

The Rufford Foundation

Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Isabel Marques da Silva
Project title	Conservation management of Endangered fish spawning aggregations and reef sharks in the WIO: Promoting community designated marine protected areas
RSG reference	23019-B Isabel Marques da Silva
Reporting period	2017 October to December 2018
Amount of grant	9980
Your email address	Fish.isabel@gmail.com
Date of this report	20-3-19

1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Expand acoustic telemetry component				A number of species were tagged with acoustic transmitters including six grey reef sharks (<i>C. amblyrhynchos</i>), one scalloped hammerhead shark (<i>Sphyrna lewini</i>), and two giant trevally (<i>Caranx ignobilis</i>). Of these, three grey reef sharks were also tagged with satellite tags which will provide information on large-scale shark movements. In addition, two more acoustic stations were added to the network of acoustic receivers around Vamizi Island.
Carry out remote underwater video (RUV) surveys				RUVs were deployed around Vamizi island and SW at Neptunes, with 58 deployments between January and February 2018. During all the 1 hour deployments, at least two unique sharks were identified, and at most nine were observed during a single video capture event. Due to poor weather conditions in January 2018 we were unable to deploy RUVs to record the giant grouper (<i>Epinephelus lanceolatus</i>) spawning aggregation. However, we remain hopeful that this natural phenomenon will be captured in the future.
Provide capacity building to two local residents on acoustic telemetry techniques and RUV applications				Training was provided on RUVs for two undergraduate and two masters students. We also supported two PhD students; one using RUV data to investigate biomass and biodiversity across diverse fisheries pressor and another applying acoustic telemetry techniques. One lecturer also received training on acoustic telemetry techniques.

<p>Organize meetings between scientists, the government, lodges and the local communities to discuss the designation of a new MPA encompassing Neptunes Arm</p>			<p>Participated in a movie festival in Maputo and screened "Vamizi, Cradle of Coral" movie. In addition, meeting was organised between the local Fisheries Council (CCP), local fishermen and government to facilitate discussion regarding the status and management of the Vamizi community protected area (CPA) and proposed Neptune's Arm protected area. Participated in ANAC meeting (protected areas agency), and a WWF meeting about northern Mozambique and the ecological and social characterization of Vamizi and Neptune's Arm.</p>
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

At first there was some difficulty in capturing the sharks due to poor weather and boating conditions which made navigating the nearshore environment difficult. However, the timing of this trip and improved conditions throughout the rest of the field period allowed us to identify new hotspots for grey reef sharks. This success is likely due to the improved timing of the field season with optimal oceanographic conditions (lack of El Nino compared to 2016) which may have led to the presence of more sharks around Vamizi Island. In addition, we acoustic tagged our first scalloped hammerhead, an endangered species which has not yet been studied in these waters. Two giant trevally were also acoustic-tagged this season, this species is a valuable game fish and is targeted by local fishermen and international sport fishermen.

Two additional acoustic receivers were deployed in the Vamizi waters, one to the north of the island and one to the north-east. These receivers will expand the existing Vamizi-Neptune's network to capture nearshore movements of tagged sharks and fish.

Provide capacity building to two local residents on acoustic telemetry and RUV techniques.

This component was successfully achieved. The RUVs project was undertaken by several undergraduate and masters students. Two undergraduates were trained in how to identify fish and use EventMeasure software from SeaGIS to document and measure fish recorded during video capture. These students are now subsequently working on other fisheries projects as a result of their acquired expertise. A masters student was also trained in how to operate the RUV and carry out data analysis. The

RUVs project was partially supported by the PhD thesis of Katrina Heckendorn, a student at Rhodes University in South Africa.

The acoustic telemetry fieldwork was undertaken by a lecturer from the Lúrio University and Danielle Orrell, a PhD student from the University of Windsor, Canada. Local skippers and community members were employed during these projects, and fisheries officials also accompanied the team.

Organise meetings between scientists, the government, lodges and the local communities to discuss a new MPA at Neptunes.

As a result of successful outreach and collaboration within local communities the importance of Vamizi and Neptune's for shark and fish populations is well understood. The film festival was well received by the Minister of Fisheries, and this helped in the promotion of the proposed expansion of the Vamizi locally managed marine area (LMMA). Since the minister's approval of the proposal several months ago, we are now waiting for the governor's final approval. Without approval for the Vamizi LMMA by local government, the protection plans for Neptunes cannot progress.

In order to support the Neptunes designation we propose that Lúrio University oversees the efforts of the Vamizi and Methundo Island lodges and the two nearby communities (Vamizi and Kifuki). A precedent for a university-led approach to establishing an MPA in Mozambique has already been set by Eduardo Mondlane University. This university manages a small MPA in southern Mozambique, which was also the first MPA in the country, implemented in colonial times, and has remained effective through the independence process until the present day.

Further discussions of the Neptunes MPA design are still necessary, specifically to determine its size (must be >10 ha to be approved at the provincial level by the governor), and exact boundaries. These discussions are underway with the communities and the lodges, all of which currently engage in fishing in this area. This management plan needs to be approved by the communities/lodges prior to submission.

3. Briefly describe the three most important outcomes of your project.

The three most importance outcomes were:

(i) The expansion of the acoustic telemetry network and tagged species

Acoustic receiver stations

Two acoustic receivers were deployed during the field season. One was deployed north of the island, and the other to the south-east (Figure 1).

