

Project Update: February 2022

Short description of the initial project plan project

There are four parts to the project overall. The first is to collect sediment cores along a vertical and horizontal beach profile and quantify the plastics present along these gradients. Examining plastic concentration along this vertical gradient provides an indication of the fate of plastics on our beaches and compare this to what they have been historically at deeper stratification levels. Doing this along the shore (horizontally), will allow us to determine if nearshore current features could affect the deposition of particles along the beach.

The second part is 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. These counts will be aided by cameras and will assist with determining whether the nearshore environment around Durban is a sink for plastic debris. Previous research has conducted surveys using nearshore surface trawls (Naidoo & Glassom, 2019b) but none have examined the benthic environment in South Africa.

The third part of the project will involve the collection of juvenile fish from under floating debris along the coastline. They will be transported back to the lab for identification, dissection and isolation of any plastic material present. Any plastic present in the fish will be compared to the polymer of the debris that the fish was found under. However, the main aim of this part of the project, will be to determine if floating plastic debris affect fish populations by expanding the range of the species.

The fourth and last part to the project will be 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 will be a study that has been built upon from previous research by Naidoo & Glassom (2019a). Faecal casts will be collected, and their associate gut community identified and compared. The gut community will be identified using both morphological and metagenomic techniques.

References

Naidoo, T., & Glassom, D. (2019 a). Decreased growth and survival in small juvenile fish, after chronic exposure to environmentally relevant concentrations of microplastic. *Marine Pollution Bulletin*, 145, 254–259. <https://doi.org/10.1016/j.marpolbul.2019.02.037>

Naidoo, T., & Glassom, D. (2019 b). Sea-surface microplastic concentrations along the coastal shelf of KwaZulu–Natal, South Africa. *Marine Pollution Bulletin*, 149, 110514. <https://doi.org/10.1016/j.marpolbul.2019.110514>

Progress achieved to date

Admin: With regard to admin, all the relevant sampling permits, including those from EKZN wildlife, DEFF, DALRRD and a provisional approval of animal ethics (AREC/027/020PD), has been obtained.

Progress on projects: There are four proposed projects.

Project 1: Plastic sampling on beach scarps

Samples for this project have been collected at the following beaches: uMlanga, Isipingo, Sea Park, Umzumbe, Pumula and Durban beach front. Beaches were closed

for some periods due to the pandemic and this sampling is very opportunistic and can only be done when the scarp feature forms, on specific beaches after specific storm conditions. Samples are in the lab and need to be processed. Equipment relating to this project has been obtained.

Project 2: Recording and identifying plastic on the seafloor around the Durban area
For this project the underwater camera system has been purchased. They have initially sent through the wrong cable. I had to await delivery of the correct product for more than 2 months. We have eventually chosen now to use the product in conjunction with a GoPro camera, since the shipment also sent through a camera that could not record. I am busy building a camera housing attached to dive lasers and an underwater torch to house all the camera equipment and dive lasers. Therefore, this sampling will be undertaken this month. We can then go out and take footage of plastics on the seafloor off the Durban coastline, by towing the camera below a boat, while at the same time, also looking out for more samples for project 3.

Project 3: Fish species under floating plastic debris and their possible range expansions
Here equipment for collection has been obtained. Collection has begun, however more samples have to be collected and have the fish identified, including possibly obtaining samples outside of KZN by partnering up with other organisations from the east coast of South Africa.

Project 4: Tank setup - Plastic ingestion experiments

All 45 tanks have been built and setup, with pumps and protein skimmers, filled with seawater and fish have been collected, acclimated for 2 months and weighed. The experimental feed had also been ground and produced with the different plastic types for the experiment. Equipment relating the experiment has been purchased. The project is a chronic exposure and therefore is long term and is still running. Campus had been closed off for some time due to the pandemic and the KwaZulu-Natal unrest that happened in the province during last year, therefore I had to plan the experiments around this. I plan to stop the experiment at the end of May 2022. During the experiment I will also be identifying gut fauna down to the lowest possible taxon. Will also run eDNA on gut fauna, but this will be outsourced.

I have attached a report from the cost center that is handling the funding at the university. All the purchases are shown on this report. Lines that show my name are for smaller project related items that I personally purchased and thereafter produced the slips for reimbursement.

