



Centre for Environment
Fisheries & Aquaculture
Science



South African Training Report

Commonwealth Litter Programme - South Africa



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Executive Summary

The Commonwealth Litter Programme (CLiP) is an initiative delivered by the Centre for Environment Fisheries and Aquaculture Science (Cefas) and funded by the United Kingdom's Department for Environment, Food and Rural Affairs. It supports developing countries across the Commonwealth in preventing plastics entering the oceans.

A range of training exercises were delivered in South Africa as part of CLiP, covering both micro plastics and macro litter.

Training courses, on microplastics monitoring and analysis in environmental samples, were delivered as part of the last day of the Marine Plastic Litter Workshop to highlight the need for harmonised protocols for microplastic monitoring by sharing CLiP Standard Operating Procedures (SOPs) and discuss limitations. Staff capacity building exercises were also delivered to employees of the Department of Environment, Forestry and Fisheries (DEFF) and the South African Environmental Observation Network (SAEON) to ensure sharing of expertise between collaborators and to give the opportunity to produce long-term monitoring baseline datasets for microplastics in environmental compartments using standardised protocols.

Training for macro litter monitoring was delivered by Cefas scientists to staff and students from University of KwaZulu-Natal (UKZN), producing a strong scientific one-off study under CLiP, while equipping the university with the knowledge, skills and equipment to run a similar study in the future.

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1 Introduction

1.1 The Commonwealth Litter Programme

The Commonwealth Litter Programme (CLiP) is an initiative delivered by the Centre for Environment, Fisheries and Aquaculture Science (Cefas) and funded by the United Kingdom's Department for Environment, Food and Rural Affairs (Defra). It supports developing countries across the Commonwealth in preventing plastics entering the oceans.

This report covers the capacity building and joint research ventures undertaken during CLiP.

1.2 Training

The absence of standardised protocols for the monitoring of microplastics in environmental samples is making comparison between data sets difficult. Difficulties in comparing studies could lead to the production of erroneous conclusions on which regulatory measures are being based. Training exercises, via knowledge sharing and staff capacity building, are key to ensure the implementation of best practices (e.g. strict quality controls) and to address specific local needs (e.g. optimisation of CLiP protocols to address local requirements).

As part of the Science and Education pillar of CLiP, training courses were delivered across different activities including field monitoring protocols and laboratory analytical techniques. Knowledge transfer and staff capacity building exercises are essential in ensuring high quality work and long-term collaborative opportunities.

Another focus of the CLiP Science and Education pillar is beach macro litter and the identification of the most frequently found items on a beach in order to inform government legislative actions and policies. In order to gather data, complementary to the existing South African data sets, a daily accumulation study was designed at two sites around the city of Durban in conjunction with the University of KwaZulu-Natal (UKZN). Training was delivered to students and a professor from the UKZN by Cefas scientists. This included ensuring they were equipped with the knowledge, skills and correct fieldwork equipment and personal protective equipment (PPE) to carry out a beach survey every day for ten consecutive days. All trainees were shown how to conduct a 100 m beach litter survey, following the CLiP methods, which are modified from the Oslo-Paris (OSPAR) standard protocol for Europe. The results of which will be a joint publication between Cefas and UKZN.

2 Academic workshop

Cefas, CSIR (Council for Scientific and Industrial Research) and DSI (Department for Science and Innovation) co-delivered a Marine Plastic Litter Workshop in Cape Town on the 02-03 of October 2019. The agenda included a plenary session and working groups to review the current scientific knowledge on marine plastic litter as well as the identification of knowledge and policy gaps (see: Cefas (Centre for Environment, Fisheries & Aquaculture Science), 2020. CSIR – DSI – Cefas

Marine Plastic Litter Workshop Day 2 – Report, Commonwealth Litter Programme South Africa.
Author: Umberto Binetti.)

