



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



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Second Institute of Oceanography, SOA, China

Qingdao, May 28, 2018

# OUTLINE

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**1** Background

**2** Diversity and Community structure

**3** Major factors affecting the distribution of megafauna

**4** Future plan

**5** Conclusion

# 1. Background

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## 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)





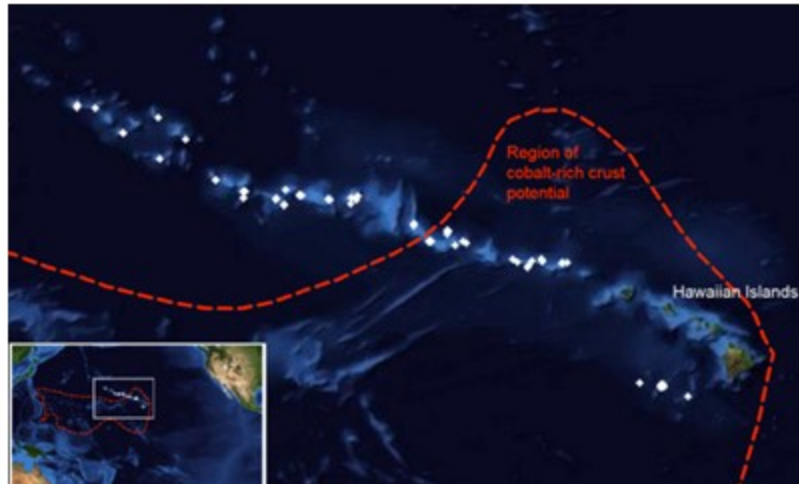
# 1. Background



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 regarded as a key index (Rogers et al., 2007; Chivers et al., 2013; Davis et al., 2015; Ramos et al., 2016).

# 1. Background

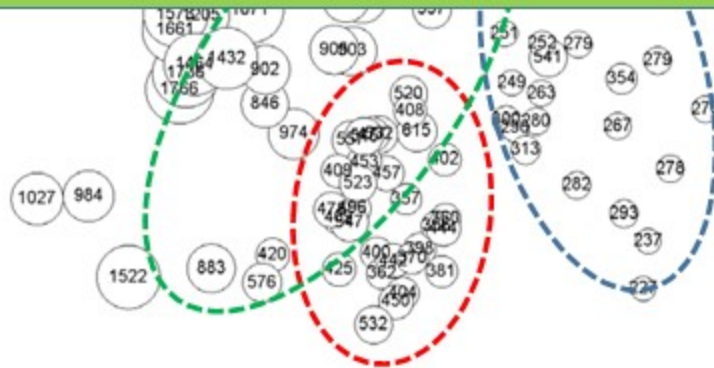


## Fauna of Cobalt-Rich Ferromanganese Crust Seamounts

Technical Study: No. 8



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

Hydrobiologia (2015) 761:161–180  
DOI 10.1007/s10750-015-2327-9



BIOLOGY OF THE ROSS SEA

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

Malcolm R. Clark · David A. Bowden

Received: 4 January 2015 / Revised: 29 April 2015 / Accepted: 2 May 2015  
© The Author(s) 2015. This article is published with open access at Springerlink.com

**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



ORIGINAL ARTICLE

## Patterns in megabenthic assemblages on a seamount summit (Ormonde Peak, Gorringer Bank, Northeast Atlantic)

Manuela Ramos<sup>1,2</sup>, Iacopo Bertocci<sup>1</sup>, Fernando Tempera<sup>2</sup>, Gonçalo Calado<sup>3</sup>, Mónica Albuquerque<sup>4</sup> & Pedro Duarte<sup>5</sup>

- 1 CMAAR – Interdisciplinary Centre of Marine and Environmental Research, Porto, Portugal
- 2 MARE – Marine and Environmental Sciences Centre, Department of Oceanography and Fisheries, Horta, Azores, Portugal
- 3 Departamento de Ciências da Vida, Universidade Lusófona de Humanidades e Tecnologias, Campo Grande, Lisbon, Portugal
- 4 Instituto Português de Malacologia (IPM), ZooMarine, Albufeira, Portugal
- 5 Norwegian Polar Institute, Fram Centre, Tromsø, Norway

