

Polychaetes from Australia's Eastern Abyss

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Introduction

The abyss is the least understood and sampled of any Australian environment. Although the abyssal environment (3501–6500m) [1] makes up around 30% of Australia's marine territory (42.8 million km²) [2], and contributes a major part of Australia's Exclusive Economic Zone (EEZ), the deeper areas of Australia's EEZ have been extremely poorly sampled [3]. Prior to 2017 no biological data had been collected from the abyssal environment in Australian Marine Parks. Only three biological samples had been collected from Australia's eastern abyss by Russian and New Zealand vessels in 1976 and 1982, respectively.

To address the deficit in knowledge of Australian abyssal communities, in May/June 2017, the expedition 'Sampling the Abyss' on board the Marine National Facility R/V *Investigator*, led by Museums Victoria and supported by CSIRO and NESP Marine Biodiversity Hub was the first expedition to survey the abyssal environment from Tasmania to southern Queensland. The main aim was to describe the species composition, genetic connectivity and trophic relationships of the abyssal and lower bathyal fauna.

There are few studies on abyssal species distribution and none from the eastern Australian abyss. Many abyssal species have been recorded to have wide geographic and bathymetric distributions. Broad latitudinal faunal bands have been identified in shallow water and bathyal species from Australia to the eastern Antarctic, with fauna along the eastern Australian coast divided into tropical and temperate species [4]. Polychaetes generally represent the dominant component of the deep-sea macrobenthos, thus are useful organisms for biogeographical studies.

The aim of this project is to 1) identify and describe Australian abyssal polychaetes, 2) understand species distribution along the Australian eastern abyss and 3) perform the first description of polychaete diversity from the eastern Australian abyss.

