

Final Evaluation Report

Your Details	
Full Name	Trishan Naidoo
Project Title	Fate and impacts of plastics in the environment and on marine biota
Application ID	33441-2
Date of this Report	25/07/2023

1. 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
Objective to collect sediment cores along a horizontal beach profile and quantify the plastics present along these gradients.				Sampling done, samples analysed for meso-debris and recorded. Micro-debris identification can still be done with the remaining samples
Objective to conduct visual surveys of the levels of plastic debris that has settled out of the water column and settled on the sea floor, in the nearshore environment.				Objective has been done but not fully more sampling needs to take place. The equipment has been built tried and tested, it just needs to be refined. Footage along the shore has been taken and has been analysed for submerged debris
Objective to conduct plastic ingestion experiments on juvenile fish and examine whether plastic fed treatments have an influence on the gut community of fish relative to control treatments.				This was one of the main objectives and is very close to completion. All experiments done all DNA analyses done, now results are currently being analysed and I write out the article and start publicising the results.

2. Describe the three most important outcomes of your project.

- a) We have found that plastic accumulation can occur at different beach profile depths and that certain beaches near urban areas, that were thought to be very polluted, were not as polluted at depth.
- b) We have developed a new novel camera (manta ray system) that can be towed behind a boat to examine the seafloor for plastic debris. The initial footage that we have looks promising, but we need to account greater for water turbidity in shallower environments.
- c) We have compared plastic-fed fish to control fish that were not fed plastic. Fish survival is reduced in the plastic treatments compared to control fish. Fish gut contents were sent for DNA analyses to compare the gut fauna between these two treatments and results are being examined currently. This will tell us if plastics are affecting or changing the microbial community in the fish gut or not. This has implications for overall fish health.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

During the initial phases of the project, there was a delay in the correct product for the underwater camera system more than 2 months. They initially sent through the wrong cable. We had then decided to use the product in conjunction with a GoPro camera, since the shipment was also sent through a camera that could not record. However, this has been dealt with and the system has been built. But because of flooding and high turbidity we still had to wait for the water to clear out before we could see anything on the ocean floor.

Here are the 3 main other setbacks to this project that had deviated significantly from the timeline:

2020-2022

Due to the Covid pandemic in South Africa was under a lockdown for the most part of 2020 till 2022. Campus had been closed off for some time due to the pandemic and beaches were also closed off, so no access allowed on beaches which restricted sampling.

2021

There was a large-scale unrest that occurred in KwaZulu-Natal during 2021, therefore I had to plan the experiments around this. Due to the Covid pandemic, people not having food resources, coupled with the former president being sentenced to prison, there was wide scale looting and burning of buildings and companies occurring in the province and there was a nation wide shut down for a few weeks. There was massive violence and looting and people could not leave their homes. This also restricted sampling plans. Please see the link below.

[South Africa riots: Looting and shooting in Durban - BBC News](#)

2022

Then the Durban floods that occurred, which hampered sampling especially for camera footage with the turbid waters was also a major setback. The nearshore environment that we wanted to sample was too turbid to see with the camera footage because the heavy rainfall, runoff and flooding caused all the sediment to be washed down rivers and enter the ocean. Access to some areas along the coastline in some of the study sites was also restricted because of this. For example, at the Isipingo site boats had to be used on normal roads to go out and save people standing on the rooftops of their flooded houses. We had to therefore plan sampling around this. Please see link below

[Durban floods: South Africa floods kill more than 300 - BBC News](#)

4. Describe the involvement of local communities and how they have benefited from the project.

Local communities have benefited from the project in terms of learning about plastic pollution and helped in clean-up operations that have resulted since the start of this project, in areas such as the Durban Harbour. However, because of the pandemic it was also difficult to be in close approximation with people and the

local communities for this project. As soon as results are finalised, they will be made aware of the impacts that plastics can have on fish.

