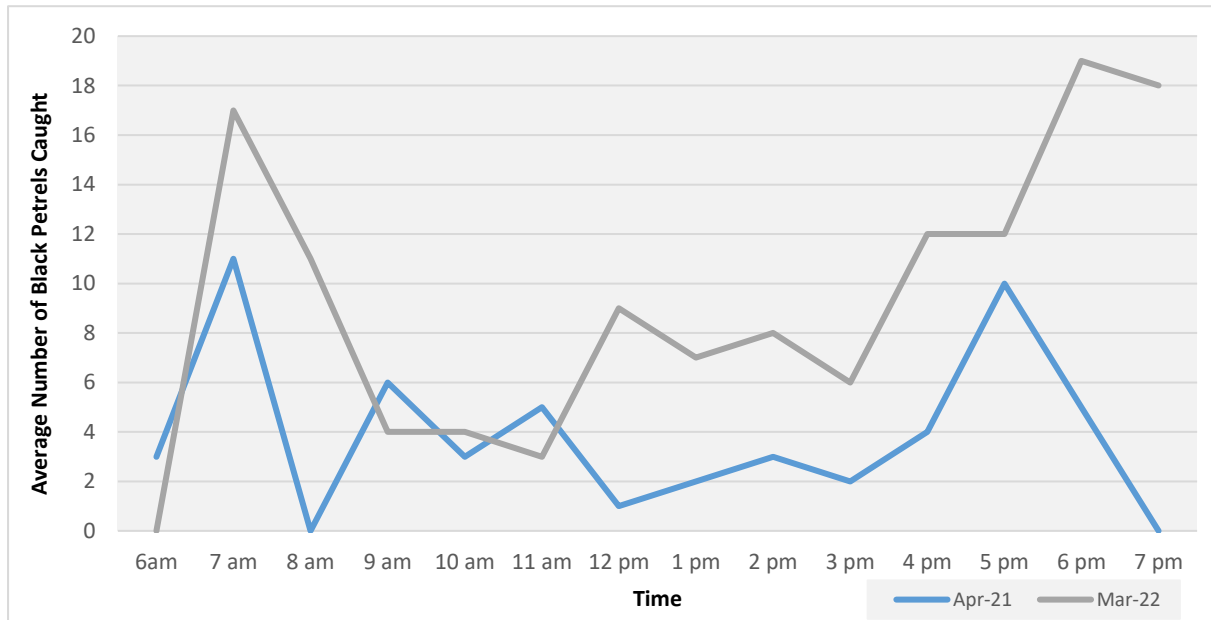


Figure 5. Average capture rate of tākoketai/black petrels over time from the April 2021 and March 2022 trips.

3.7 Evidence of fish-hook damage

During the March 2022 trip, three birds were found to have apparent evidence of fish-hook damage to their bills. Figure 7 shows one individual with clear damage to the bill assumed to have been sustained from a fish-hook, potentially from a conflict with a commercial or recreational fishing vessel. This species is known to be at great risk from commercial fisheries within New Zealand's Exclusive Economic Zone (Richard & Abraham 2013; Whitehead et al. 2019). This would align with what has been seen at the breeding colony on Aotea/Great Barrier Island during burrow monitoring (E. Bell, WMIL, pers. comm.).



Figure 6. Assumed evidence of previous fish-hook capture and subsequent damage to bill of tākoketai/black petrel

4. DISCUSSION

A total of 193 (April 2021: $n=54$, January 2022: $n=17$, March 2022: $n=122$) black petrels were newly banded over all of these trips. This is a high number of newly banded individuals, with only 6 previously banded birds caught during 7 days' worth of at sea catching representing just 3% of all black petrels caught over that period. The most successful location for capturing black petrels was location '31 in March which was north of the Mokohinau Islands, and where 65 black petrels were caught. More black petrels were caught in the close vicinity at other locations ('34': $n=7$ and '35': $n=15$) and at '22' in January 2022 ($n=13$). A total of 313 seabirds were captured altogether across all trips (April 2021: $n=67$, January 2022: $n=35$, March 2022: $n=209$). In March 2022, the 209 seabirds captured included four species of seabird, as detailed above. It is important to note that the capture of species other than black petrels was often unavoidable due to their associations with feeding black petrels behind the back of the boat. This will always be a factor of any at-sea work and should be taken into account.

In March 2022 the average daily capture of black petrels ($n=43$) was much higher than in January ($n=17$). The reasons for this are likely numerous. Not only was the March trip longer, but the team had more experience, and a better grasp of the cast net method. Additionally, we trialled placing birds straight into a drawstring bag for processing after being caught during the March 2022 trip, something that we had not done previously. This allowed a far more efficient and faster pace of capture during March 2022. Importantly, having undertaken two previous trips we had learnt from mistakes and had a better idea of the optimum capture locations and directed the skipper there at the start of each day. Understanding the best times for capture, which appear to be first and last light of the day (Figure 6), also allowed better capture rates for the March 2022 trip we believe.

