Diego Garcia Yellowfin Tuna Tagging Expedition

Final Report, February 2019

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Funded by the Bertarelli Foundation through the Bertarelli Programme in Marine Science

Executive Summary

In the Indian Ocean, the Indian Ocean Tuna Commission (IOTC) Working Party on Tropical Tunas (WPTT) has classified the ecologically significant and commercially important yellowfin tuna (*Thunnus albacares*) as '*Overfished and Subject to Overfishing'*. As a global conservation and management strategy, large Marine Protected Areas (MPAs) have been increasing in number and size with the goal of protecting reef and pelagic species and the ocean ecosystems they occupy. The British Indian Ocean Territory (BIOT) Marine Protected Area provides a unique opportunity to investigate the role of MPAs in the protection and management of commercially important pelagic fishes, such as yellowfin tuna. Thus, a team of four BPMS researchers visited Diego Garcia in January 2019 to undertake a trial within its recreational fishery to see if it could serve as a source of valuable year-round data on yellowfin tuna in the central Indian Ocean (tagging, morphometrics, and DNA and stable isotope samples).

The expedition demonstrated that the Morale, Welfare and Recreational (MWR) vessels used by the fishery are appropriate platforms for tagging activities. However, due to a combination of adverse weather, mechanical failures and flight cancellations, we were only able to fish for a total of 22 hours (having planned for 48 hours). Furthermore, an unusually prolonged period of hot, still weather (possibly linked to El Niño) resulted in yellowfin tuna being absent from the waters around Diego Garcia. Due to the spatial restrictions of the MWR boats (that could travel no further than three nautical miles from Diego Garcia) and gear restrictions (jigging and trolling), we were not able to access the cooler refuge areas where we suspect the fish were under these conditions. Therefore, no yellowfin tuna were encountered or tagged on this expedition. We were however able to use Dogtooth tuna (*Gymnosarda unicolor*) as a proxy and establish a protocol for the deployment and reporting of mark recapture floy tags within the recreational fishery.

Despite the challenges faced, a total of 83 fish were caught including Great barracuda (*Sphyraena barracuda*), Kawakawa (*Euthynnus affinis*), Wahoo (*Acanthocybium solandri*), Dogtooth tuna, Black-saddled grouper (*Plectropomus laevis*), Marbled coral grouper (*Plectropomus punctatus*), Rainbow runner (*Elagatis bipinnulata*), Green jobfish (*Aprion virescens*), Red snapper (*Lutjanus sebae*) and baitfish (*Clupeidae*). Morphometric data and muscle tissue samples were collected from each fish with samples sent to the Chemical Tracers Laboratory at the University of Windsor for subsequent isotopic analyses.

After consultation with base personnel and MWR staff on-island, it was apparent that the previous advice we had been given by base personnel regarding December and January being the optimum time for this trial was erroneous and based on logistics and not ecology. Through unstructured interviews with individuals associated with the recreational fishery, all but one (who suggested December) suggested that June-September is a much better time for yellowfin tuna. Given that the boats are fit for purpose and the methodology worked well, if the fish are there, we are very confident that important data on yellowfin tuna can be gathered through this fishery. Thus, based on the new evidence obtained, we believe that a second trial should be undertaken in July 2019.

Introduction

Top predators are ecologically significant, yet many are faced with the effects of growing anthropogenic pressures such as overexploitation (overfishing and illegal fishing). As a global conservation and management strategy, large Marine Protected Areas (MPAs) have been increasing in number and size with the goal of protecting reef and pelagic species and the ocean ecosystems they occupy. However, to date, few empirical studies have addressed their use and effectiveness for protecting pelagic animals. Thus, the British Indian Ocean Territory (BIOT), given it is an oceanic biodiversity hotspot in the centre of the Indian Ocean where highly migratory pelagic species aggregate at points during their life history, provides a unique opportunity to address this crucial knowledge gap.