The CSIR – DSI – Cefas Marine Plastic Litter Workshop included the option of a laboratory tour and training exercise on the last day (03 October 2019). 16 participants attended a two and a half hour training exercise in small groups (

Table 2.1). The first part of the training consisted of an oral presentation of CLiP protocols for the monitoring and analysis of microplastics in environmental compartments, as well as, the sharing and review of Cefas CLiP SOPs. The oral presentation was also followed by a Question and Answer (Q&A) session to address more specific needs. The second part of the training exercise consisted of a practical demonstration in the laboratory of the equipment provided for microplastic analysis, as well as, the use of an Attenuated Total Reflection Fourier Transform Spectroscopy (ATR-FTIR) unit for the identification of the polymer type of the extracted items. The training exercise allowed the identification of specific gaps in current research at the University of Cape Town (UCT) in accessing ATR-FTIR facilities leading to further collaboration and joint research (see section 4). Training materials (presentation materials as well as CLiP SOPs) were also shared electronically following the training exercise.



Figure 2.1 Attendees to the microplastic laboratory tour and training exercise held at DEFF facilities on the 03 October 2019 as part of the CSIR – DSI – Cefas Marine Plastic Litter Workshop.

Table 2.1 Attendees to the microplastic laboratory tour and training exercise held at DEFF facilities on the 03 October 2019 as part of the CSIR – DSI – Cefas Marine Plastic Litter Workshop.

First name	Surname	Affiliation
Trishan	Naidoo	UKZN
Hank	Bouwman	NWU
Lorien	Pichegru	NMU
Peter	Ryan	UCT
Toshka	Barnardo	SST
Sumaiya	Arabi	CSIR
Coleen	Moloney	UCT
David	Glassom	UKZN
Eleanor	Weideman	FitzPatrick Institute of African Ornithology, UCT
Douw	Steyn	Plastics SA
Carina	Verster	NWU
Danica	Marlin	SST
Fiona	Piller	Freelance
Sadan	Zaynab	WWF
Takinda	Chitaka	UCT
Lucienne	Human	the South African Environmental Observation Network (SAEON)

Note: CSIR: Council of Scientific & Industrial Research, DEFF: Department of Environment, Forestry and Fisheries, NMU: Nelson Mandela University, NWU: North-West University, SAEON: South African Environmental Observation Network, SST: Sustainable Seas Trust, UCT: University of Cape Town, UKZN: University of KwaZulu-Natal WWF: World Wide Fund for Nature.

3 Capacity building

Capacity building and knowledge transfer was carried out as a priority following the installation of the laboratory facilities. The training exercise included a theoretical aspect, with a presentation on the issue of plastics and microplastics in the environment, as well as the introduction of Health and Safety requirements when working in a laboratory environment. The remaining training included the practical demonstration of the extraction, isolation and quantification of macro and microplastics in environmental samples, including sediments and in biota. The training was delivered to three staff from DEFF (Figure 3.1) as well as 2 staff from SAEON (Table 3.1). Knowledge transfer was carried out by sharing Cefas SOPs on the extraction and analysis of microplastics in environmental matrices (water, sediment and biota) as well as related risk assessments and COSHH (Control of Substances Hazardous to Health) forms.



Figure 3.1 DEFF staff member analysing microplastics in biota samples.

Table 3.1 Name and affiliation of the laboratory trainees involved in the staff capacity building exercise

First name	Surname	Affiliation
Keshnee	Pillay	DEFF
Yandiswa	Mdazuka	DEFF
Gcobani	Mooi	DEFF
Tarryn	Swartbooï	SAEON
Lucienne	Human	SAEON

Note: DEFF: Department of Environment, Forestry and Fisheries, SAEON: South African Environmental Observation Network.

4 Collaboration and joint research opportunities

4.1 Microplastics

The training exercise from the CSIR – DSI – Cefas Marine Plastic Litter Workshop led to collaborative opportunities with the support of a PhD student from UCT with the use of CLiP ATR-FTIR facilities. This collaborative research involved an initial training of the postgraduate student on FTIR technique as well as method selection. Additional support, such as joint publication, has also been proposed between Cefas and UCT.