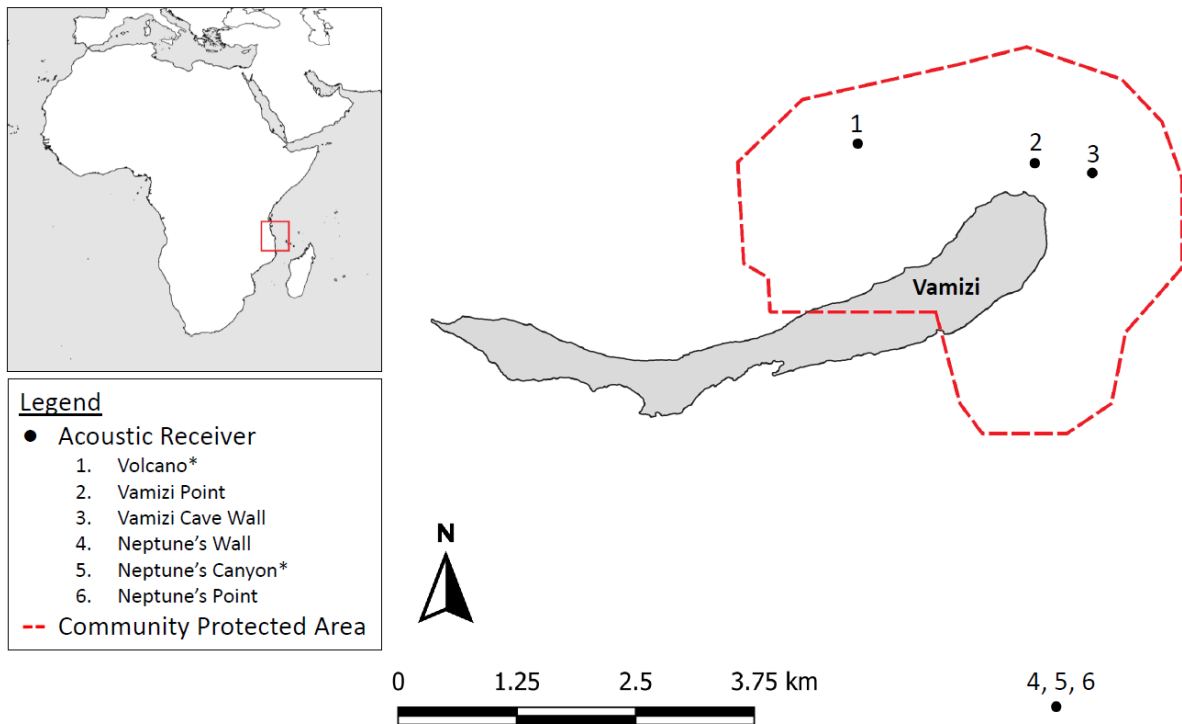


Fig. 1. Map of Vamizi Island, with deployed receivers (indicated by the black circles).

Grey reef sharks

Six additional grey reef sharks were tagged [GR3-GR9]; five sharks were caught at the new "cave wall" receiver north of Vamizi, and one at Neptune's Arm. Of these, five were female and one was male. In addition to the two sharks tagged in previous years (two in 2014), the sharks tagged this season have the potential to transmit for the next 5 -10 years. By collecting long-term data on the movements of this species at this unique location, it is possible to build a detailed profile of residency, habitat use and the role in the environment on animal movement.

Sharks tagged in 2014

Grey reef shark, 2014 #1

The first grey reef tagged as part of this project was a 1.65m pregnant female tagged in 2014. In 2014-2016 this tag was predominantly detected at Neptune's Canyon (Table 1; Fig. 2). Some detections were also recorded March – April and September – November 2015 at Neptune's wall. Following this, this shark was not subsequently detected again on any of the receivers across the two sites. This was likely due to loss of the tag because it was externally placed on the shark (rather than surgical implantation).

Table 1. Total number of detections per year per receiver for the first shark tagged in 2014

Year	NEP Canyon	NEP Point	NEP Wall
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2014	20646	0	0
2015	47013	0	7658
2016	4445	1	0
2017	0	0	0
2018	0	0	0

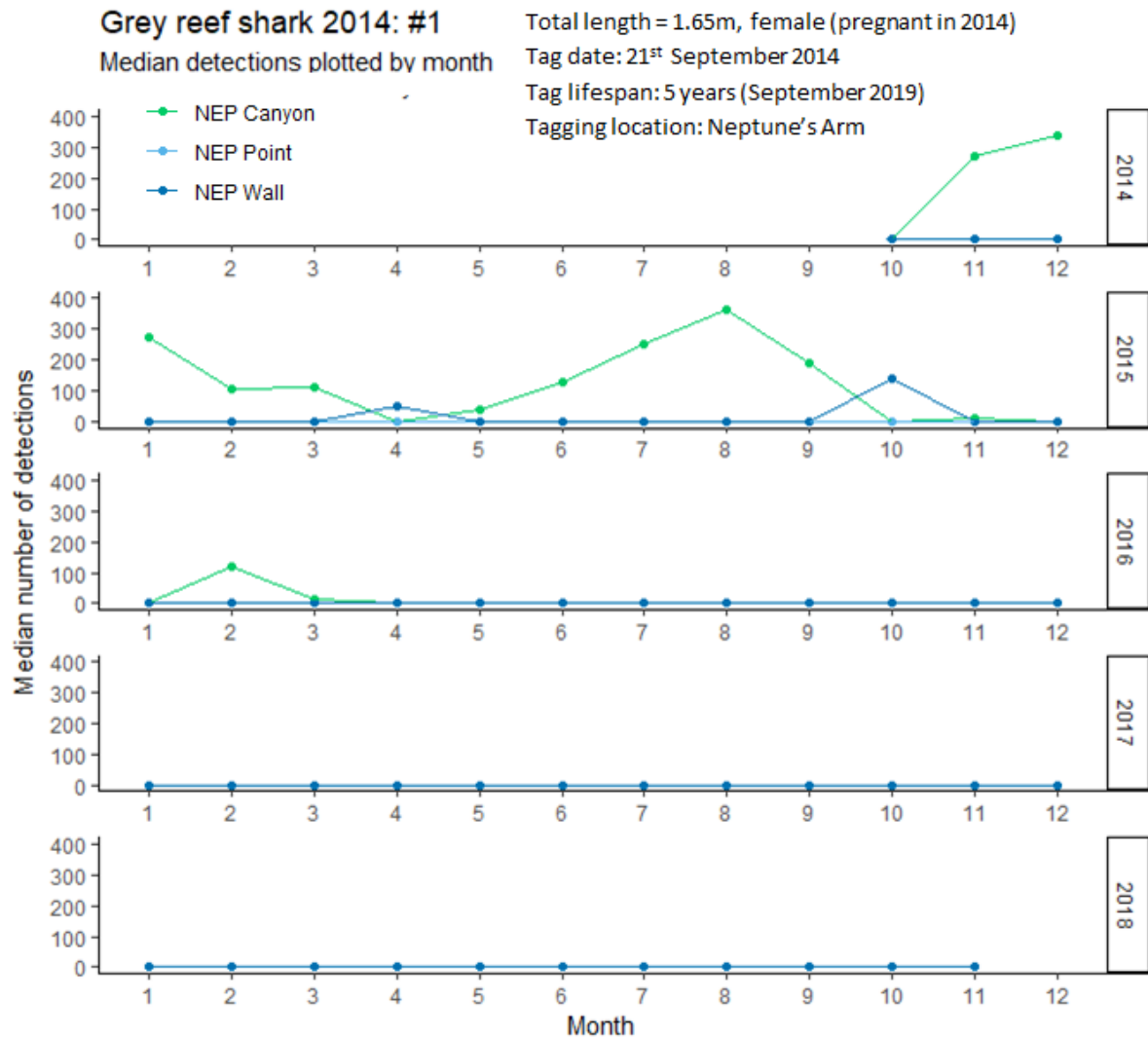


Fig. 2. Grey reef shark #1 tagged in 2014 at Neptune's Arm. The median number of detections was calculated and plotted for each month from 2014-2018.