Since 2013, a collaborative team from Stanford University, the University of Western Australia (UWA) and the Zoological Society of London (ZSL) have participated in several joint research expeditions deploying electronic tag technology to study the residency and connectivity of sharks and mantas, within and around BIOT. These expeditions have resulted in the deployment of a significant acoustic receiver array (currently 56 receiver elements) and over 400 fish tagged with four types of tag technology: acoustic, pop-up archival satellite (PAT), smart-positioning or temperature transmitting (SPOT) and biologging camera tags. The data these tags are providing is revealing how the archipelago's different habitats (i.e. lagoons, outer reefs, pelagic environments) shape the behavioural ecology and life history of a diverse range of shark and ray species (Jacoby et al. submitted). In addition, they are elucidating the roles that apex predators play in maintaining the structure and function of this remote ecosystem (Curnick et al. 2019). The ability to use these data to estimate spatial, temporal and population dynamics provide vital information that is necessary for protecting the region. Yet, research to date has been focused primarily on elasmobranch species, with only a handful of teleost species tagged.

In the Indian Ocean, the Indian Ocean Tuna Commission (IOTC) Working Party on Tropical Tunas (WPTT) has classified yellowfin tuna (*Thunnus albacares*, Near Threatened in the IUCN Red List of Threatened Species) as '*Overfished and Subject to Overfishing'*. Thus, yellowfin tuna are a priority species for the Bertarelli Programme in Marine Science (BPMS). To date, the BPMS team have only tagged a handful of yellowfin tuna within the BIOT MPA (Carlisle et al., in review) but they are known to be present year-round across the MPA from the historical fisheries record (Dunn & Curnick, submitted; Curnick et al., submitted). Currently, yellowfin tuna are targeted by the recreational fishery around the island of Diego Garcia for sport. We believe that this fishery could support a unique research opportunity and generate much needed data that would be of interest to science, managers and the IOTC. Therefore, we undertook an expedition in January 2019 to trial a yellowfin tuna tagging project around Diego Garcia and start to quantify the ecological significance of the BIOT MPA for this commercially important pelagic species within the Indian Ocean.

Aims and Objectives

A team of four BPMS researchers (David Curnick, ZSL; Raymond Arida, Stanford University; Taylor Chapple, Stanford University; and Robert Schallert, Stanford

University) visited Diego Garcia with the aim of investigating whether the ongoing recreational fishery could serve as a source of valuable year-round yellowfin tuna data (tagging, morphometrics, and DNA and stable isotope samples). The primary objectives of this expedition were to:

1) Analyse available recreational fisheries datasets to quantify seasonal patterns in the catch composition.
2) Establish a protocol for the deployment and reporting of mark recapture floy tags on yellowfin tuna within the Diego Garcia recreational fishery.
3) Deploy up to 10 satellite and/or survivorship tags on yellowfin tuna and billfish (if encountered) to quantify off-shore movement behaviour.
4) Collect tissue samples for isotopic and DNA analyses to provide information on the trophic ecology and habitat use of species within BIOT and on the patterns of connectivity of elasmobranchs and teleosts across the Indian Ocean.
5) Offer training to the Environment Officer, Senior Fisheries Protection Officer and other interested personnel in tagging methods and the taking and storing of DNA and isotope samples.
6) Communicate our work to the personnel on Diego Garcia and ensure findings are made available to the Indian Ocean Tuna Commission and embedded within the UK Blue Belt Programme.

This project was undertaken under permit BIOT0003SE19 granted by the UK Foreign and Commonwealth Office and the BIOT Administration.

Methods

Timing

Previous recommendations from base personnel and our understanding of the historical industrial fishery record (whose peak fishing season was November through to January, Curnick et al., submitted) meant we targeted December/January for this initial trial. Logistical constraints, such as flight availability, led to the expedition taking place between the 21st January and the 5th February 2019.

Platforms

We hired a Boston Whaler from the Morale, Welfare and Recreational (MWR) office on Diego Garcia. Although the vessel comes equipped with fishing rods and fishing tackle suitable for yellowfin tuna capture, we brought all of our own gear so as not to depend on MWR resources. As well as bringing all of our own fishing tackle, we also brought all the necessary tagging supplies and sampling equipment. Any additional resource required were sourced from the science store (vials and ethanol). The boat came with an experienced captain and deckhand and carried a maximum of seven people. As the science team consisted of four people, this enabled us to host one citizen scientist onboard each day. The boats maintained constant radio contact with Port Operations and were not allowed beyond three nautical miles offshore from Diego Garcia. MWR boats are not permitted to head south beyond Donkey Gate, owing to a previous boating accident in the area. Given the occurrence of a prominent sub-surface feature 1 km off the southern tip of Diego Garcia, the science team obtained special permission to go beyond Donkey Gate (with support of the Executive Officer Major Renny Bulmar and Logistics Officer Lieutenant Kieran Tamayo). The MWR

