

## BENTHOS in Hainan, China

Benthic organisms, also called Benthos, are animals and plants that live on, in, or near the bottom of water bodies. They are part of many ecosystems worldwide and play an important role as food source, in nutrient recycling, carbon storage and oxygenation of sediments. Change in environmental conditions through pollution and other causes strongly affect benthic organisms. This way, some can serve as indicators for water quality.



Soldier crab *Mycitris* (Photos on this page: i. Nordhaus)

## FACTS

### What are benthic organisms?

The benthic community is made up of invertebrates, fish, algae, and seagrass. Benthic invertebrates are animals without a backbone and include insects, mollusks (snails and mussels), worms, and crustaceans (crabs, shrimps). They can be found worldwide in lakes, rivers, estuaries, tidal flats, mangrove forests, and coral reefs. In the oceans they occur from the intertidal zone down to the deep sea.

### Examples of species from Hainan, China



Mussels



Grazing nudibranch



Goose barnacle *Lepas*



Prawns

## Why are they important?

Benthos is a food source for other organisms, for instance, fish, birds and crustaceans. It is also a source of food and income for many people. Benthic animals are important for the decay of organic matter and the release of nutrients. Thus, they are an essential part of food webs and promote nutrient cycling. Through feeding and burrowing, they contribute to carbon storage and oxygenation of sediments. Some invertebrates like mussels and barnacles filter suspended particles from the water, thus improving water quality.

## Water filtration

- Oysters filter suspended particles from the water, including small algae, sediment and pollutants;
- One oyster filters up to several liters per hour;
- Oyster reefs are important for water purification and shore protection and they provide habitat for other organisms.



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## Ecological functions of benthic animals



Oxygenated burrow walls



Casts from crab burrows

- 1) Bristle worm *Nereis*, © S. Dittmann      3) Fiddler crab, © I. Nordhaus  
2) Mud shrimp *Callinassa*, © S. Dittmann      4) Leaf-eating crab, © T. Romero

## Bioturbation

- Burrowing by crustaceans, worms and clams provides oxygenated habitats, which increases biodiversity;
- The shape and depth of burrows are species-specific;
- Excessive salt is washed out through the burrows;
- Through digging, nutrients are distributed in the sediment;
- One bristle worm can pump up to 240 ml of water per hour through its burrow.

- The term "benthic" is derived from the Greek "βένθος" meaning "depth"
- Benthic organisms are numerous (up to 20,000 individuals/m<sup>2</sup>)
- Benthic habitats cover 70% of the Earth

Interesting  
facts

### Interesting links

[http://www.ozcoasts.gov.au/indicators/benthic\\_inverts.jsp](http://www.ozcoasts.gov.au/indicators/benthic_inverts.jsp)  
<http://omp.gso.uri.edu/ompweb/doe/science/biology/benth1.htm>

<https://www.cabi.org/isc/datasheet/107788>  
<http://www.springer.com/gp/book/9783662538760>

## Benthos classification

### Type

**Phytobenthos** comprises the benthic plants, mainly macroalgae, diatoms, and seaweed

**Zoobenthos** comprises benthic animals such as crustaceans, mollusks, worms, and fish

### Size

**Macrobenthos** such as clams or amphipods is larger than 1 mm

**Meiobenthos** such as bristle worms, mud dragons, and copepods is 63  $\mu\text{m}$  to 1 mm in size

**Microbenthos** such as diatoms and bacteria is smaller than 63  $\mu\text{m}$

### Location

**Endobenthos** lives buried in the sediment like bristle worms

**Epibenthos** lives on top of the sediment like sea anemones

**Hyperbenthos** lives above the sediment like benthic fish

## What are the threats?

Benthic communities are strongly affected by environmental conditions, including sediment composition, water quality, salinity, hydrological factors, and by direct human intervention. The main threats are:

- Waste, pesticides, oil pollution, fertilizer impairing the water quality;
- Overexploitation, overfishing;
- Destruction of their habitats;
- Changes in the natural hydrologic regime.



Sampling of benthic organisms © I. Nordhaus

### Our study in Hainan Island has found that:

- Effluents from aquaculture and industry and mangrove loss and fragmentation affect benthic diversity, community composition and the food web.
- The crab *Parasesarma bidens* and the mussel *Geloina expansa* are good bio-indicators for the assessment of nutrient pollution.



## Take home messages

- Benthos comprises a very diverse group of organisms distributed in ecosystems worldwide
- They play an important role as food source, in nutrient recycling, carbon storage and oxygenation of sediments
- The crab *Parasesarma bidens* and the mussel *Geloina expansa* are good bio-indicators for the assessment of nutrient pollution

### Imprint

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