Grey reef shark, 2014 #2

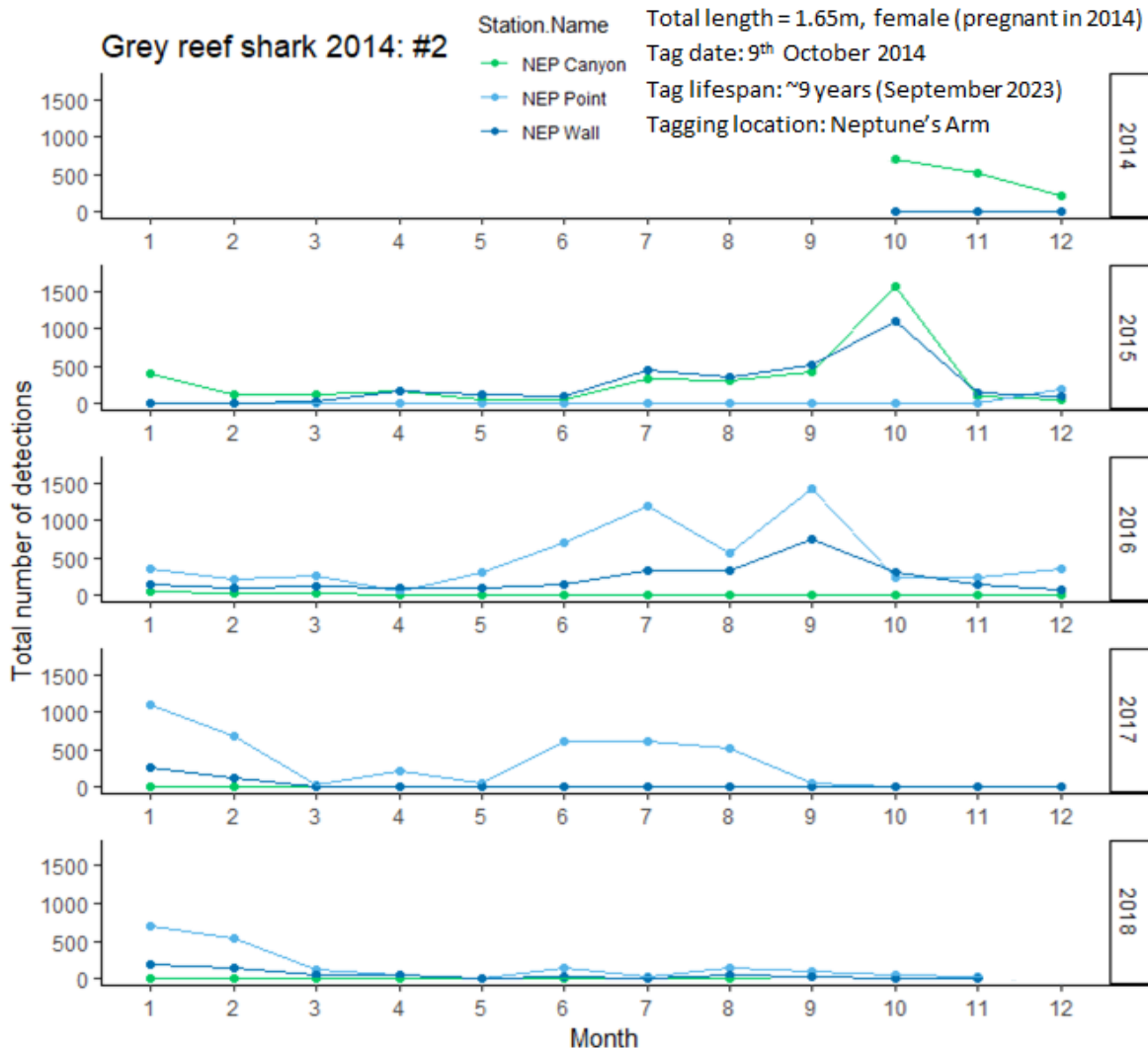


Fig. 3. Grey reef shark #2 tagged in 2014 at Neptune's Arm. The cumulative total number of detections was plotted for each month of the year (1-12).

GRS2 has been consistently detected at Neptune's Arm from 2014-2018 (Table 2). In 2014-2015 the majority of detections were concentrated on the Neptunes (NEP) Canyon receiver. It should be noted that at the time of tagging this female was pregnant, and it was observed that an aggregation of pregnant females were resident within Neptune's canyon. Towards the end of 2015 the number of detections at Neptune's declined sharply, suggesting that this individual potentially retreated into deeper water to thermoregulate (as stipulated in the Rufford Report, 2016). This conclusion is supported by the satellite tag data collected during this period. The continuous detections of this individual since 2014, indicates high site fidelity to this area. Interestingly, this individual seems to return to Neptune's towards the latter half of the year (2014, 2015 and 2016) which may be related to reproductive behaviour. In 2018, grey reef shark #2 was still present at the site, however, the number of detections is much lower than in previous years (Table 2).