boats were not able leave dock before 0730 and had to be back at the marina no later than 1800. Furthermore, the crews were not able to work longer than their contractual eight hours per day. Therefore, the tagging team had the choice of going out in two blocks of four hours each day (0730-1130 and 1400-1800) or in one eight-hour block within the aforementioned operating window.

Fishing methods
Upon arrival at the marina, we sought recommendations by MWR officials, fishers and the boat captains on where and when to fish. In addition, we targeted areas of concentrated bird activity (booby and terns), a known indicator of tuna activity. Our predominant fishing method was trolling with a combination of surface and diving lures on monofilament lines with a maximum capacity of five concurrent lines (using outriggers). However, we also occasionally switched to two spinning rods, especially when targeting areas where seabirds were feeding. We had initially planned to spend 12 days out on the water, totalling 46 hours of fishing time (Table 1).

Method of Capture
Two methods of fishing were used to attempt capture yellowfin tuna. Trolling was the main method of fishing used. The best way to target fish while trolling is to troll along depth breaks such as drop-offs or seamounts or along temperature breaks. A spread of six lures varying in type, colour and size were towed behind the boat. These lures were trolled at different distances and depths. Cedar plugs, jets feathers, and Rapalas were used with mono leaders and single hooks as to ensure as little physical damage to the fish as possible. Jigging was the second method. A variety of knife jigs and surface irons were thrown into diving birds and bait congregating on the surface in attempts to catch the fish feeding deeper below the surface

Tagging procedures
To date, the team has deployed over 400 electronic tags in BIOT. Most of these tags have reported, indicating a high success with handling, tagging and releasing fish and elasmobranchs in the region. The 2019 Diego Garcia tagging expedition focused on yellowfin tuna and billfish (if opportunistically encountered) but the following describes procedures carried out on all species caught, unless otherwise stated.

We used fishing techniques that minimised stress and risk to the animals and ensured that they were rapidly brought to the boat after being hooked. Once at the boat, all fish were carefully lifted onto the MWR vessel using a supportive sling when necessary. For each animal caught, we collected basic morphometric data (length, sex, body condition) and muscle tissue samples for isotopic analysis (extracted from just below the first dorsal fin). Samples were stored immediately on ice before being transferred to a freezer within our accommodation on Diego Garcia at the end of the fishing session. Any yellowfin or billfish caught would also have fin tissue samples collected (taken from the first dorsal fin) and stored in 70% proof ethanol for subsequent DNA analyses. After all the data were collected, fish were released back into the water with total handling times kept below five minutes to minimise stress.

Any yellowfin tuna caught were to be tagged with a small mark recapture floy tag (Hallprint type: yellow PDATs (plastic tipped thick dart tags)) with a bespoke PDAT stainless steel applicator. These tags are consistent with those used in previous IOTC tagging projects). In addition, larger tunas (>95cm) and any billfish encountered, were

to be tagged with MiniPAT satellite tags (Wildlife Computers). These satellite tags collect and archive data on depth, temperature, and light levels and detach from the tagged animal after a programmed period of time. Tags will then float to the surface and transmit data to the Argos system, providing information on the movements and habitat use of tagged animals. All tags were to be placed on for programmed durations of 9-12 months to reveal long-term patterns of movements and connectivity. MiniPAT tags are attached to two small titanium darts with a reinforced leader – a method developed and refined by the Stanford team during their work on bluefin tuna in the Pacific. Darts are sterilized and then inserted into the dorsal musculature at the base of the dorsal fin.

All procedures were approved by the ZSL Ethics committee.