**Keywords** Gorringer, management, megabenthic assemblages, patterns, seamount, vulnerable marine ecosystems

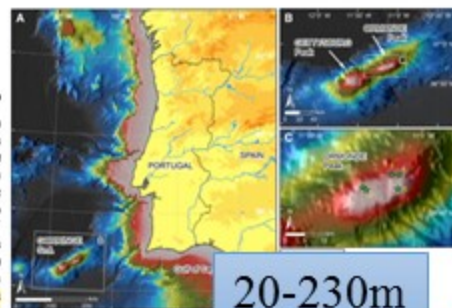
**Correspondence** Manuela Ramos, MARE – CentreMARE / Azores/Prof. Dr. Frederico Machado, 49901-862, Horta, Azores/Portugal. E-mail: manuela.ramos@mare-centre.pt

Accepted: 28 November 2015

doi: 10.1111/mare.12353

**Abstract**

Gettytsi mout : tic), wit importa serve se implems Sites of ROV di and qui the sea Ormonde system :



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

RESEARCH ARTICLE

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

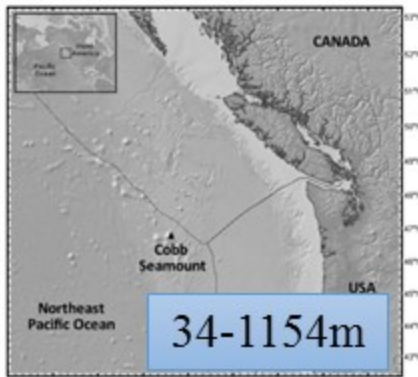
Cherisse Du Preez<sup>1\*</sup>, Janelle

<sup>1</sup> Institute for Ocean Sciences, Fish Biological Station, Fisheries and Oceans Science Center, National Institute of Oceanography, National Institute of Oceanography

\* Current address: Department of Oceanography, University of Victoria, Victoria, BC, Canada  
\* cpdz@uvic.ca

**Abstract**

Partially owing to their isolation and low depth, shallow seamounts are considered to be ecological islands. However, few comprehensive studies have examined the structure and distribution of benthic communities on shallow seamounts. This study examines the structure and distribution of benthic communities on Cobb Seamount, a shallow seamount in the Northeast Pacific Ocean. Water vehicles were used to visit 10 sites (in size) between 34 and 1154 m



## SCIENTIFIC REPORTS

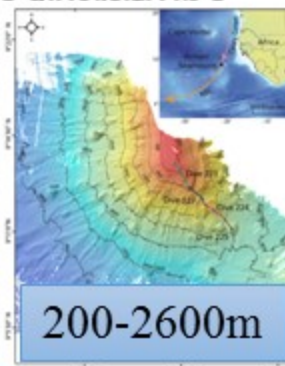
OPEN

## Species replacement dominates megabenthos beta diversity on a remote seamount

Lissette Victorero<sup>1,2</sup>, Katleen Robert<sup>1</sup>, Laura F. Veerle A. I. Huvnen<sup>1,3</sup>

Received: 10 October 2017  
Accepted: 21 February 2018  
Published online: 07 March 2018

Seamounts are proposed to be hotspots of deep-sea biodiversity due to their isolation and low depth. However, studies on the underlying causes of local processes behind beta diversity using ROV video, camera traps, and other methods are limited. We developed beta diversity analyses, we identified two beta diversity processes: species replacement and species addition. Species replacement was high with an index of 0.92 out of 1.0. Species replacement was affected by depth-related differences in species abundance. This study identifies the different beta diversity components and driven protecting regional deep-sea biodiversity.