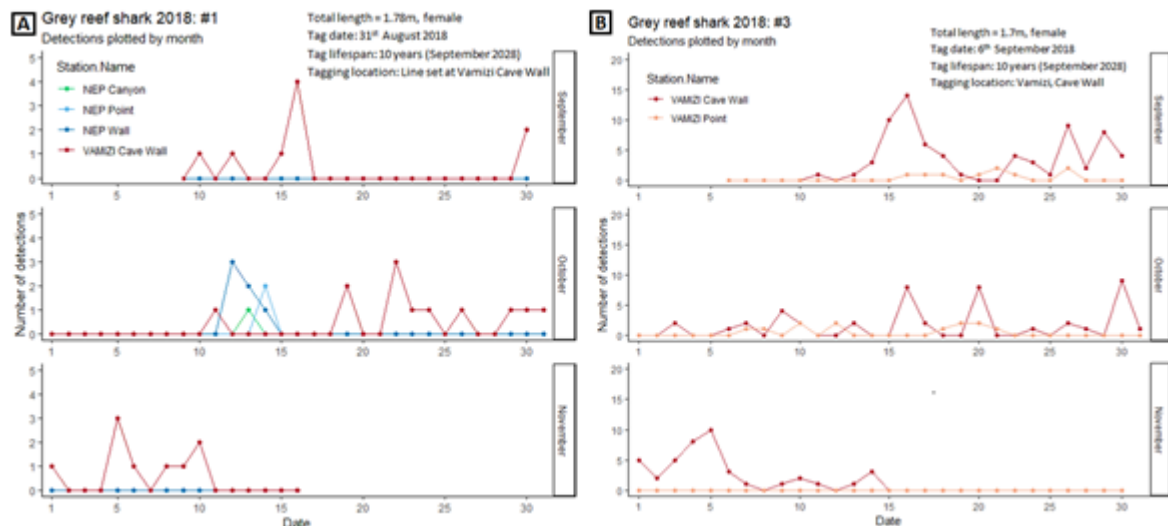
Table 2. Total number of detections per year per receiver for the second grey reef shark tagged in 2014. *Detection data lost September 2017-January 2018

Year	NEP Canyon	NEP Point	NEP Wall
2014	1447	0	0
2015	3699	190	3080
2016	120	5889	2638
2017*	0	3826	391
2018	56	1910	560

Grey reef sharks tagged in 2018

During the 2018 field season six grey reef sharks were tagged with V16 acoustic transmitters. Of these individuals, four were tagged close to Vamizi Island (typically NE and NW) and two in proximity to Neptune's Arm (original tagging site). This is the first time sharks have been sighted and captured around Vamizi Island.

Of the four sharks tagged next to Vamizi Island, the majority were only detected on receivers adjacent to the tagging site. These three sharks show varying degrees of site fidelity. GRS3 had a maximum of 14 detections (Fig. 4B) and GRS6 a maximum of 27 detections on a receiver during September (Fig. 4D), suggesting these sharks were transient in the area but were present in nearby waters. In contrast, GRS4 was detected regularly across the two-month period, with up to 210 detections on a single day suggesting high site fidelity to the Vamizi Cave wall (E of Vamizi). One of the tagged sharks, GRS1 (Fig. 4A), however, was detected on multiple Neptune's receivers for several days in October, before being redetected back north on the Vamizi receivers. This shark therefore showed clear movement between the two tagging locations.



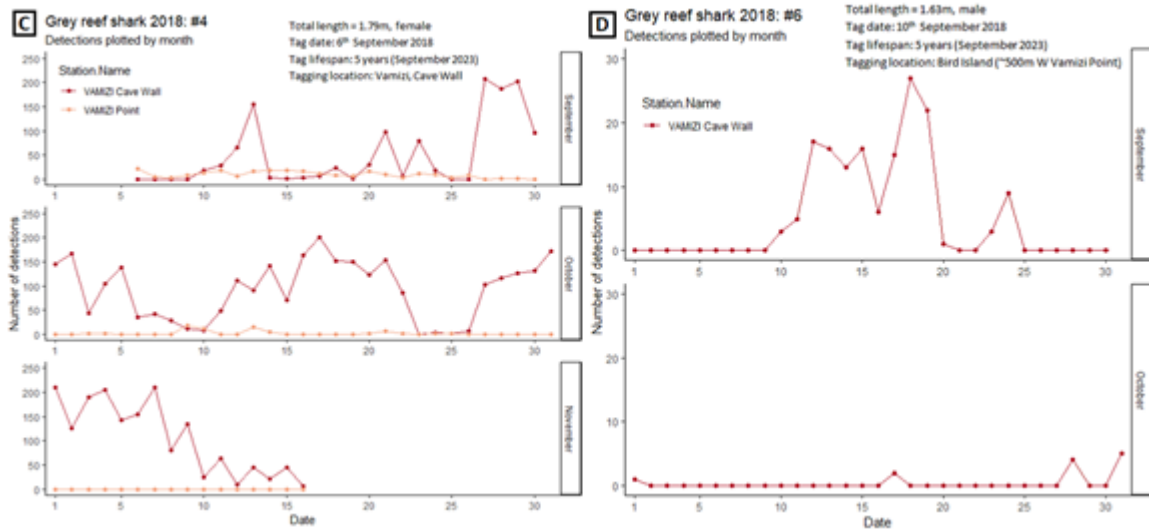


Fig. 4. Detection profiles of grey reef sharks (#1, 3, 4 and 6) tagged close to Vamizi.

The other two sharks were tagged and detected only on Neptune's Arm receivers. While GRS2 (Fig. 5A) was detected mostly in September, GRS5 (Fig. 5B) was detected regularly across all three receivers on Neptune's during the two months following capture.

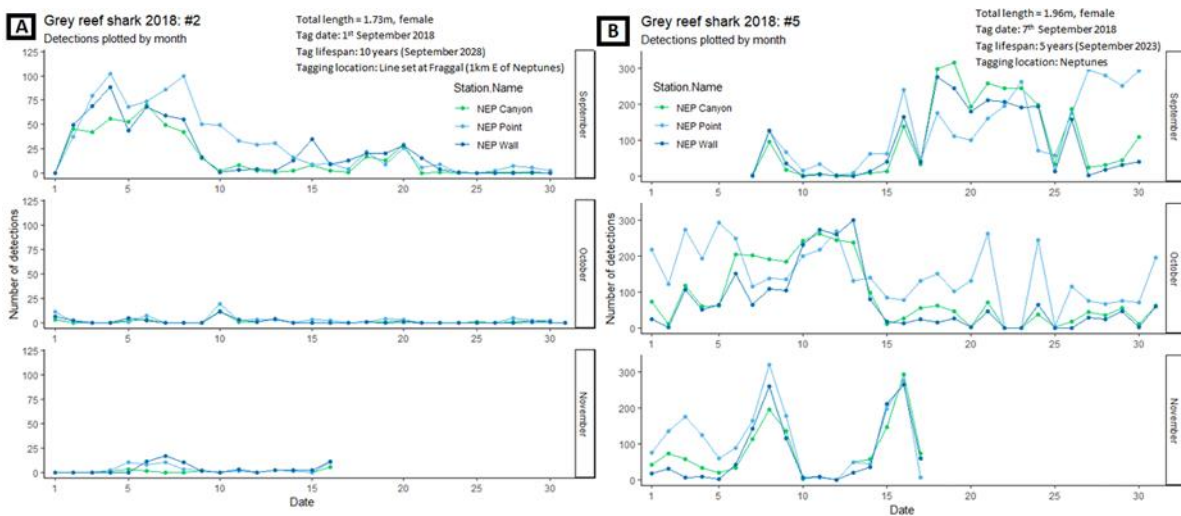


Fig. 5. Detection profiles of grey reef sharks (#2 and 5) tagged near to Neptune's Arm.