Table 1. The planned body of work between the 22nd January and the 5th February 2019 during the Diego Garcia Yellowfin Tuna Tagging Trial

Time		Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues
Start	Finish	22/01	23/01	24/01	25/01	26/01	27/01	28/01	29/01	30/01	31/01	01/02	02/02	03/02	04/02	05/02
07:30	08:00		Orientation	Fishing	Fishing	Fishing	Fishing	Fishing	Fishing	Fishing	Fishing	Fishing	Fishing	Fishing	Fishing	Pack-up and debrief
08:00	08:30															
08:30	09:00															
09:00	09:30															
09:30	10:00															
10:00	10:30															
10:30	11:00															
11:00	11:30															
11:30	12:00															
12:00	12:30	Fly in		Lunch	Lunch	Lunch	Lunch		Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Fly out
12:30	13:00															
13:00	13:30															
13:30	14:00															
14:00	14:30			Fishing	Fishing	Fishing	Fishing	Lunch	Fishing	Fishing	Fishing	Fishing	Fishing	Fishing	Fishing	
14:30	15:00															
15:00	15:30															
15:30	16:00															
16:00	16:30							Science talk								
16:30	17:00															
17:00	17:30															
17:30	18:00															

Table 2. The realised body of work between the 22nd January and the 5th February 2019 during the Diego Garcia yellowfin tuna tagging trial

Time		Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues
Start	Finish	22/01	23/01	24/01	25/01	26/01	27/01	28/01	29/01	30/01	31/01	01/02	02/02	03/02	04/02	05/02
07:30	08:00		Orientation	Fishing	Fishing	Fishing	Fishing Citizen scientist onboard	Fishing	Fishing Citizen scientist onboard	Fishing Citizen scientists onboard	Fishing cancelled: Adverse weather	Cancelled	Cancelled	Cancelled	Cancelled	Cancelled
08:00	08:30															
08:30	09:00															
09:00	09:30															
09:30	10:00															
10:00	10:30															
10:30	11:00															
11:00	11:30															
11:30	12:00															
12:00	12:30	Fly in		Lunch	Lunch	Lunch	Lunch		Lunch	Lunch	Lunch					
12:30	13:00															
13:00	13:30															
13:30	14:00															
14:00	14:30			Fishing	Fishing cancelled: Adverse weather	Fishing	Fishing	Lunch	Fishing cancelled: Boat repairs	Fishing	Fly out early: Booked flights cancelled					
14:30	15:00															
15:00	15:30															
15:30	16:00															
16:00	16:30							Science talk								
16:30	17:00															
17:00	17:30															
17:30	18:00															

Outcomes

Due to a combination of adverse weather, mechanical failures and flight cancellations, we were only able to fish for a total of 22 hours (Table 2), less than half what we had planned. This significantly impacted our ability to reach many of our original objectives. Furthermore, the unusually prolonged period of hot, still weather (possibly linked to El Nino) meant that the water surrounding Diego Garcia was unusually hot. As yellowfin tuna, like most pelagic predators, avoid such warm waters, they likely headed offshore and/or to deeper cooler water. Due to the spatial restrictions of the boat (three nautical miles from Diego Garcia) and gear restrictions (jigging and trolling), we were not able to access these cooler refuge areas.

Thus, reporting against our original objectives, here are the outcomes of the expedition:

Objective 1: Analyse available recreational fisheries datasets to quantify seasonal patterns in the catch composition.

Some data have now been provided through MRAG and are being analysed by David Curnick. However, more data, especially relating to fishing effort, are required before standardised indices of abundance can be generated, and temporal trends identified. Through the Environment Officer, Harri Morrall, we have now requested these data directly from the MWR office. Furthermore, through unstructured interviews with personnel on the island, we now have a much better understanding of this fishery and its nuances. These insights will be invaluable in future assessments of the fishery and the planning of future expeditions.

Objective 2: Establish a protocol for the deployment and reporting of mark recapture floy tags on yellowfin tuna within the Diego Garcia recreational fishery.

Although no yellowfin tuna were caught, we were able to establish a protocol using dogtooth tuna (*Gymnosarda unicolor*) as a proxy (Figure 1). Two conventional tags were inserted at the base of the first dorsal fin (one on either side) to safeguard against tag loss or shedding. To comply with previous IOTC tagging initiatives, tags were marked with a unique code identifier (e.g. UK000100), a reference to the location of initial tagging and group responsible (BIOT/BPMS), and a contact email address for reporting its recapture. The reporting of future tagged yellowfin tuna will be advertised through posters at prominent locations around the island, particularly around the marina. In addition, colleagues at MRAG advise that the project be communicated to the wider Indian Ocean fishery through an IOTC circular.