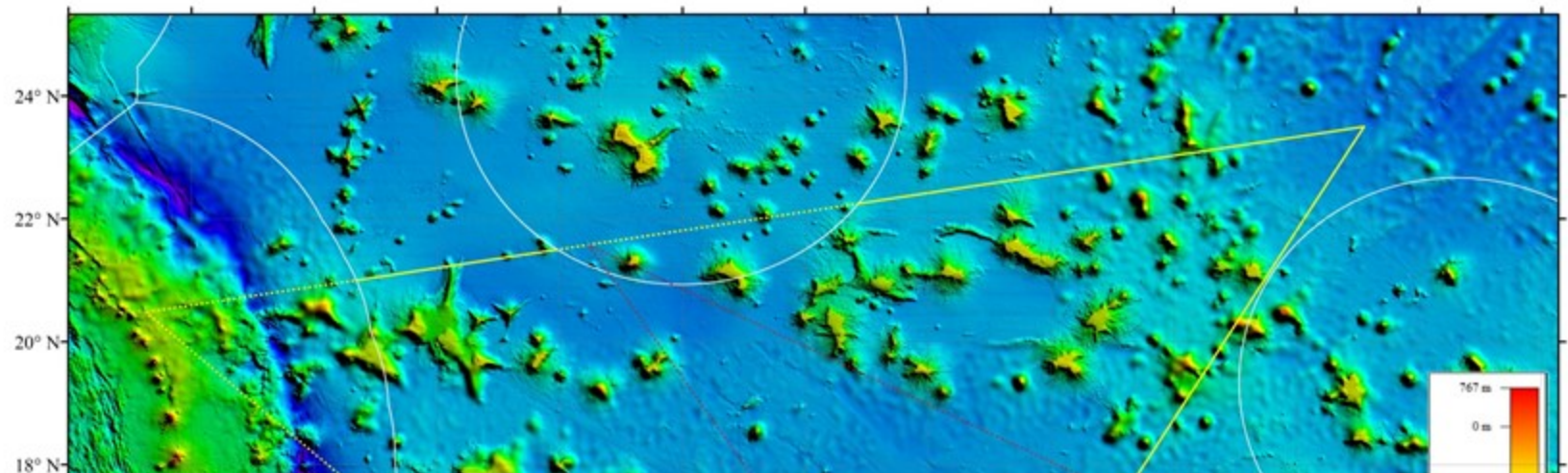
OPEN ACCESS

**Citation:** Du Preez C, Curtis JMR, Clarke ME (2018) The Structure and Distribution of Benthic Communities on a Shallow Seamount (Cobb Seamount, Northeast Pacific Ocean). *PLoS ONE* 13(10): e0205513. doi:10.1371/journal.pone.0205513

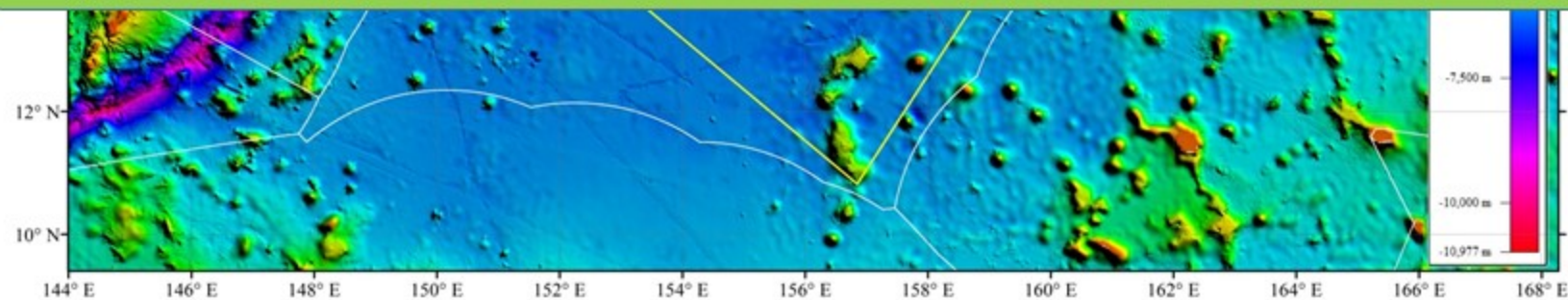
**Editor:** Heather M. Patterson, Department of Agriculture and Water Resources, AUSTRALIA

