



2010. The impact of the trend in MOC seen above in GECCO2 leads to the mid-depth warming trend in the western and eastern IO. The role of MOC changes driven by the Southern Ocean warming on the upper ocean are critical for future projections of tropical climate modes and the monsoons.

## Ocean Vision Census - Marine Biology

### New Species Described from Specimens Collected by the U.S. Program on Biology of the International Indian Ocean Expedition

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**Dr. Urban has recently retired from his position as SCOR Executive Director at the end of January, but will continue to support SCOR in various capacities.**



#### Introduction

The first International Indian Ocean Expedition (IIOE-1) was conceived by the Scientific Committee on Oceanic Research (SCOR) at its first meeting in 1957; the Intergovernmental Oceanographic Commission because a co-sponsor of the project in 1960. A major goal of the IIOE was to study the biology of the Indian Ocean, to develop a basic understanding of the productivity of the region and its potential for feeding the developing countries surrounding the ocean basin, but also to understand how the seasonally reversing monsoon winds affect ocean biology. The United States funded a U.S. Program in Biology, which was primarily conducted from the ships R/V Anton Bruun and R/V Te Vega, and from field stations in India and Madagascar. The Bruun hosted many Indian scientists on its cruises.

The Bruun and Te Vega used a variety of equipment to sample organisms from plankton to large pelagic fish, including plankton nets of various types, trawl nets, dredges, long-line fishing gear, hook-and-line fishing, and collection by hand in shallow-water and onshore. U.S. scientists sent 3.6 million specimens from IIOE-1 to the Smithsonian Oceanographic Sorting Center (Wellen and Fehlmann, 1974). IIOE-1 had a major impact on determining what organisms lived in the Indian Ocean, not surpassed until the time of the Census of Marine Life (Wafar et al., 2011). Specimens collected during IIOE-1 are still being used to describe new species and understand how species fit within higher taxa; papers using IIOE-1 specimens were published as recently as 2018 (e.g., Baker et al., 2018), 54 years after the specimens were collected.

The Bruun made 10 cruises as part of the IIOE and the Te Vega made 4 cruises. A complete station list and other information from these cruises is given in Urban (2019a,b,c,d). This article will present information about the role of the U.S. Program in Biology in the discovery of new species in the Indian Ocean.

Specimens from the IIOE were used to describe at least 113 new species (Urban, 2020) and to revise genera for several different types of organisms. Several new species described from materials collected by the Bruun were named for the ship and/or the namesake Danish biologist, including amphipod (*Deutella antonbruuni*) and isopod (*Gnathia antonbruunae*) crustaceans, a myctophid fish (*Diaphus antonbruuni*), and an octocoral (*Protodendron bruuni*, now *Corymbophyton bruuni*). Sixty-four percent



of the described species are crustaceans.

The most typical time from collection to description (the statistical mode) was 3 years. Fifty percent of the descriptions (the statistical median) were accomplished in 10-11 years, and the mean time between collection and description was 19 years. In several cases, many new species were described in a single publication, as the author reexamined an entire genus or family. Two species described from specimens collected by U.S. scientists are shown below.

## References

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Curious Wormfish, *Gunnellichthys curiosus*. Source: Andrey Ryanskiy / Fishbase. License: CC by Attribution-NonCommercial-ShareAlike (Bray, 2016). Named by Dawson (1968) based on specimens collected by James E. Böhlke at the Seychelles Islands on 23 February 1964.



Brittle star *Astrocyclus somaliensis*.

Source: Baker et al. (2018), Euryalid brittle stars from the International Indian Ocean Expedition 1963 - 64 (Echinodermata: Ophiuroidea: Euryalida), *Zootaxa* 4392 (1), pp. 1-27. Copyrighted material used with permission from Zootaxa (<https://www.mapress.com/j/zt>). Specimen collected on Anton Bruun Cruise 9, Station 463 on 18 December 1964 off the coast of Somalia.

## The Transporters - Physics: Ocean, Atmosphere

### Role of currents and eddies in shaping ocean thermal response to TC Phailin

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**This article summarises a remarkable finding with clear implications on the physical and biogeochemical processes along the east coast of India and the exchanges between BoB and Arabian Sea. The first author is pursuing her PhD at INCOIS.**

Tropical cyclones (TCs) are one of the most extreme cases of air-sea interaction where a lot of heat and momentum exchange takes place. The strong atmospheric winds associated with the TCs can greatly influence the underlying ocean as a result of which the ocean responds. The primary response with the TC passage is the reduction in SST underneath the storm core which generally ranges from 1- 6°C (Price 1981; D'Asaro 2007). The magnitude of upper ocean cooling is generally a function of initial ocean conditions, intensity of the storm and its translation speed. Past studies that estimated the mixed layer heat budget have emphasized the relative importance of various physical processes in governing the rate of temperature change, i.e., temperature tendency. They have quantified that 70-90% of mixed layer cooling is dominated by vertical mixing in the surface and ~5% is accounted for upwelling in