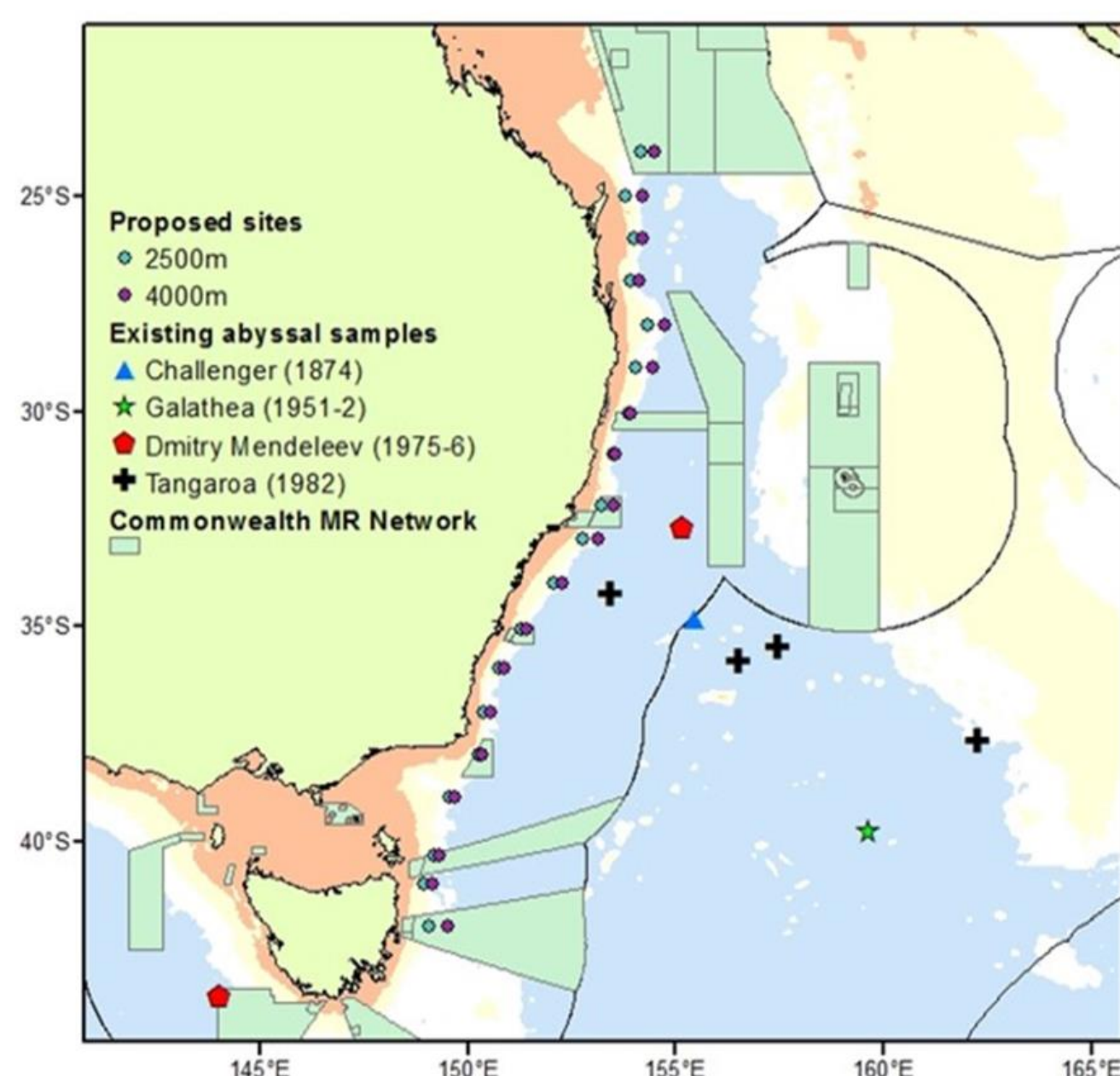


Figure 1. Map of sites sampled off the east coast of Australia during RV *Investigator* expedition 'Sampling the Abyss'. Prior to 2017 only seven deep-sea sites had been sampled. Black lines represent EEZ boarder. Light green polygons represent Australian Marine Parks.

Methods

Forty-nine beam trawl samples were collected from 13 sites at 1 degree intervals of latitude from 42°S to 24°S along the east coast of Australia from Tasmania to Southern Queensland (Fig.1). Trawl samples were conducted at both lower bathyal (~ 2500 m) and abyssal depths (~ 4000 m).

Large megafauna were removed from the trawl sample, smaller macrofauna were picked off, roughly sorted, identified to higher taxa and photographed. Sediment residues from the trawl were sieved using a 300 µm mesh size, organisms were roughly sorted by taxa. Most of the catch was preserved in 95% ethanol and the remainder in 10% buffered formalin.

The polychaete specimens collected from the beam trawl (Fig. 2) were deposited in the Australian Museum, Sydney and Museums Victoria, Melbourne where they were morphologically identified to species and assigned Latin binomial names where possible using published identification keys.



Figure 2. Polychaetes collected from beam trawl samples. A) Maldanidae, B) Ampharetidae, C) *Potamethus* sp., D) *Nothria* sp., E) *Paradiopatra* sp., F) Pectinariidae, G) Nereididae (images courtesy of Karen Gowlett-Holmes)



Figure 3. New species of *Spirodiscus*, family Serpulidae. Collected from Brenke sled.

Preliminary Results

Identification of abyssal polychaetes: A total of 2357 polychaete specimens from 33 families and 114 species (Table 1) were recorded. Serpulidae (34% of total polychaete abundance), Aphroditidae (17%) and Ampharetidae (13%), Sabellariidae (9%) were the most abundant families (Fig. 4).