**Received:** June 16, 2018

# 1. Background



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



比例尺: 1:7000000

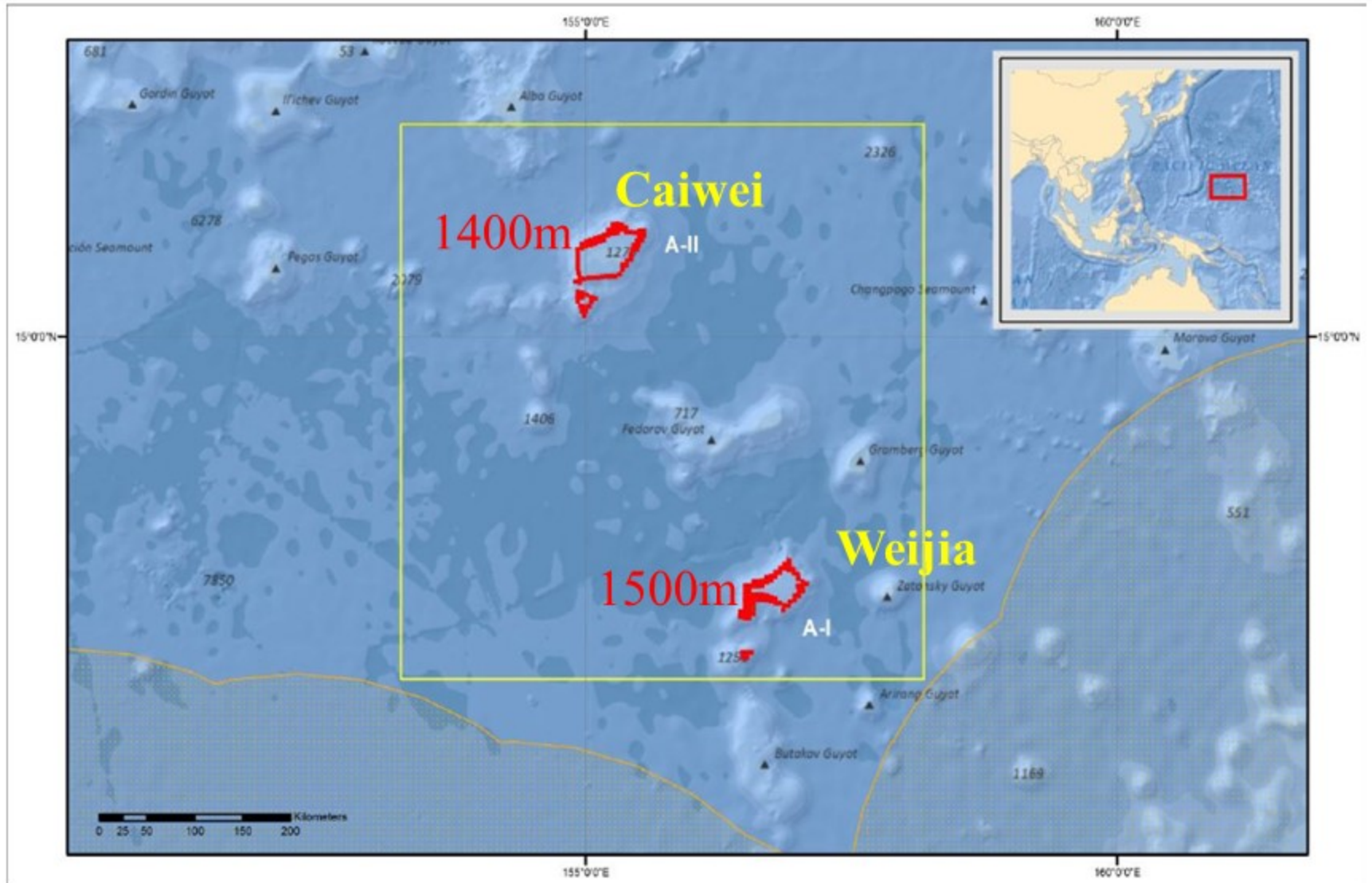
0 100 200 400 600 800 Kilometers

制图人: 李正刚

The water depth of seamount summit is greater than 1200m



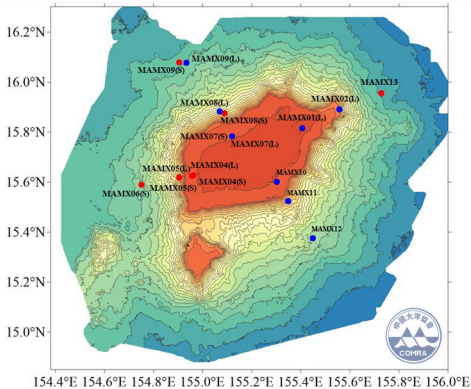
# 1. Background



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

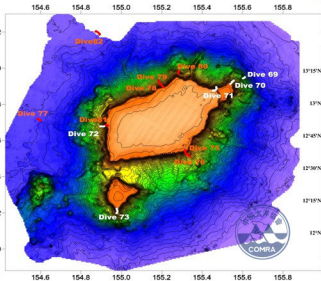


# 1. Background

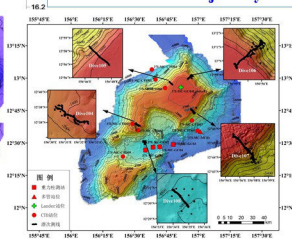


# 1. Background

Thirteen dives by *Jiaolong* submersible on the Caiwei Guyot



Five dives on the Weijia Guyot

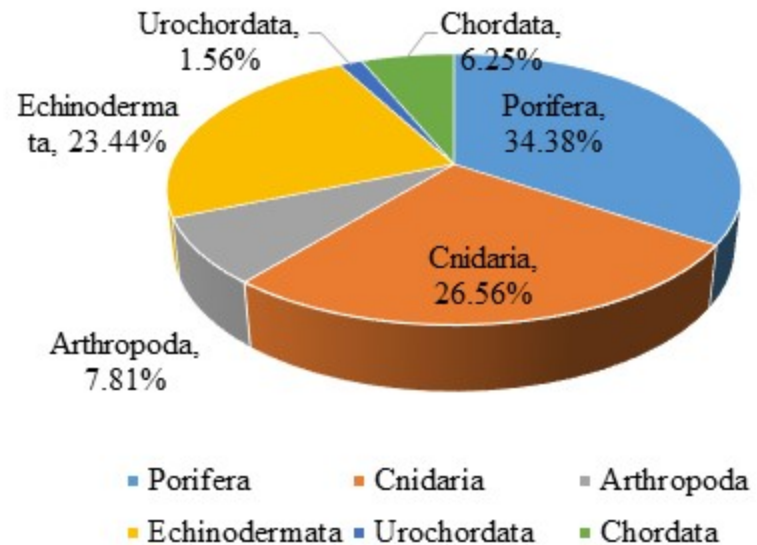