During conversations with the British Representative, Commander Karen Cahill, we were advised that the current by-laws involving the recreational fishery prohibited catch and release. This meant that we had to land at least one fish per trip (if we caught something). After further discussions with personnel on Diego Garcia, it is clear that this policy requires clarification and stems from personal interpretation of the by-laws. Regardless, this is something that will need to be addressed should BIOTA be interested in establishing a full mark recapture study of yellowfin tuna around Diego Garcia and moving towards a more sustainable catch and release fishery (at least for some species).

Figure 1. Dogtooth tuna (fork length 130cm) caught on the 28th February 2019 around Diego Garcia (left) and two yellow PDAT tags deployed either side of the second dorsal fin (right).

Objective 3: Deploy up to 10 satellite and/or survivorship tags on yellowfin tuna and billfish (if encountered) to quantify off-shore movement behaviour.

Unfortunately, no suitable fish were caught during this expedition and therefore no satellite tags were deployed. As a result, these tags are now being stored for a future BIOT tagging expedition.

Objective 4: Collect tissue samples for isotopic and DNA analyses to provide information on the trophic ecology and habitat use of species within BIOT and on the patterns of connectivity of elasmobranchs and teleosts across the Indian Ocean.

A total of 83 isotope samples from Great barracuda (*Sphyraena barracuda*), Kawakawa (*Euthynnus affinis*), Wahoo (*Acanthocybium solandri*), Dogtooth tuna, Black-saddled grouper (*Plectropomus laevis*), Marbled coral grouper (*Plectropomus punctatus*), Rainbow runner (*Elagatis bipinnulata*), Green jobfish (*Aprion virescens*), Red snapper (*Lutjanus sebae*) and baitfish (*Clupeidae*) were collected on this expedition (Appendix I). Samples were initially taken back to the Institute of Zoology, Zoological Society of London and stored in -40°C freezers before being sent to the Chemical Tracers Laboratory at the University of Windsor, Canada on the 26th February 2019 on dry-ice for analysis. These data will contribute to our ongoing collaborative research project on trophic ecology in the BIOT MPA (e.g. Curnick et al. 2019).

Objective 5: Offer training to the Environment Officer and other interested personnel in tagging methods and the taking and storing of DNA and isotope samples.

We provided training to the Senior Fisheries Protection Officer (Tom Franklin), Plantation Manager (Mahan Luchman) and military personnel on appropriate methods used to catch, handle, conventionally tag and sample teleost fishes. Training for the Environment Officer was scheduled for the 30th and 31st January but had to be postponed due to our unscheduled early departure. Training on tagging techniques will now be provided to the Environment Officer at the Zoological Society of London headquarters in London.

Objective 6: Communicate our work to the personnel on Diego Garcia and ensure findings are made available to the Indian Ocean Tuna Commission and embedded within the UK Blue Belt Programme.

We gave a presentation to approximately 20 island personnel on the 24th January and took five citizen scientists out on the boat with us to give them hands on experience of our research. We had hoped to take more citizen scientists out with us. However, due to space restrictions on the boat (we were only able to take one citizen scientist out per day) and the number of fishing days being cut short, we were not able to host as many people as we would have liked. Any subsequent expeditions will ensure that spaces are available on boats for more citizen scientists to join as it is a great way to engage with the island personnel. This expedition report will also be made available to the IOTC and Blue Belt programme.

Recommendations

It was apparent that the previous advice we had been given by base personnel – that December and January were the optimum time to undertake this trial around Diego Garcia – was erroneous and based on logistics and not ecology. Furthermore, upon consultation with staff at the marina, it is clear that the recreational fishery does not follow the same patterns as the historical industrial fishing, with local ocean dynamics playing a much greater role in the presence and abundance of yellowfin tuna around the island. Through unstructured interviews with approximately ten individuals associated with the recreational fishery, all but one (who suggested December) suggested that June-September is a much better time for yellowfin tuna. Given that the boats are fit for purpose, if the fish are there, we are very confident that important data on yellowfin tuna can be gathered through this fishery. Thus, based on the new evidence obtained, we believe that a second trial could be undertaken in July 2019 and is more likely to be successful.