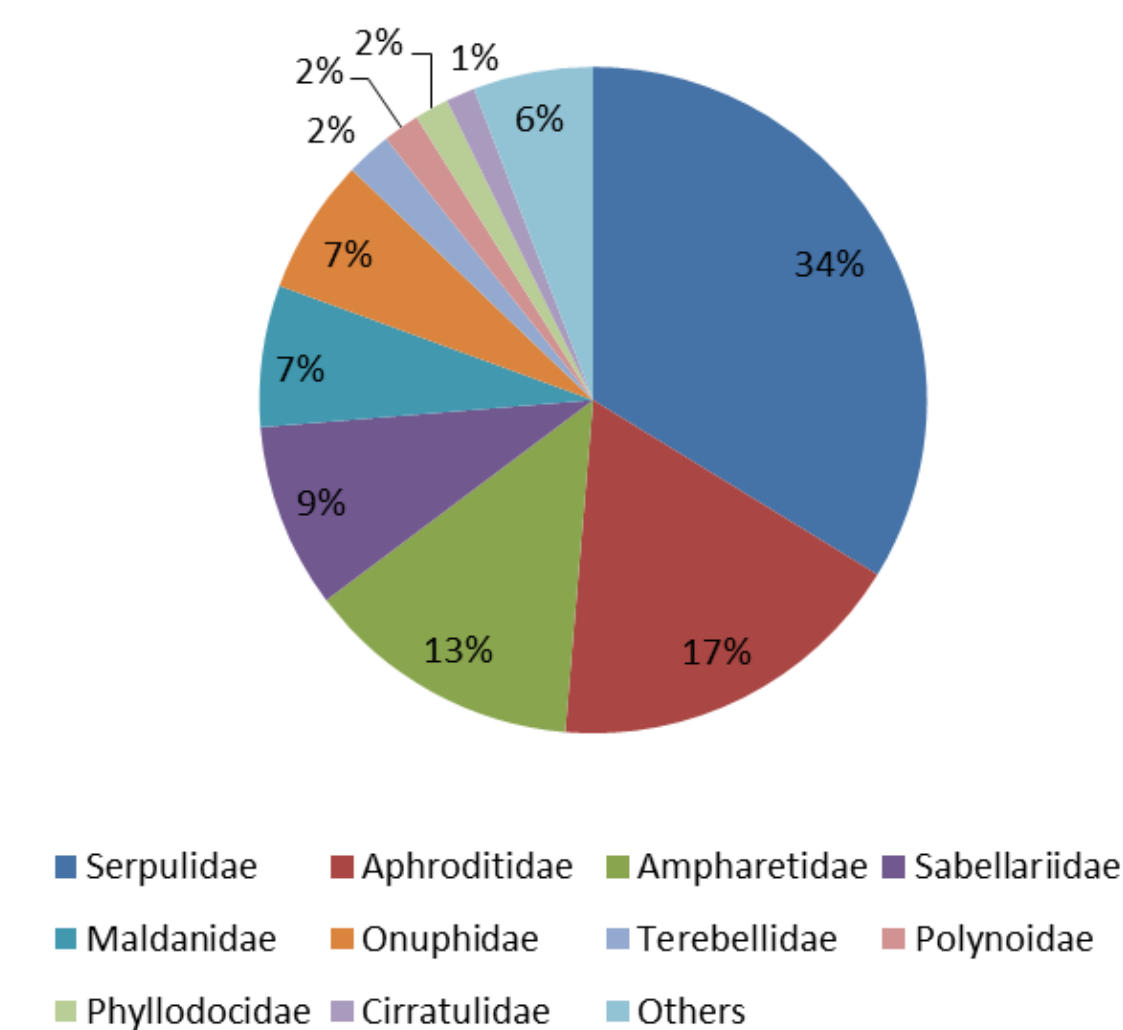
The family Serpulidae had the highest number of species (15 species) followed by Onuphidae (11 species). The most abundant species were *Hyalopomatus* sp. nov. (Serpulidae), *Laetmonice yarramba* (Aphroditidae), Ampharetidae sp. C, *Gesaia* sp. (Sabellariidae) and *Abyssoclymene annularis* (Maldanidae).

New species: Around 93 species could not be designated a Latin binomial name suggesting they may be new to science. Confirmed new species include the serpulids *Spirodiscus* (Fig. 3) and *Hyalopomatus* sp. nov. Eight new species of onuphids including *Paradiopatra* sp. nov. and *Nothria* sp. nov were identified.

Table 1. Polychaete families and number of species n/a collected from beam trawl, data for species level yet to be processed
*estimate as work ongoing

Polychaete family	Number of specimens	Number of species*
Serpulidae	796	15
Aphroditidae	414	6
Ampharetidae	316	9
Sabellariidae	211	3
Maldanidae	162	6
Onuphidae	155	11
Terebellidae	52	9
Polynoidae	42	9
Phyllodocidae	39	3
Cirratulidae	33	2
Others	137	42
Total	2357	115

Figure 4. Percentage abundance of polychaete families collected from beam trawl sampling.



Species Distribution: Preliminary morphological studies indicated that Ampharetidae sp. C (Fig. 5) and *Laetmonice yarramba*, two of the most abundant species, appeared to have wide latitudinal distribution from Southern Queensland to Tasmania. Both species were found at both lower bathyal (~ 2500m) and abyssal depths (~ 4000m).