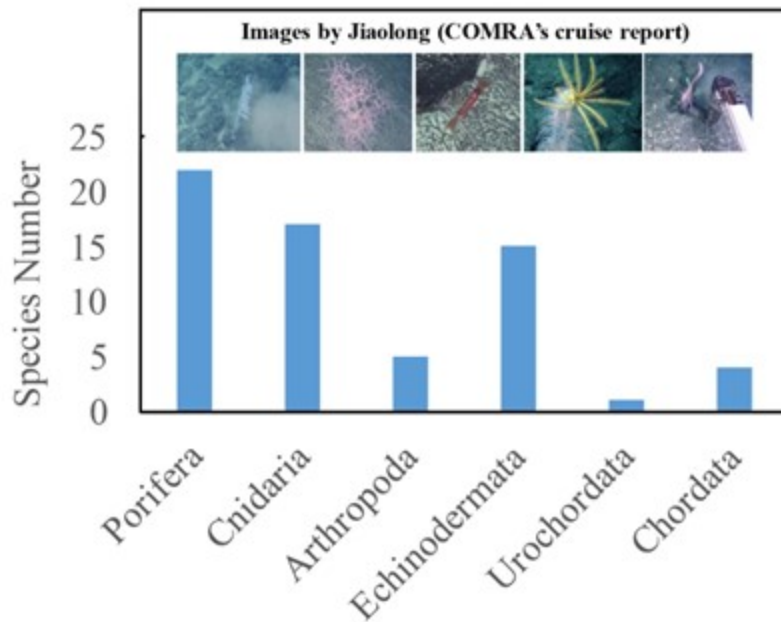


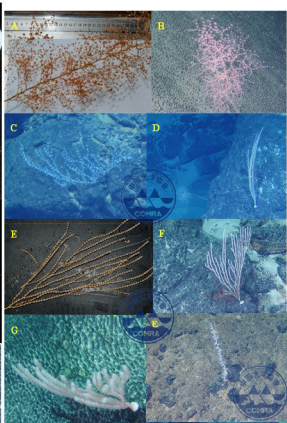
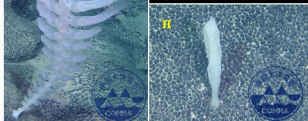
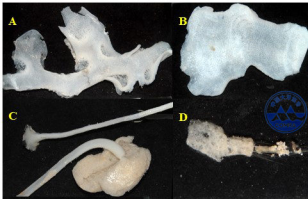


## 2. Diversity and community structure

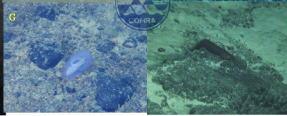
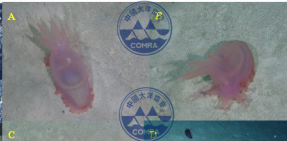
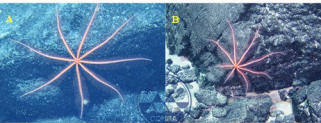
**Diversity** (based on specimens collected by *Jiaolong*)

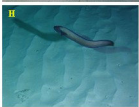
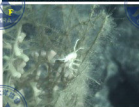
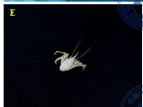
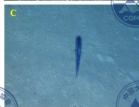
6 Phyla, 38 families, 64 species, dominated by poriferan, cnidarian and echinoderm.