Scalloped hammerhead shark

We were fortunate to tag a scalloped hammerhead shark (*Sphyrna lewini*) NE of Vamizi Island during the September 2018 field season. While hammerheads have been tagged with standard marker tags in Southern Africa (Diemer, Mann & Hussey, 2011), this is the first hammerhead to be tagged in Northern Mozambique.

This individual was detected at Neptune's as well as closer to Vamizi across the three months since tagging (Fig. 6). Most detections occurred in late October/early November, which may be in response to changing sea surface temperatures as observed by Diemer, Mann & Hussey (2011). Continued monitoring of this individual and future tagging efforts to increase sample size will provide important information for incorporating this species in future management plans.

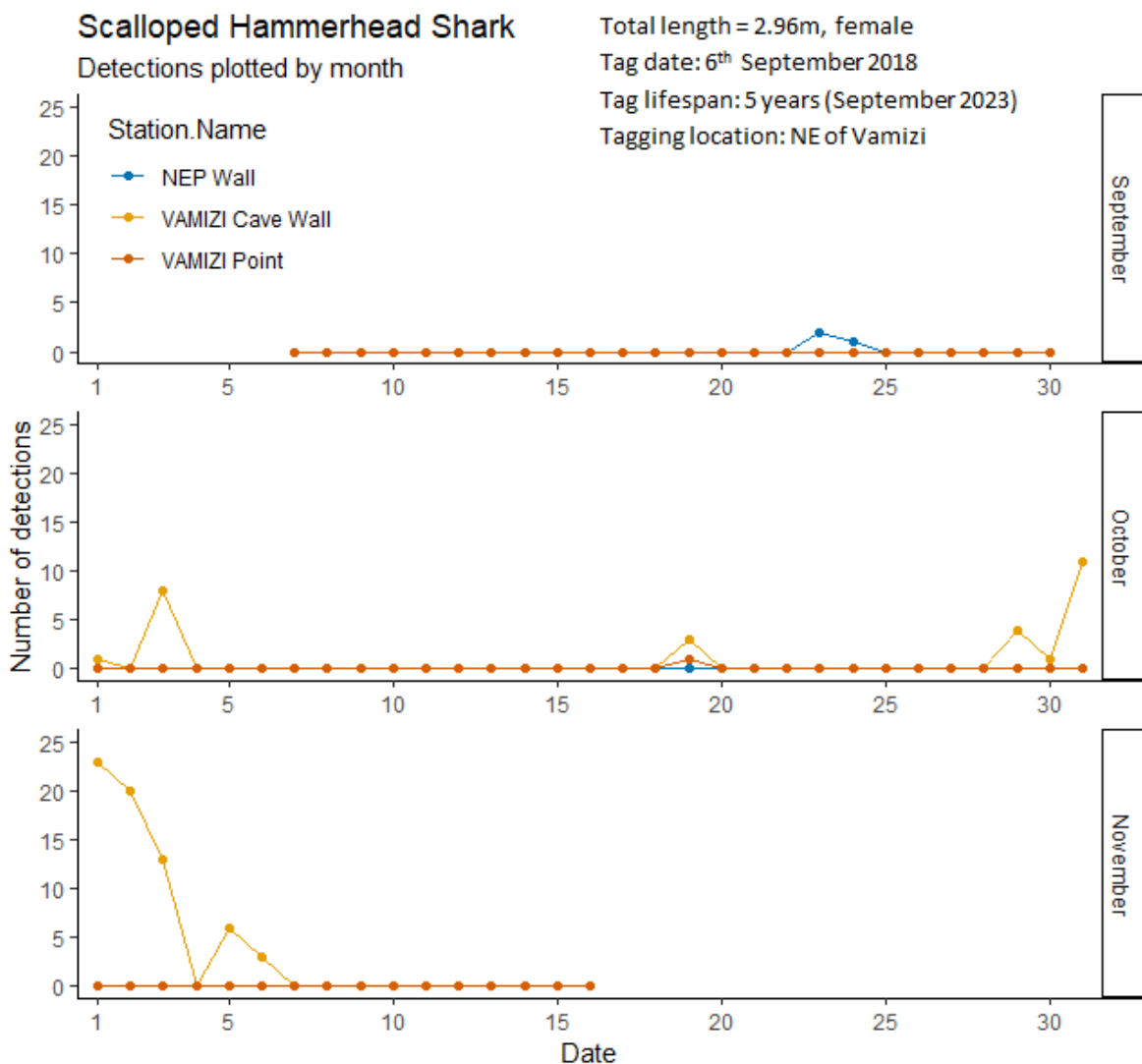


Fig. 6. Detection profile of the scalloped hammerhead shark tagged in September 2018

Groupers

Of the groupers tagged in 2015, three were detected at least a year after the tag date. Two of these groupers, the yellow-edged lyretail (*Variola louti*) showed high site fidelity, with a large proportion of detections on the Neptune’s Wall receiver (Fig. 7, Fig. 8).