The most successful times of day for capture was found to be around first and last light, with the afternoon having a slightly slower capture rate. There was great success catching birds in the first 1.5 hours after first light and the last two hours before dark. This was maximised by getting to those locations for first light to be ready to catch those birds. It was also found that during the afternoon, if there were few birds around, once most birds around the boat were captured and marked, those and the others became far too wary for catching, meaning we often had to move on to a new site or wait for more birds to gather.

Over the first two evenings in March 2022, it was found that numbers of birds steadily grew until dark when there were often high numbers of black petrels, flesh-footed shearwaters, and New Zealand storm petrel around the boat. As found previously, when birds were present in large numbers around the back of the boat (>10), a feeding frenzy ensued, and the birds generally become less aware of the people on the boat as they were focussing on competing with other birds for the food placed on the surface of the ocean. On the final evening in March 2022 however, we did not see this behaviour from black petrels and flesh-footed shearwaters, with much lower numbers around the back of the boat. One hypothesis is that this may well be attributable to the full moon that night, but we cannot be sure. Even so, further work should look to avoid the brightest moon phases where possible.

Black petrels and flesh-footed shearwaters were quick to learn about the novel threat of the cast net. If the net was thrown, and particularly if it missed the target, most birds become very aware of the person with the net. They often avoided coming in too close to the boat when that person was present, unless there were high numbers of birds around. This was especially true when very few birds were around. As was found on previous work undertaken in April 2021 by WMIL (Crowe & Burgin 2021), a lot of additional bait (pilchards and burley) had to be used to lure birds in closer to be able to successfully catch them with the cast net, particularly when they were in low numbers. The optimum time to throw was when the birds dove down or had their head just under the surface of the water when looking for sunken bait. This gave a higher chance of catching them. Many birds would come in with their wings raised ready for a quick escape though, flying off before the net could be thrown, which provided an extra challenge.

Wind was another factor that was certainly prevalent in the March 2022 trip. Strong 14 knot winds with stronger gusts made the exposed side of the boat particularly difficult to cast the net effectively. The wind would often partly close the lightweight net, or even divert it slightly off course if strong enough. This was taken into account on those days where the winds were high, and didn't entirely hinder successful capture, more that it added an extra challenge that should be taken into consideration during future work.

Overall, despite the challenges, the March 2022 trip was the most successful trip to date undertaken by WMIL, with far more birds caught compared to not just the January 2022 trip, but also the work undertaken in April 2021 (Crowe & Burgin 2021). The latter trip was undertaken at the tail end of the black petrel 2020/2021 breeding season, and so it is likely that there were fewer birds around, but we feel that the March 2022 trip was also getting towards this latter breeding season stage. As discussed above the success of the March 2022 trip was likely down to more experience and knowledge on this capture technique. This understandably makes WMIL very keen to continue this work earlier in the breeding season to better target black petrels, particularly pre-breeders, when they are known to be in higher numbers in this area. Furthermore, we are also pleased to see the applicability of this capture method for other species of seabird, including much larger species such as Campbell Island mollymawk, to much smaller species like NZ storm petrel, which could help increase understanding about these species at sea ecology.

Undertaking the past three trips with Trevor on El Pescador has shown us the optimum requirements for a vessel for this type of work, particularly the importance of the duckboard at the back of the vessel. This is imperative to allow room for the person to throw the cast net as low to the ocean's surface and close to the birds as possible. The Far Out Ocean Research Collective vessel is much larger, and a yacht, so may prove sub-optimal. We recommend still undertaking a trial on the Far Out Ocean Research Collective vessel, as whilst we are unsure as to how capture will work off the boat of a much larger vessel, or indeed a small dinghy vessel, it will be good to test out different vessels to better understand suitability for this type of work in the future.

5. RECOMMENDATIONS

Key recommendations are summarised below:

- As recommended previously (Crowe & Burgin 2021), these trips need to be undertaken earlier in the breeding season, i.e., November through to January, with several trips throughout the breeding season to allow WMIL staff to capture more birds.
- A considerable amount of bait is used for this work, and we recommend taking more than we did to facilitate creating more feeding frenzies and theoretically more birds behind the back of the boat for capture. Five bags of burley and over 10kg of pilchards were used during the one-day trip in January 2022, so a considerable amount of bait is needed for 3-to-4-day trips.
- A key recommendation surrounding further work is confirming and planning this work much further in advance to increase the success of this work and take into consideration all that has been learnt over these past three trips. With the contract signed in January 2022 and a busy field schedule WMIL staff did their best to quickly fit these trips in, particularly with ever changing weather and swell conditions, COVID restrictions, and aligning theirs and the skipper's schedules. More time for planning will allow us to align our schedules with other WMIL contractual commitments, El Pescador Charters and Far Out Ocean Research Collective, as well as look to avoid the brightest moon phases, and worst weather windows where possible.
- We recommend undertaking a trial on the Far Out Ocean Research Collective vessel, as whilst we are unsure as to how capture will work off the boat of a much larger vessel, or indeed a small dinghy vessel, it will be good to test out different vessels to better understand suitability for this type of work in the future.

- Future work should budget for a team of three (minimum) to have flexible flying and accommodation costs, as well as the rising costs of diesel fuel for boat charters and covering the cost of higher bait use.

6. ACKNOWLEDGEMENTS

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