Megafauna Community Structure, Distribution and Impact Factors on the Caiwei Seamount

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1. Background

What’s the megafauna?

Animals large enough (larger than 2 cm) to be determined in photographs, proposed as key taxon for environmental impact assessment in deep-sea mining.

(ISBA/19/LTC/8)
1. Background

Major factors affecting seamount biological communities include primary productivity of the overlying water; the hydrodynamic regime; the chemical nature of the water column; the geomorphology, geological origin of the seamounts (Clark et al., 2010), and distance from shore (O’Hara et al., 2010).

Most environmental factors are closely related to depth, therefore, depth is often regard as a key index (Rogers et al., 2007; Chivers et al., 2013; Davis et al., 2015; Ramos et al., 2016).
In three zones, **cnidarian** species are different from each other, especially **corals**, were commonly the characterizing species in these faunal assemblages.

Three depth zones:
- 200-350m
- 360-600m
- 750-1800m

The main determinant of community composition was depth
1. Background

Seamount biodiversity: high variability both within and between seamounts in the Ross Sea region of Antarctica

Malcolm R. Clark · David A. Bowden

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Abstract Seamounts in the Ross Sea were surveyed during the New Zealand IPY-CAML research voyage in 2008. Admiralty seamount, and seamounts of the Scott Island Seamount chain (Scott Island, Scott A, Scott B. Scott South) were sampled to examine an ecoregion of benthal faunal biodiversity.

The depth of seamount summit is only dozens of meters to hundreds of meters

The Structure and Distribution of Benthic Communities on a Shallow Seamount (Cobb Seamount, Northeast Pacific Ocean)

Cherise Du Preez · Janeels

Abstract Partially owing to their isolation from other well-studied seamounts, few comprehensive studies of benthic communities on shallow seamounts have been conducted. We report on the diversity, structure, and relative importance of benthic communities on Cobb Seamount, a shallow seamount in the northeast Pacific Ocean.

Species replacement dominates megabenthos between remote seamounts

Lissette Victorero · Katleen Robert · Laura F. Veerle · A. L. Huvenne

Seamounts are proposed to be hotspots of deep-sea biodiversity and increased productivity in a heterogeneous landscape. We investigated species replacement between two seamounts in the Northeast Atlantic and found that species replacement was affected by depth, distance, and geographic location. The results suggest that seamounts are not isolated ecosystems but rather part of a larger biodiversity network.
1. Background

What are the factors affecting the structure and distribution of megafaunal communities on these seamounts?

The water depth of seamount summit is greater than 1200m
1. Background

Since 2012, COMRA has conducted environmental surveys in the contract area.
1. Background
1. Background

Thirteen dives by *Jiaolong* submersible on the Caiwei Guyot

Five dives on the Weijia Guyot
2. Diversity and community structure

**Diversity** (based on specimens collected by *Jiaolong*)

6 Phyla, 38 families, 64 species, dominated by poriferan, cnidarian and echinoderm.
2. Diversity and community structure

6 new species

*Platlylistrum subviridum* sp. nov. (Wang et al., 2016)

*Poliopogon canaliculatus* sp. nov. *Semperella retrospinella* sp. nov. (Wang et al., 2016)

*Paralebbeus jiaolongi* n. sp. (Xu et al., 2016)

*Spongicoloides weijiaensis* n. sp. (Xu et al., 2017)

*Uroptychus inaequipes* sp. nov. (Dong et al., 2017)
3. Major factors affecting the distribution of megafauna

(1) Water Depth

Megafaunal assemblages are similar between summit and slope.
3. Major factors affecting the distribution of megafauna

(1) Water depth

Megafaunal assemblages on the base mainly consist of sea cucumber, star fish, brittle star and small sponges, and are different from summit and slope, with lower density and smaller body size.

Base (5500m)
3. Major factors affecting the distribution of megafauna

(2) Bottom Current & Sediment Environment

The sediment surface on the west slope is very flat.
The sediment surface on the east slope is wavy.
3. Environmental factors influencing megafauna distribution

(2) Bottom Current & Sediment Environment

West slope above 2500m
bottom current weak, higher coverage of sediment, higher diversity of habitat.

East slope above 2500m
strong bottom current washing the seabed, the substratum is mostly covered by crust and rock.
Differences in biodiversity and density due to differences in Bottom Current & Sediment Environment

**West slope:**
Higher biodiversity and lower density. There are representative species in both sessile animals (sponges and corals) and the movable animals (sediment feeder sea cucumber).

**East slope:**
Hard substratum is favorable habitat for sessile animals. megafauna is dominated by sessile animals such as sponges, corals and sea lilies.
Biodiversity is low but density is high.
3. Major factors affecting the distribution of megafauna

within small scales (e.g., on both sides of the ridge) the bottom current and sedimentary environment has a significant impact on the megafauna community and distribution.
3. Major factors affecting the distribution of megafauna

West side of the ridge:
due to weak bottom current, with high sediment coverage, megafauna mainly consists of fish, star fish and sea cucumber, sponge appears sporadically.

East side of the ridge:
bottom current washing the seabed, the substratum is mostly covered by crust, nodules and rock. Megafauna is dominated by sponges.
3. Major factors affecting the distribution of megafauna

(3) Topography (complicated terrain vs strong current)

High density of corals and sponges were generally observed on steep cliff
3. Major factors affecting the distribution of megafauna

Due to strong current around steep cliff brings more suspended particles, which is the major food source of these filter feeders, forming coral or sponge cluster.
4. Future plan

A comparative study on megafauna between Caiwei & Weijia Seamounts.
- Community structure
- Biodiversity
- Genetic connectivity
5. Conclusion

- The megafauna community is dominated by poriferan, cnidarian, and echinoderm;
- Megafaunal assemblages are similar between the summit and slope of Caiwei seamount, but they are significantly different from megafaunal assemblages of the base;
- Bottom current and sedimentary environment appeared to play important role in controlling megafauna distribution;
- High density of corals and sponges were generally observed on steep cliff.
Thanks for your attention!