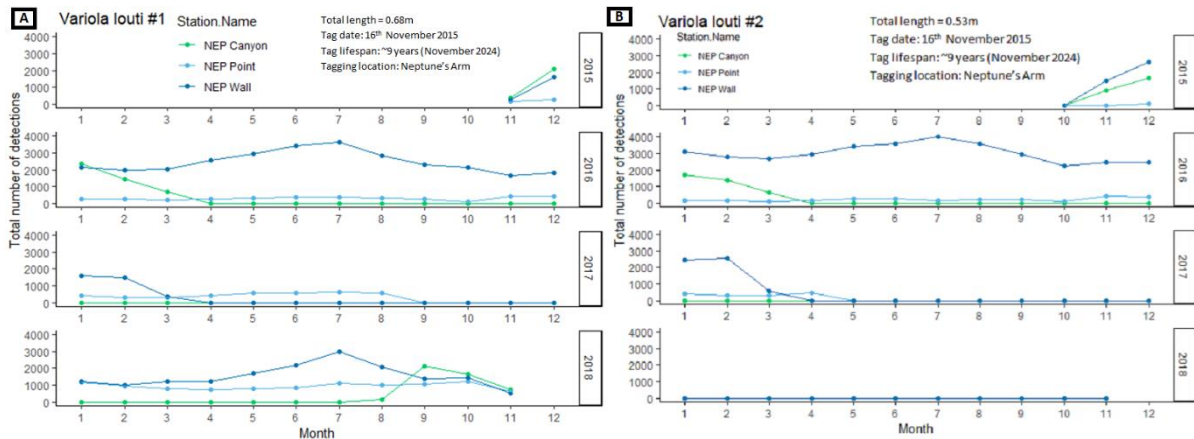


Fig. 7. Detection profiles of the *Variola louti* grouper tagged in November 2015

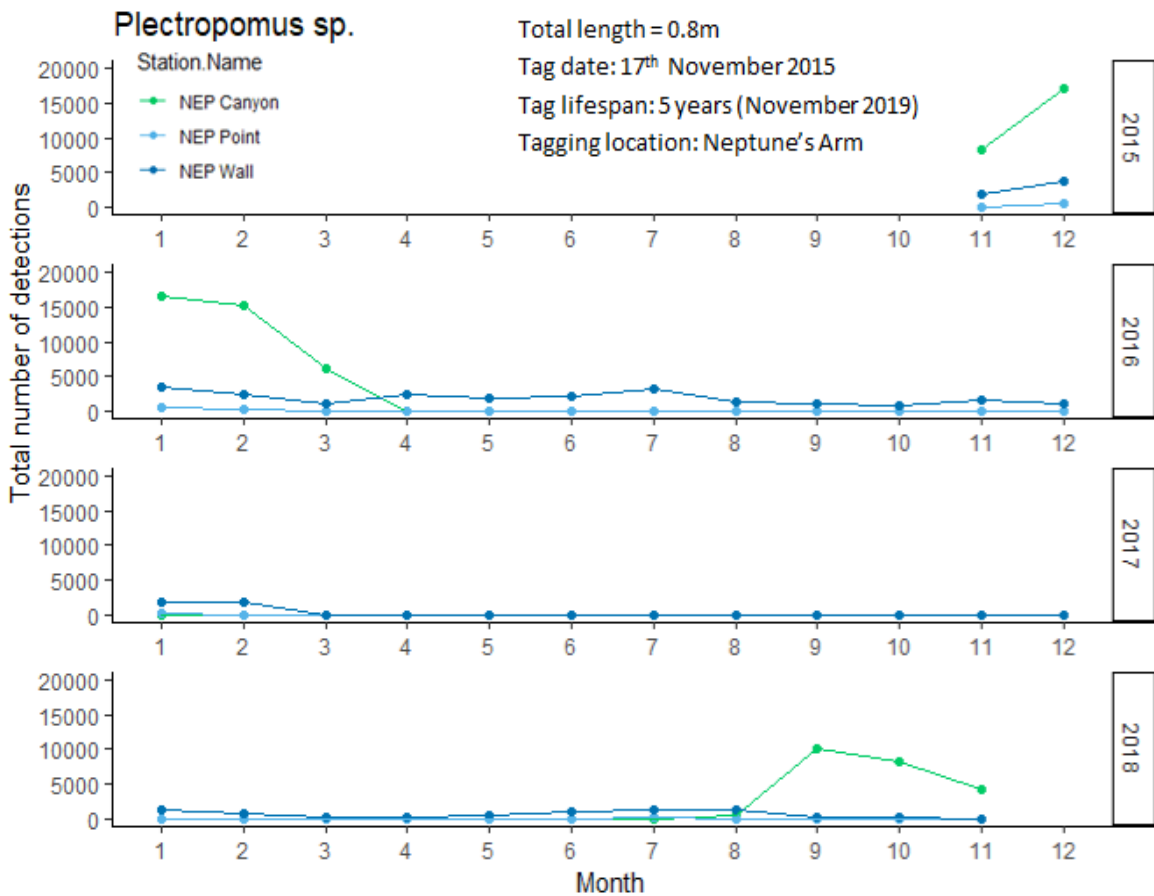


Fig. 8. Detection profile of the *Plectropomus sp.* tagged in November 2015

Giant trevally (GT)

The aggregation of *C. ignobilis* around Vamizi Island was first documented in 2014 (Silva et al. 2014) and was the first reported spawning aggregation reported in the Western Indian Ocean. It is anticipated that the giant trevally tagged during this season, the non-spawning period, will still provide essential insight into the habitat use of this species around the island to fuel future investigation. In addition, the movements of this species have been documented in southern Mozambique (Daly et al. 2018) and there is potential for a comparative movement study between sites in the future.

The two giant trevally (Giant trevally 1 [GT1], Giant trevally 2 [GT2]) were both tagged in the waters surrounding Bird Island (500m west of Vamizi Point). These are the first GTs to be tagged in northern Mozambique and this data will provide a unique insight into the site fidelity and habitat use of this species within the region. While both GTs were detected most frequently at the Vamizi receivers (Cave wall and Point; Table 3), GT1 showed higher site fidelity from September-November 2018 than GT2. Interestingly, both GTs travelled to Neptune's in late October (GT1: 10am 29th October NEP Canyon detection, and seconds later on NEP Point, Fig. 9A; GT2: 31st October NEP Canyon detection, simultaneously detected on NEP Point, Fig. 9B). It may be that these fish travelled from the shallow waters of Bird Island to the deeper waters of Neptune's due to temperature increases in October which typically follow the coldest temperature period (July-September). After this movement, GT2 was not detected in the two following weeks of recording after an initial detection again on the cave wall receiver, whereas GT1 showed high fidelity back at these sites following its translocation.