Research Outputs over last year

Nel H. A, Naidoo T, Akindede E. O, Nhiwatiwa T, Fadare O. O, Krause S, (2021). Collaboration and infrastructure is needed to develop an African perspective on micro(nano)plastic pollution.

Environmental Research Letters.16, 021002.



Beach scrap sampling.



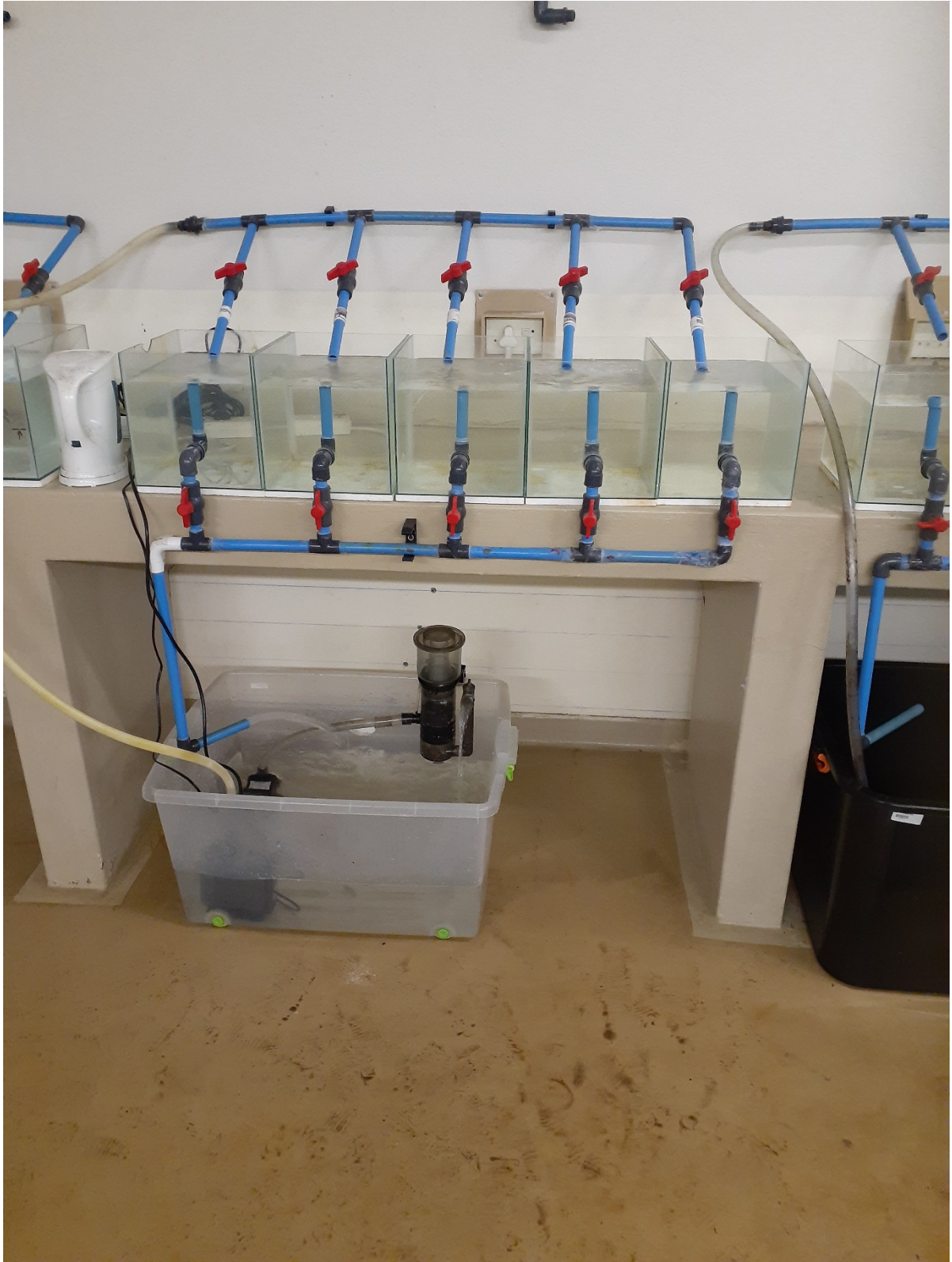
Beach scrap sampling.



Microplastic sampling.



Microplastic sampling.



Tank set-up for ingestion experiments.



Underwater camera system.