Acknowledgements

This work was funded through the Bertarelli Programme in Marine Science. We would like to thank the BIOT Administration for granting us permission to undertake the research, the military personnel on Diego Garcia for their support during fieldwork and the boat captains and deckhands on the Boston Whalers for taking us out each day. We would especially like to thank Commander Karen Cahill, Major Renny Bulmar, Lieutenant Kieran Tamayo, Harri Morrall, Samuel Bullen, Shiela Estrella (MWR), Mary Grace Dumlao and Claris Dumlao for all of their assistance. We would also like to thank Rachel Jones and Heather Koldewey for reviewing the report.

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Appendices

Appendix I. Fish caught during the 2019 Diego Garcia yellowfin tuna tagging expedition. FL denotes fork length (cm).

#	Date	Time	Location	Species	FL (cm)	Isotope sample	Fishing method
1	24/01/19	AM	East	Rainbow runner	63.5	DGISO30	Trolling
2	24/01/19	AM	East	Kawakawa	58	DGISO29	Trolling
3	24/01/19	PM	Northwest	Kawakawa	37	DGISO28	Trolling
4	24/01/19	PM	Northwest	Rainbow runner	71	DGISO27	Trolling
5	24/01/19	PM	Northwest	Kawakawa	35	DGISO26	Trolling
6	24/01/19	PM	Northwest	Baitfish	-	DGISO25	Trolling
7	24/01/19	PM	Northwest	Baitfish	-	DGISO24	Trolling
8	24/01/19	PM	Northwest	Baitfish	-	DGISO23	Trolling
9	24/01/19	PM	Northwest	Baitfish	-	DGISO22	Trolling
10	24/01/19	PM	Northwest	Wahoo	113	DGISO21	Trolling
11	24/01/19	PM	Northwest	Kawakawa	58	DGISO20	Trolling
12	24/01/19	PM	Northwest	Wahoo	95	DGISO19	Trolling
13	24/01/19	PM	Northwest	Rainbow runner	47	DGISO18	Trolling
14	24/01/19	PM	Northwest	Kawakawa	52	DGISO17	Trolling
15	25/01/19	AM	West	Wahoo	110.5	DGISO16	Trolling
16	25/01/19	AM	West	Kawakawa	37	DGISO15	Trolling
17	25/01/19	AM	West	Barracuda	110	DGISO14	Trolling
18	25/01/19	AM	West	Wahoo	108	DGISO13	Trolling
19	26/01/19	AM	Southwest	Wahoo	119	DGISO39	Trolling
20	26/01/19	AM	Southwest	Wahoo	104	DGISO40	Trolling
21	26/01/19	AM	Southwest	Wahoo	104	DGISO41	Trolling
22	26/01/19	AM	South	Rainbow runner	47	DGISO42	Trolling
23	26/01/19	AM	South	Kawakawa	53	DGISO43	Trolling
24	26/01/19	AM	South	Rainbow runner	45	DGISO44	Trolling
25	26/01/19	AM	South	Rainbow runner	43	DGISO45	Trolling
26	26/01/19	AM	South	Kawakawa	56	DGISO46	Trolling
27	26/01/19	AM	South	Jobfish	63	DGISO47	Trolling
28	26/01/19	PM	South	Kawakawa	44	DGISO48	Trolling
29	26/01/19	PM	South	Rainbow runner	45	DGISO49	Trolling
30	26/01/19	PM	South	Rainbow runner	50	DGISO50	Trolling
31	26/01/19	PM	South	Rainbow runner	53	DGISO51	Trolling
32	26/01/19	PM	South	Wahoo	105	DGISO12	Trolling
33	27/01/19	AM	Southwest	Kawakawa	54	DGISO60	Trolling
34	27/01/19	AM	South	Kawakawa	55	DGISO61	Trolling
35	27/01/19	AM	South	Jobfish	79	DGISO62	Trolling
36	28/01/19	AM	South	Kawakawa	54	DGISO63	Trolling
37	28/01/19	AM	South	Rainbow runner	50	DGISO64	Trolling