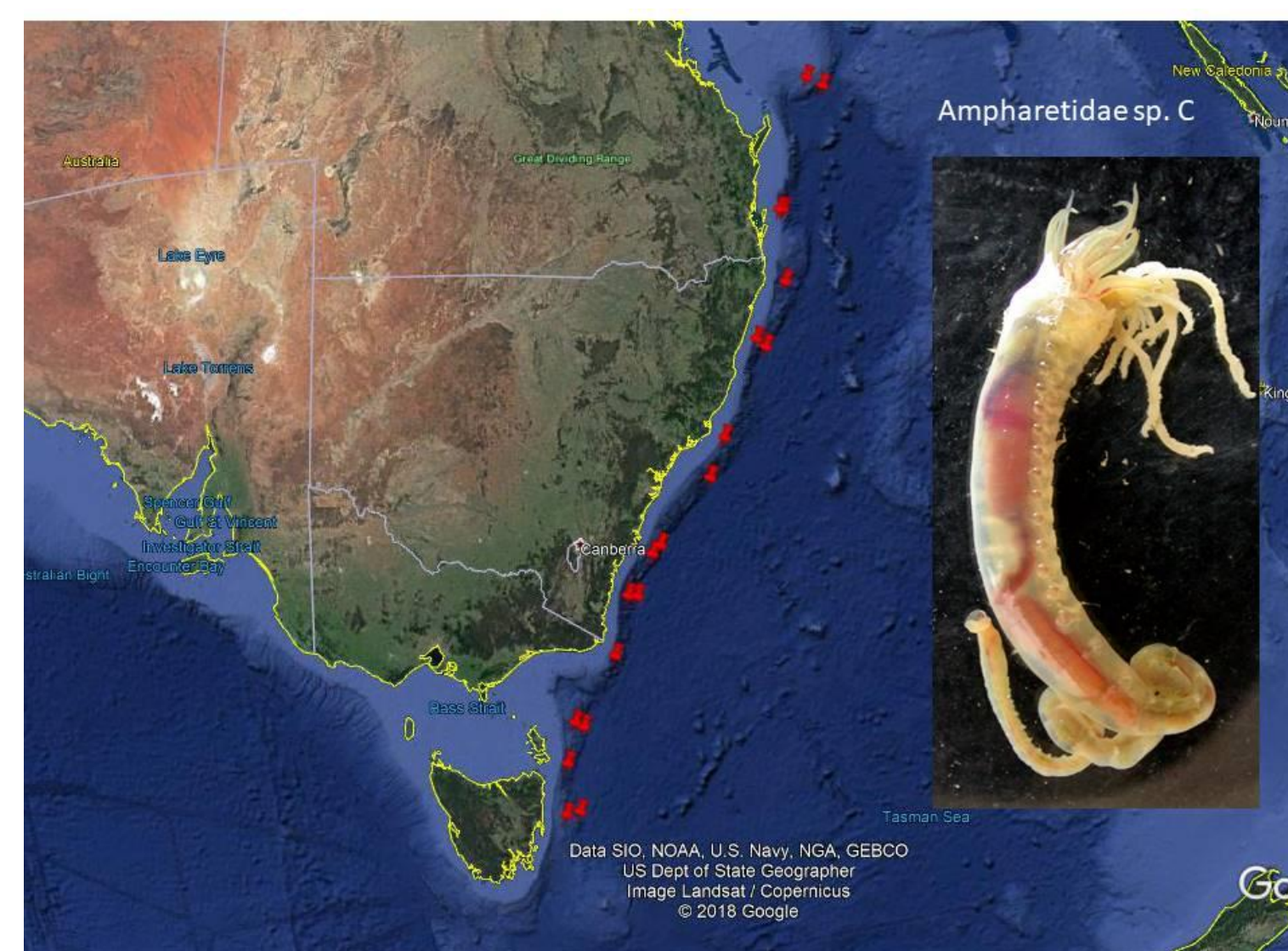


Figure 5. Species distribution of Ampharetidae sp. C in the Australian eastern abyss. Red icons mark stations where species was present.

Conclusions and Future Directions

- New polychaete species from the Australian abyss have been discovered and will be formally described.
- Morphological investigations indicate that the most abundant species have wide latitudinal and bathymetric distributions along the east coast of Australia.
- Further work on the families Ampharetidae, Onuphidae, Terebellidae, Serpulidae, Sabellidae and Polynoidae together with future molecular studies will further investigate population connectivity along the eastern Australian abyss.
- How diverse is the Australian abyss compared with abyssal environments worldwide?

References

- Watling, L., et al., (2013) PROG OCEANGR. 111: p. 91-112.
- Heap, A.D. and Harris, P.T., (2008) AUST J EARTH SCI. 55(4): p. 555-585.
- Hutchings, P., (1999) The challenge to conserve and manage Australia's marine biodiversity. PAC CONSERV BIOL. 5(4): 242-249.
- O'Hara T.D., Rowden A.A., Bax NJ, (2011). CURR BIOL. 21:226-230