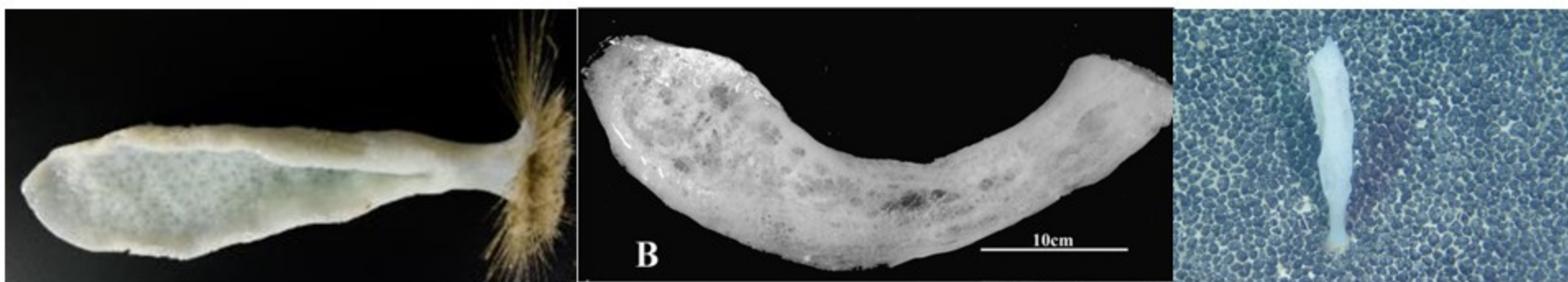






## 2. Diversity and community structure

6 new species



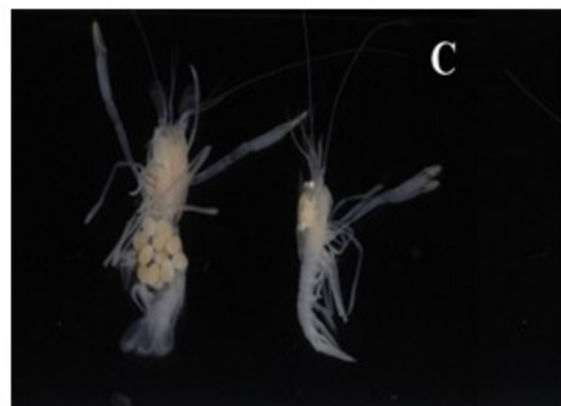
*Platylistrum subviridum* sp. nov.  
(Wang et al., 2016)

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

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



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



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

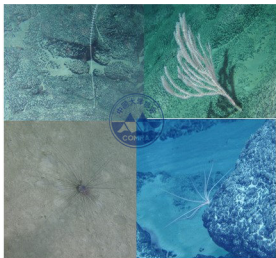


*Uroptychus inaequipus* sp. nov.  
Dong et al., 2017

### 3. Major factors affecting the distribution of megafauna

#### (1) Water Depth

Megafaunal assemblages are similar between summit and slope.



Summit (1500m)



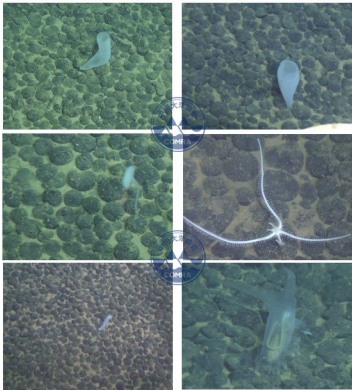
Slope (3000m)

### 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.

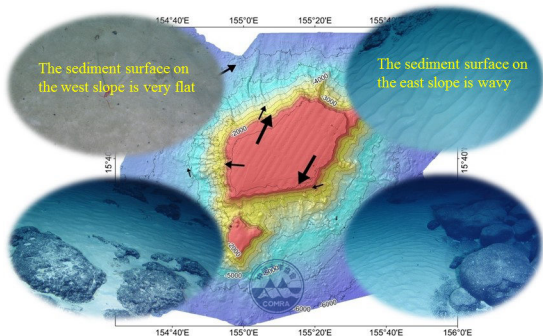
Base (5500m)