Conservation management will be informed on the following aspects:

- The heavily impacted beaches in KZN as well as the depth profile structure of debris within these beaches.
- The abundance and dominant types of pollution on the coastal seafloor adjacent to these beaches.
- Threshold concentration and exposure times of microplastic ingestion, that could cause changes to fish gut health.

I have also presented as an invited speaker for the first Pan-African Micro(nano)plastic Network webinar, in which I can engage with African government officials, conservation management groups and other stakeholders on the status and impacts of plastic pollution in Africa. We aim to further determine the type of pollution data required by conservation management and other stakeholders for the most effective remediation impact to be achieved.

5. Are there any plans to continue this work?

Yes, more work needs to be done on the project and build up especially once the results are finalised and communities can be engaged with to highlight the issues around plastic pollution. I am also hoping to use some of the equipment for more projects that can be carried out in my plastic pollution research and the Rufford Foundation will be duly acknowledged in these outputs that are to come out.

In addition to this, in terms of capacity building there are other students that have used the equipment and experimental setups that I purchased and built using this grant and they will also acknowledge Rufford in their theses, and any literature that may that come out from those. The equipment is at the university and therefore helps to train many other students for years to come via the grant from this project. Using the equipment purchased with the Rufford grant at campus and that will aid with future investigations on plastic pollution. There is now a student (Refilwe Mofokeng) that is organising regular harbour clean-ups in the area in which many volunteers off and on campus now participate on a regular basis.

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

Awareness of the project has already started being created as, some work toward the awareness of plastic debris in Durban has already been documented. In November 2020, an insert by the team, together with a conservation group called breathconservation, was featured on a local wildlife television programme (called 50/50, <http://www.5050.co.za/>). During this segment, a reef and beach clean-up in Durban was documented. We wish to continue being a part of these public clean-up operations. In addition to this, I have also been presenting some of the work in online webinars. The first of which was held on the 4th February 2021 and cover issues related to microplastic pollution in Africa. These webinars will involve various stakeholders. We have also, in the past, disseminated research in newspaper articles

and will continue to do so, as results and conclusions of the study become available. Please see: <https://www.newframe.com/you-are-what-you-eat-including-plastic/> for one such example.

The work will be shared with others through attending conferences, writing-up for peer reviewed publications and even just meeting people in the field and speaking about the research, especially during harbour clean-ups and sample collections. Bits of the project have also made its way into two newspaper articles. I have also created a simple short guideline on how to isolate plastics from fish and given this to other researchers to get them involved in the research.

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

The actual length of the project was longer than anticipated since were many components to cover especially in the timeframe. however, even through all the setbacks most of the field work is complete and the project is well on its way to success. The remainder of the time now needs to be concerned with analysing field samples, doing more statistics on the data and writing-up reports for publication.

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

The logo has been displayed on all presentations done so far on the project, within the local meetings and department meetings and other presentations done concerning plastic pollution by me.

I also presented at the first Pan-African Micro(nano)plastic Network webinar, in which I can engage with African government officials, conservation management groups and other stakeholders on the status and impacts of plastic pollution. In this presentation I did mention some of the work that I was doing under the funding from The Rufford Foundation.

All forthcoming reports will have the Rufford logo on it and these will be sent through to Rufford as they are published. Since Covid has now ended we can also attend more in person conferences and speak about the research and therefore the logo will get publicised further. Lastly, all material that will be published from this project will have duly acknowledged Rufford for funding this research.

9. Provide a full list of all the members of your team and their role in the project.

Dr. David Glassom – Post-doc supervisor and aided with project development and implementation.

Roy Jackson – senior Marine technician at UKZN – Helped set up and run experiments and all skipping done at sea for the research project.

Prof. Ryan Wasserman and his student **Tafara Frank Bute** who are assisting with the DNA analyses.

10. Any other comments?

Thank you Rufford for the grant. It has not only paved the way for my future but also assisted many other students who can now do research focusing on microplastics with the equipment that was purchased with this grant. The experimental setup will also be a permanent feature of our campus marine science unit and many other experimental investigations can be done using these recirculation systems. The costs not included in the pdf are the vehicle use to sampling sites and the university boat.