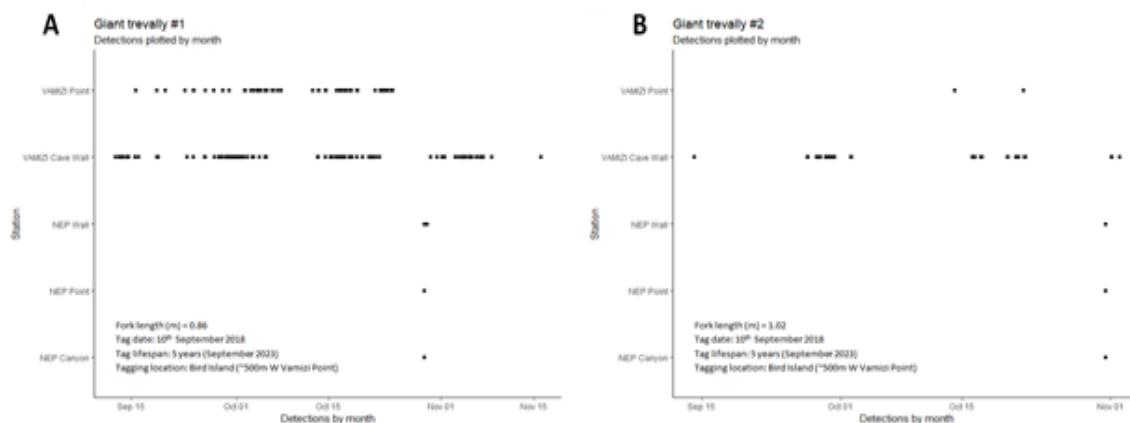


Fig. 9. Detection period: 10th September 2018 to November 17th 2018. A. Giant trevally #1, B. Giant trevally #2.

Table 3. Detections per station, per month for GT1 and GT2

GT1 detections					
Month	NEP Canyon	NEP Point	NEP Wall	Vamizi Cave Wall	Vamizi Point
Sept	0	0	0	262	30
Oct	2	1	2	354	200
Nov	0	0	0	173	0

GT2 detections					
Month	NEP Canyon	NEP Point	NEP Wall	Vamizi Cave Wall	Vamizi Point
Sept	0	0	0	149	0
Oct	2	2	1	184	4
Nov	0	0	0	6	0

(II) -RUV's date and the importance of Vamizi waters for sharks

Around Vamizi Island we conducted 53 BRUV surveys in the mornings (7am to noon) between December 27th, 2017 and January 3rd, 2018. We averaged nine deployments a day. During this period the seas were too rough to use the BRUVs during afternoons and for 2 full days. Almost half the BRUVs deployments were inside the marine protected area (25 surveys) and the majority of surveys were on coral (44 surveys). We chose sites where sharks were expected based on expert opinion, however we were not able to control the exact angle and position of the cameras since they were deployed from the boat. Depths ranged from 8 to 24 m with an average of 16.8 m.

A total of nine sharks were observed on these RUVs around Vamizi. Two reef shark species were documented; the grey reef shark (*Carcharhinus amblyrhynchos*) and the blacktip reef shark (*Carcharhinus melanopterus*). Each species was recorded in four videos each; in one video it was not possible to determine the species (but it was the same genus). As expected for reef sharks, all but one of the sites where sharks were recorded was on coral reefs. The one video where sharks were not observed on coral reef was a flat area dominated by algae. The maximum number of sharks (n=4) was recorded at this site.

When comparing RUVs from Vamizi with those conducted at other sites in northern Mozambique, it is evident that the most sharks were observed at Vamizi. We conducted BRUV surveys in Pemba (35 surveys), Nuaro (14) and Southern Quirimbas National Park (11) and only one grey reef shark was reported in Quirimbas. However,

these RUV surveys were standard fish biodiversity surveys and sites were not targeted specifically for sharks (only 23 were conducted in coral habitats). Thus while RUVS suggest that Vamizi has a larger shark population than other areas, further RUV survey effort will be required.

In support of the RUV data, however, there are several lines of evidence to suggest Vamizi should have relatively large and healthy shark populations. First of all, Vamizi is reported to have some of the healthiest and most complex coral reefs in the region. These reefs have been resistant to bleaching (like many of the coral reefs in northern Mozambique), but also experience less fishing pressure than highly populated areas. Dr da Silva and others found that the size of fish captured in Mozambique increased with increasing distance from cities and that fish sizes tend to decrease as a fishery becomes overexploited. For sharks, this suggests there are still larger fish available as prey (and this is supported by RUV surveys and recreational fisheries catches from the lodges). A second reason for higher shark abundance around Vamizi is the occurrence of marine protected areas. While only three of the nine RUVs where sharks were observed were deployed in marine protected areas, all of them were close to Vamizi MPA boundaries. Work by the SPACES project showed that fish densities were over five times higher within Vamizi's marine protected areas when compared to Pemba. Even outside the reserves fish biomass was twice as high to that reported elsewhere (Da Silva et al., 2015). The availability of prey resources and partial protection from fishing around Vamizi provides habitat for sustainable shark populations.

(III) Capacity building and meetings

By supporting both local and international students, both capacity building and knowledge exchange was encouraged. The main aim of the meetings organised between the government and local communities was to encourage discussion regarding the proposed protected area encompassing Neptune's Arm. While an agreement has yet to be reached, we proposed that Lúrio University should oversee future discussions and management of the proposed protected area. It is likely that this will be a slow process, as we wait for the final decision on its protected status as part of the Vamizi LMMA (Local Marine Managed Area). We do, however, expect a positive outcome.

4. Briefly describe the involvement of local communities and how they have benefited from the project (if relevant).

Local communities benefited in several ways from the overall project:

- (i) Several skippers from different communities were trained in acoustic telemetry/RUVs and participated in all field operations. Furthermore, UniLúrio students were trained in the application and analysis of RUV data. Other students also took part in educational programmes specially dedicated to studying sharks in Vamizi/Kifuki Island.

- (ii) Meetings were organised with local communities (Vamizi and Kilfuki) to discuss the implementation of the Neptune's MPA, and the response from the community was very positive and supported its protection.
- (iii) The documentary "Vamizi - Cradle of Coral" was presented at the Maputo film festival in the presence of the Fisheries Minister. The documentary had a big impact and led to the minister supporting the LMMA legalization for Vamizi and initiating discussions on the proposed MPA at Neptunes. In addition, the documentary improved the general understanding of the importance of marine animals and in particular, sharks at Neptunes and within the wider marine environment.
- (iv) Students undertook activities about sharks in the villages; both a shark theatre and shark song were produced. The shark theatre was performed by the women in the village and the shark song was an activity undertaken in Vamizi School. Both performances were recorded, and a small video was produced. Also, a video about the giant grouper aggregation was produced to promote knowledge about fish spawning aggregations. All these films had a positive impact in the communities where they were screened.