### 3. Major factors affecting the distribution of megafauna

#### (2) Bottom Current & Sediment Environment



### 3. Environmental factors influencing megafauna distribution

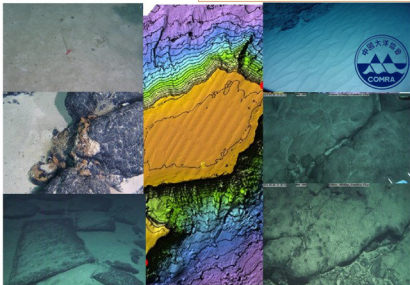
#### (2) Bottom Current & Sediment Environment

##### 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.



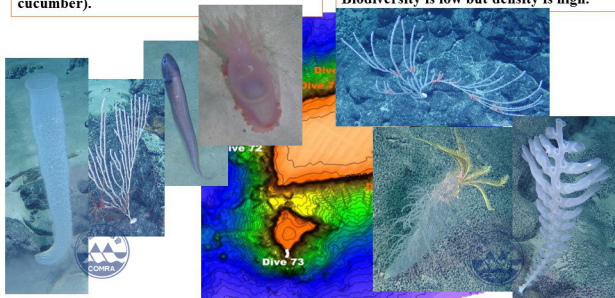
# Differences in biodiversity and density due to differences in Bottom Current & Sediment Environment

## 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:

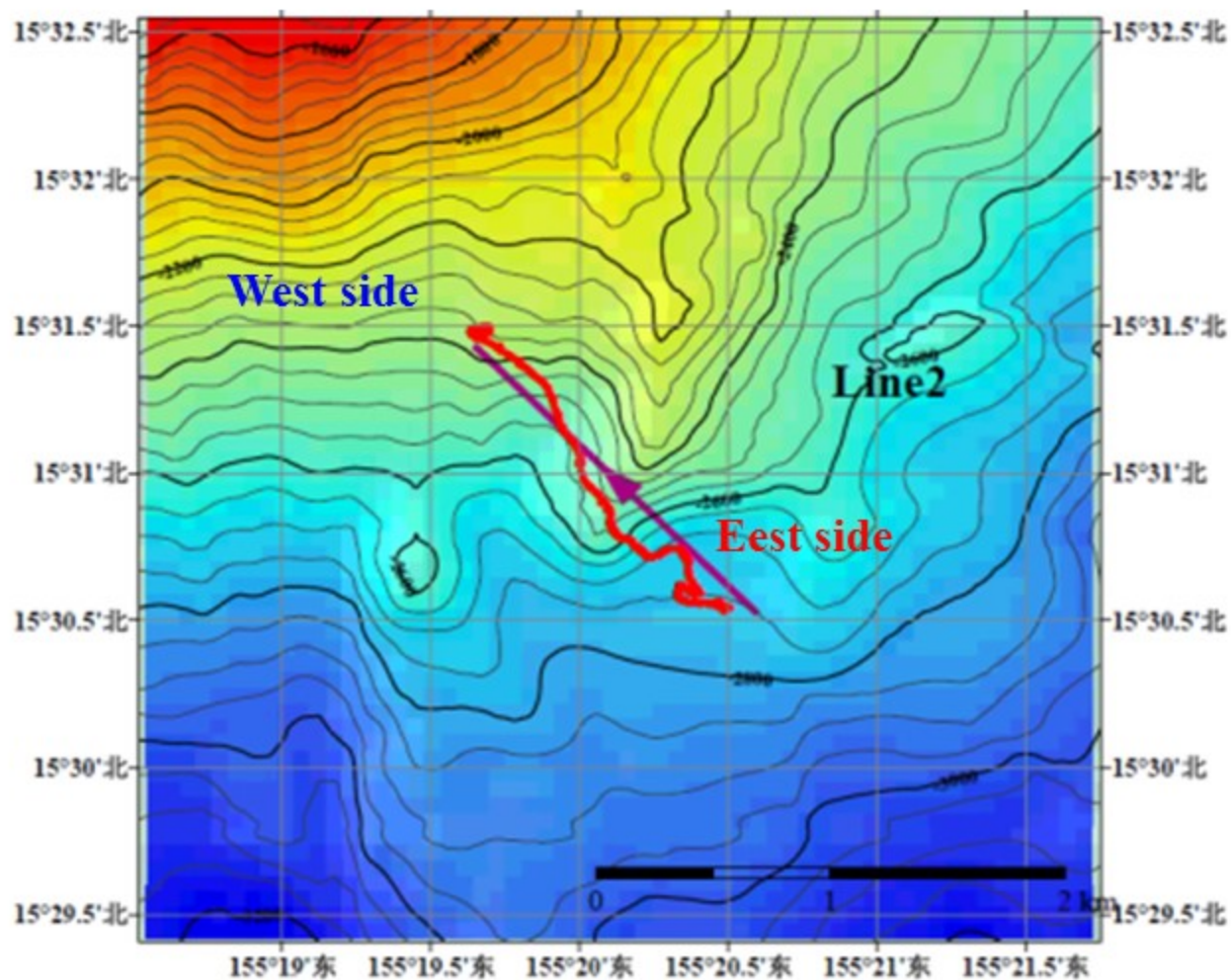
Hard substratum is favorable habitat for sessile animals. megafauna is dominated by sessile animals such as sponges, corals and sea lilies. Biodiversity is low but density is high.





