

Research Notes...

The Nekton *First Descent* Expedition: progressing our knowledge of the Indian Ocean to catalyze its sustainable governance

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The Nekton *First Descent* expedition in Seychelles was the first in a series of expeditions due to take place over the next three years to explore the Indian Ocean. Led by the Nekton Oxford Deep Ocean Research Institute (Nekton) this expedition followed two previous expeditions by the institute in the Sargasso Sea (Bermuda, 2016-2018).



Figure 1: Left - OSV Ocean Zephyr viewed from the Triton submersible Kensington (© Nekton). Right - a Manta Ray flying over the Triton submersible Omega prior to the live address of President Faure (© R. Carmichael)

The *First Descent* expedition departed from Victoria in March 2019 and spent seven weeks at sea in the Outer Islands of Seychelles. The team was comprised of fifty-two people of fourteen nationalities, with thirteen scientists present onboard the 87 m long *Ocean Zephyr* (Fig. 1). Dr. Jerome Harlay and Ms. Rowana Walton from the Blue Economy Research Institute (BERI) at the University of Seychelles were part of this multi-disciplinary science team, contributing their skills, primarily in water chemistry and hard coral identification. The expedition covered 2300 nautical miles, nine sites on six different islands, and there were over 300 deployments of scientific equipment, and more than 1600 biological samples collected. The expedition was witnessed by over 120 countries; 244 media associations together broadcasted about 4300 different media, including the world's first address from a President in a submersible as President Danny Faure broadcasted live to the world from 124 m depth (Woodall et al., 2019). There were also several educational activities and nearly 10,000 schoolchildren from sixteen countries participated in live link-ups with scientists, engineers and technicians onboard

the *Ocean Zephyr*. The datasets and research findings from this expedition ‘will support Seychelles in successful implementation of its national Marine Spatial Plan, including protection of 30% of its national waters, in support of a sustainable Blue Economy,’ said Oliver Steeds, CEO of Nekton.

Nekton is a term proposed by the German physician and biologist, Ernst Haeckel (1834-1919), to discriminate the active swimmers from the passive swimmers, the *plankton* (derived from the Greek term πλαγκτός (planktos), wandering) in the ocean. Haeckel was a contemporary of Darwin and Huxley at a very prolific period for descriptive biology.

Haeckel, E.H.P.A. (1890). *Plankton studies: Comparative studies on the meaning and composition of pelagic fauna and flora*. Published by G. Fischer, Berlin.

The preparations for this expedition began in March 2018 when a delegation from Nekton visited Seychelles to gain the support of the government, local partners and to acquire crucial local knowledge in order to launch the expedition to explore the deep ocean of the Seychelles’ vast Exclusive Economic Zone (EEZ). The Nekton expedition aligned with the national Seychelles Marine Spatial Plan Initiative which will ensure representative species and habitats have long-term protection, to improve the resilience of coastal ecosystems with a changing climate, and to ensure economic opportunities for fisheries, tourism and other uses (The Initiative, 2018), working for and on behalf of Seychelles.

The main objective of the Nekton *First Descent* expedition in Seychelles was to describe and document the state of the deep reefs which lie at depths out of reach for conventional SCUBA divers. This includes the mesophotic zone, from 40 - 150m, and the rariphotic zone recently described by Baldwin and his co-authors (2018) and lying between 150 - 300m.

The Nekton mission aimed to explore this rariphotic zone in Seychelles as they had done in Bermuda previously. In Bermuda, the Nekton team had found strong vertical zonation patterns in the biodiversity present, as well as distinct taxonomic assemblages in the rariphotic region (Stefanoudis et al., 2019). The Nekton team also spotted signs of the anthropogenic pressure (e.g. benthic debris like fishing gear, and the occurrence of invasive species) on shallow reef habitats, and cascading effects on the rariphotic zone (Stefanoudis et al., 2019). The Nekton *First Descent* mission was designed with a strong intention to raise public awareness on the rariphotic region of the Seychelles archipelago in order to encourage a new direction in the governance of marine protected areas.



Figure 2: Triton submersibles Omega and Kensington on deck, and Kensington ready for deployment (© Nekton)

The range of equipment deployed on the mission was without precedent in Seychelles, ranging from SCUBA divers, to Remotely Operated Vehicles (ROV) and state-of-the-art manned Triton Submersibles (Fig. 2), to undertake video surveys and biological sample collection. Among the more conventional investigation tools were Neuston plankton nets, Niskin water sampling bottles, and high-resolution probes mounted on conductivity, temperature and depth (CTD) water profilers. A multibeam echosounder (MBES) and acoustic Doppler current profilers were deployed to obtain bathymetric maps and time series data of current profiles, respectively. Seabed maps were generated from high-resolution MBES data and crucial in the dive planning for the submersibles and ROV. This bathymetric data will also be shared with the government of the Seychelles to inform the planning of marine protected areas (MPAs). Nine sites across six different islands were surveyed from 0 - 600m, during the Nekton expedition (Table 1), covering a total area of 27km² (M. Pownall – Bibby Hydromap’s hydrographic surveyor, pers. comm). The mission also used the new Sonardyne subsea optical communication technologies, BlueComm, for live broadcasts (over eighty hours in total) from multiple submersibles by Associated Press and Sky News as part of the Sky Ocean Rescue initiative.

Group	Island	Location	Date
Alphonse	Alphonse	East	7-9 March
		North	10-12 March 3-4 April
Aldabra	Aldabra	South	16 March
		North	17-22 March 28 March
		West	23-27 March
Astove	Astove	West	29 March-1 April
Amirantes	Poivre	<i>Transit</i>	2 April
		East	5-7 April
		D’Arros (St Joseph)	8-11 April
	Desroches	South	11-17 April

Table 1: Outer Island sites visited by the Nekton First Descent expedition in Seychelles (2019)

Nekton has invested in developing and supporting local marine scientists. As such, several Seychellois research scientists participated in the expedition, from research design to concluding outputs. This provided key support in the development of leadership skills, knowledge and research networks within Seychelles. The participation of these scientists was supported by the Seychelles Conservation and Climate Adaptation Trust (SeyCCAT) who released a special funding call for projects relating to the expedition. In July 2019, two fellowships will be undertaken by young female Seychellois scientists at the University of Oxford and the Nekton labs. Several workshops are also planned in South Africa (in collaboration with the South African Institute of Aquatic Biodiversity – SAIAB) and in Seychelles where experts will share knowledge and contribute to progress in taxonomic determination and data analysis.

The expedition was just the start of the *First Descent* mission. The science team at the Nekton institute anticipates several thousands of hours of analysis will now need to be undertaken, ranging from classical taxonomic descriptions, chemical and biochemical analyses to more advanced genetic descriptions. Hours of video surveys will also be watched and analyzed in order to describe the exceptional richness of the rariphotic zone of Seychelles. In the short term, a technical report of the expedition will be published that will be widely available and includes a summary of all data collected.

References

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