5. Are there any plans to continue this work?

With the current success and impact of this project, it is imperative that this work continues. We have secured a grant for the expansion of the Vamizi Island protected area to Neptunes, through the BAF (Blue Action Fund), for the next 4r years. We would however, also like to apply for a last Booster Grant from the Rufford Foundation. We would aim to use additional Rufford funds to continue community awareness and capacity building for local students/community members, and also to purchase more equipment to expand the existing monitoring project.

6. How do you plan to share the results of your work with others?

Project results will be presented at the Western Indian Ocean Marine Science Symposium (WIOMSA) in Mauritius in July 2019 and at the Canadian Society of Zoologists in May 2019. In addition, we are producing a scientific report in Portuguese, to send to NGOs and the fishery department in Mozambique. As a result of the 2018 field season we identified a new host (grey reef shark) and range expansion of the piscoid leech *Pontobdella macrothela*. A peer reviewed manuscript documenting this finding is now available via open access online. The RUV data is now analysed and we aim to publish a paper on these unique results for northern Mozambique. We also aim to publish a preliminary telemetry-focused scientific paper in a peer reviewed journal (combining the satellite and acoustic telemetry data). We expect that with additional funds to continue telemetry monitoring (to increasing sample sizes), that we will publish several regional reports and peer reviewed published papers on tagged species (Giant trevally, grouper and hammerhead sharks in addition to the grey reef sharks). These will be the first available telemetry (or spatial data) for the region.

7. Timescale: Over what period was The Rufford Foundation grant used? How does this compare to the anticipated or actual length of the project?

The Rufford money was received in September of 2017 but at that point it was too late to start the majority of the acoustic telemetry fieldwork. Most of the work with the communities (e.g. the Shark theatre, the song and work with the school) was completed in 2017. The RUV work was carried out during January 2018. Meetings with national and regional stakeholders took place during 2018, and the acoustic telemetry field work was undertaken in September 2018.

8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Contribution to Boat AND fuel costs for deployment/tagging	2100	5731	+3631	It was necessary to rent a boat given problems with all local vessels. Gasoline purchased was as requested in the original plan.
Bait for tagging	700	180	-520	Bait was captured using spearfishing, and therefore less money was required for this purpose.
Internal tags	2800		-2800	The University of Windsor purchased the acoustic transmitters. This allowed us to save money which covered the unexpected boat expenses.
Rebreather materials	600		-600	Very bad weather made it impossible to deploy the RUV's in January at the time of the giant grouper aggregation
Catering for a meeting at provincial level	500	500		According to the plan
Transport meetings for villages	320	410	+90	According to the plan
Transport meetings provincial level	360	343	-17	According to the plan
Accommodation		450	+450	Due to logistics, it was easier to hold the meeting in Pemba
<i>Per diem</i> for the villagers		473	+473	Villagers required food during travel
Educational materials	800	84	-716	Preparation of lesson materials

Production of spawning aggregation movie	800	800		According to the plan
Support for film festivals and projector	1000	1000		Funds supported the promotion of a video produced on Neptunes and the screening of the film in the village with the portable projector setup.
TOTAL	9980	9970	-10	

9. Looking ahead, what do you feel are the important next steps?

(1) Finance a fourth shark tagging campaign in September/October 2019 to tag additional sharks with both acoustic and satellite transmitters. It is extremely important to better delineate the area used by both the sharks and also grouper aggregation. Additional tagging of important local species (i.e. Giant trevally) will take advantage of the telemetry infrastructure (the fixed receivers) and maximise data output for management.

(2) Continue engaging the local community members in the overall project to ensure its long-term sustainability and to maintain community commitment to its overall conservation goals. Involvement will be through training and education (school to university level) and include children to adults. More awareness videos will be made, to continue education underway on the importance of these protected areas for maintaining healthy environments and high fish biomass.

(3) Further mobilise the government to develop a management plan for the area and involve the communities, the tourism companies and the university in the process. With the two initial steps achieved, it will be easier to meet this last aim.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did The Rufford Foundation receive any publicity during the course of your work?

All the videos on YouTube have the Rufford Foundation logo.

The logo was always present at all events, including the screening of “Vamizi - Cradle of Coral” in Maputo, during the WWF and ANAC meetings in Maputo, and at all community meetings held

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

Prof Nigel Hussey – Telemetry researcher (fish spatial ecology)

Dr Tessa Hempson - Vamizi resident researcher

Dr Ryan Daly – Invited researcher, expert fisher

Danielle Orrell- PhD Student – Telemetry study

Katrina Heckdorm – PhD student RUV's study

João Macuio – UniLúrio lecturer

Sidónio Machaiaie – UniLúrio Lecturer and Master student, Fish aggregations

Faruk Amade - Undergraduate student RUV's

Celina Lupaka – Undergraduate student RUV's

12. Any other comments?

Clare A. Keating Daly, Danielle Orrell, Isabel M. da Silva, João P. F. Macuio, Tessa N. Hempson, Mark Ziembicki, Nigel E. Hussey, Ryan Daly. (2019) New host and distribution record of *Pontobdella macrothela* (Schmarda, 1861) (Annelida, Hirudinea) from a Grey Reef Shark, *Carcharhinus amblyrhynchos* (Bleeker, 1856), in Mozambique, Western Indian Ocean. Check List 15 (2): 265–268

Daly, R., Daly, C.A.K., Bennett, R.H., Cowley, P.D., Pereira, M.A.M. & Filmalter, J.D. (2018) Quantifying the largest aggregation of giant trevally

Diermer, K.M., Mann, B.Q. & Hussey, N.E. D(2011) Distribution and movement of scalloped hammerhead *Sphyrna lewini* and smooth hammerhead *Sphyrna zygaena* sharks along the east coast of southern Africa, *African Journal of Marine Science*, 33(2): 229-238. doi:10.2989/1814232X.2011.600291.

Silva, I.M., Hempson, T.N. & Hussey, N.E. (2014) Giant trevally spawning aggregation highlights importance of community fisheries management no-take zone. *Marine Biodiversity*. doi: 10.1008/s12526-014-0235-2.

Silva IM, Hill N, Shimadzu H, Soares AMVM, Dornelas M (2015) Spillover Effects of a Community-Managed Marine Reserve. *PLoS ONE* 10(4): e0111774. doi:10.1371/journal.pone.0111774