### 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.



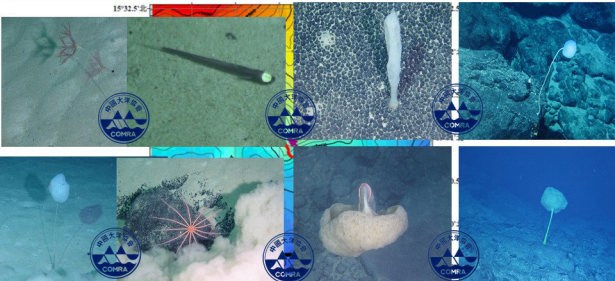
### 3. Major factors affecting the distribution of megafauna

#### 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)



coral cluster

This underwater photograph shows a dense, textured cluster of coral growing on a steep, rocky cliff face. The water is clear and blue, and the lighting highlights the intricate structure of the coral.



Sponge cluster

This underwater photograph shows a cluster of large, white, vase-shaped sponges attached to a rocky surface. The background is dark blue, and the sponges are illuminated by a light source, possibly a diver's flashlight.



Sponge and coral cluster

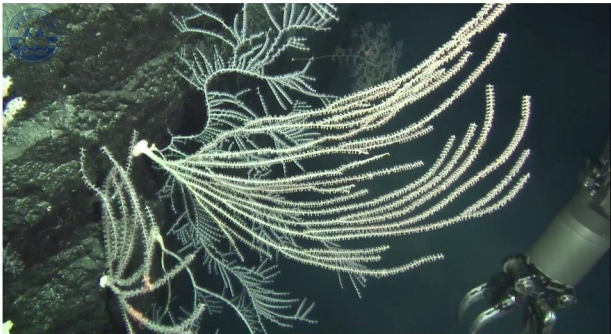
This underwater photograph shows a complex structure where sponges and coral are intertwined. The sponges are large and white, while the coral is more delicate and branching. The overall appearance is a dense, multi-layered biological community.

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.



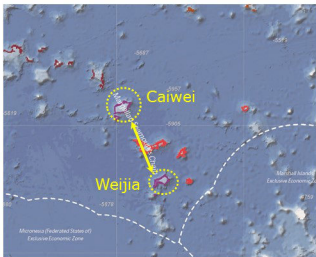
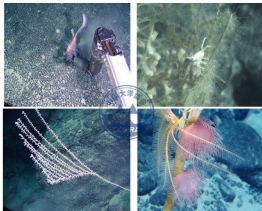
## 4. Future plan

A comparative study on megafauna between Caiwei & Weijia Seamounts.

- Community structure
- Biodiversity
- Genetic connectivity

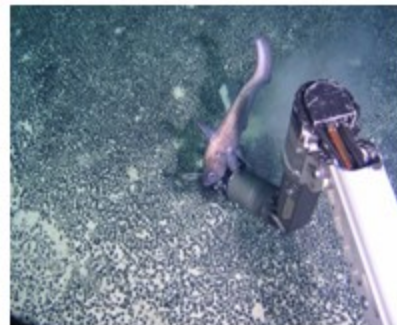


Connect or isolate?



## 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!**