4.2 Beach litter daily accumulation study

A beach macro litter daily accumulation survey was carried out on two beaches surrounding the city of Durban. This study was carried out in conjunction with the University of KwaZulu-Natal (UKZN). Five students, along with their professor were trained in the data collection, processing and data entry to continue the daily accumulation study while Cefas staff travelled to fulfil other engagements within the country. The study involved collecting beach litter items for ten days at a preassigned 100 m stretch of the beach at two locations (Amanzimtoti and uMhlanga). All

litter items were categorised, weighed and recorded in concordance with the methodology adopted in the CLiP adapted from OPSAR methodology and aligned with previous South African studies. The five students were also given the opportunity to attend and present the study at the CLiP Innovation Conference: STEM the tide of plastic waste in Africa, held in Cape Town, 05 - 06 December 2019. A collaborative scientific paper detailing this study is currently being drafted.

Table 4.1 Name and affiliation of UKZN students and staff involved in the collaboration on the Durban Daily Accumulation Study

Prefix	First name	Surname	Affiliation
Professor	David	Glassom	UKZN
Dr	Iliya	Dauda Kwoji	UKZN
Ms	Nivisti	Singh	UKZN
Ms	Prishani	Boodraj	UKZN
Ms	Thandy	Makgolane	UKZN
Ms	Tusiwe	Mkhize	UKZN



Figure 4.1: UKZN students receive training from Cefas scientist on how to conduct a beach survey and litter categorisation.

5 Conclusions

The training exercise for the microplastic laboratory was delivered at two different levels. The first training exercise consisted of a classroom presentation of CLiP sampling and analysis protocols for the detection and quantification of microplastics in environmental samples, as well as practical demonstrations in the laboratory. The second training exercise was based on the in-depth training of staff from DEFF and SAEON for the long-term use of CLiP laboratory facilities for the potential of producing long-term monitoring baseline concentrations for microplastics for different environmental compartments (water, sediment and biota). Training exercises also allowed further local collaborative projects with the short-term support of a PhD student from UCT with the training and access of some of CLiP facilities (i.e. FTIR capacities).

Training for macro litter was delivered by Cefas scientists to staff and students from UKZN, producing a strong scientific one-off study under CLiP, while equipping the university with the knowledge, skills and equipment to run a similar study in the future.



Centre for Environment Fisheries & Aquaculture Science



About us

We are the Government's marine and freshwater science experts. We help keep our seas, oceans and rivers healthy and productive and our seafood safe and sustainable by providing data and advice to the UK government and our overseas partners.

We are passionate about what we do because our work helps tackle the serious global problems of climate change, marine litter, over-fishing and pollution in support of the UK's commitments to a better future (for example the UN Sustainable Development Goals and Defra's 25 year Environment Plan).

We work in partnership with our colleagues in Defra and across UK government, and with international governments, business, maritime and fishing industry, non-governmental organisations, research institutes, universities, civil society and schools to collate and share knowledge.

Together we can understand and value our seas to secure a sustainable blue future for us all, and help create a greater place for living.

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Innovative, world-class science is central to our mission. Our scientists use a breadth of surveying, mapping and sampling technologies to collect and analyse data that are reliable and valuable. We use our state-of-the-art Research Vessel Cefas Endeavour, autonomous marine vehicles, remotely piloted aircraft and utilise satellites to monitor and assess the health of our waters.

In our laboratories in Lowestoft and Weymouth we:

- safeguard human and animal health
- enable food security
- support marine economies.

This is supported by monitoring risks and disease in water and seafood; using our data in advanced computer models to advise on how best to manage fish stocks and seafood farming; to reduce the environmental impact of man-made developments; and to respond to serious emergencies such as fish disease outbreaks, and to respond to oil or chemical spills, and radioactivity leaks.

Overseas, our scientists currently work in Commonwealth countries, United Kingdom Overseas Territories, South East Asia and the Middle East.

Our customer base and partnerships are broad, spanning government, public and private sectors, academia, non-governmental organisations (NGOs), at home and internationally.



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