38	28/01/19	AM	South	Rainbow runner	50	DGISO65	Trolling
39	28/01/19	AM	South	Kawakawa	52	DGISO66	Trolling
40	28/01/19	AM	South	Rainbow runner	48	DGISO67	Trolling
41	28/01/19	AM	South	Rainbow runner	44	DGISO68	Jigging
42	28/01/19	AM	South	Kawakawa	55	DGISO69	Jigging
43	28/01/19	AM	South	Rainbow runner	50	DGISO70	Jigging
44	28/01/19	AM	South	Kawakawa	50	DGISO71	Jigging
45	28/01/19	AM	South	Wahoo	118	DGISO72	Trolling
46	28/01/19	AM	South	Wahoo	111	DGISO73	Trolling
47	28/01/19	AM	South	Kawakawa	43	DGISO74	Trolling
48	28/01/19	AM	Southwest	Wahoo	108	DGISO75	Trolling
49	28/01/19	AM	Northwest	Dogtooth Tuna*	130	DGISO76	Jigging
50	29/01/19	AM	West	Kawakawa	51	DGISO77	Jigging
51	29/01/19	AM	West	Kawakawa	38	DGISO78	Jigging
52	29/01/19	AM	South	Jobfish	61	DGISO79	Trolling
53	29/01/19	AM	South	Rainbow runner	40	DGISO80	Trolling
54	29/01/19	AM	South	Jobfish	58	DGISO81	Trolling
55	29/01/19	AM	South	Rainbow runner	43	DGISO82	Trolling
56	29/01/19	AM	South	Baracuda	54	DGISO83	Trolling
57	29/01/19	AM	South	Wahoo	99	DGISO84	Trolling
58	29/01/19	AM	South	Kawakawa	51	DGISO85	Trolling
59	29/01/19	AM	South	Rainbow runner	50	DGISO86	Trolling
60	30/01/19	AM	Southwest	Strawberry Grouper	78	DGISO87	Trolling
61	30/01/19	AM	Southwest	Rainbow runner	45	DGISO88	Trolling
62	30/01/19	AM	South	Jobfish	57	DGISO89	Trolling
63	30/01/19	AM	South	Barracuda	69	DGISO90	Trolling
64	30/01/19	AM	South	Dogtooth Tuna**	75	DGISO91	Trolling
65	30/01/19	AM	South	Jobfish	78	DGISO92	Trolling
66	30/01/19	AM	South	Jobfish	81	DGISO93	Trolling
67	30/01/19	AM	South	Rainbow runner	38	DGISO94	Trolling
68	30/01/19	AM	Southwest	Black saddled grouper	75	DGISO95	Trolling
69	30/01/19	PM	East	Barracuda	72	DGISO96	Trolling
70	30/01/19	PM	East	Kawakawa	42	DGISO97	Trolling
71	30/01/19	PM	East	Kawakawa	44	DGISO98	Trolling
72	30/01/19	PM	Southeast	Rainbow runner	37	DGISO99	Trolling
73	30/01/19	PM	Southeast	Jobfish	49	DGISO100	Trolling
74	30/01/19	PM	Southeast	Red Snapper	59	DGISO101	Trolling
75	30/01/19	PM	Southeast	Jobfish	65	DGISO102	Trolling
76	30/01/19	PM	South	Rainbow runner	43	DGISO103	Trolling
77	30/01/19	PM	South	Jobfish	69	DGISO104	Trolling
78	30/01/19	PM	South	Rainbow runner	47	DGISO105	Trolling
79	30/01/19	PM	South	Barracuda	65	DGISO106	Trolling
80	30/01/19	PM	South	Barracuda	61	DGISO107	Trolling

81	30/01/19	PM	South	Jobfish	62	DGISO108	Trolling
82	30/01/19	PM	Southwest	Dogtooth Tuna	74	DGISO109	Trolling
83	30/01/19	PM	Southwest	Rainbow runner	51	DGISO110	Trolling

*Fish #49 tagged with two conventional tags UK00002 and UK00003.
**Fish #64 tagged with two conventional tags UK00006 and UK00007.