

# **Macrobenthos diversity and ecology of a Chinese mudflat in the East China Sea**

## **Dissertation**

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der Christian-Albrechts-Universität zu Kiel

vorgelegt von

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*“By three methods we may learn wisdom. First, by reflection, which is noblest. Second, by limitation, which is the easiest; and third by experience, which is the bitterest.”*

Confucius (孔子)  
(551-479 BC)



## OVERVIEW

**A synopsis of the macrobenthic assemblages along the Southern bank of the Hangzhou Bay, China**

Ha Trieu Hung LIU, Peier WANG, Zipan WANG, Jifang YANG, Ragnhild ASMUS, Harald ASMUS  
*Marine Biodiversity (submitted)*

**Influence of triangular club-rush *Schoenoplectus triqueter* on the macrobenthic community of the Hangzhou Bay, China**

Ha Trieu Hung LIU, Peier WANG, Xiao Xia TU, Jifang YANG, Ragnhild ASMUS, Harald ASMUS  
*WETLANDS DOI: 10.1007/s13157-014-0515-4*

**The trophic structure of the macrobenthos of a macro tidal flat in the Southern bank of the Hangzhou Bay, China**

Ha Trieu Hung LIU, Zhi Huan XU, Gong Guo LI, Jifang YANG, Ragnhild ASMUS, Harald ASMUS  
*Chinese Journal of Oceanology and Limnology (in prep.)*

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**The motivation and main objectives of this study were:**

- 1.) to provide fundamental spatial as well as temporal information on the diversity and abundance of the macrozoobenthic community along the Southern bank of the Hangzhou Bay, China;
- 2.) to evaluate the differences between the faunal composition of the macrobenthos from a bare mudflat and that of an adjacent *Schoenoplectus triqueter* (triangular club-rush) marsh;
- 3.) to investigate the trophic position and interaction amongst the macrobenthic assemblage in the Southern Hangzhou Bay, using stable isotope techniques.



ABSTRACTS ONLY

## **A synopsis of the macrobenthic assemblages along the Southern bank of the Hangzhou Bay, China**

Ha Trieu Hung LIU, Peier WANG, Zipan WANG, Jifang YANG, Ragnhild ASMUS, Harald ASMUS - *Marine Biodiversity (under review)*

### **Abstract**

This study focuses on the diversity and distribution of the macrozoobenthic community in the Hangzhou Bay, China. Samples were collected from five different sites along the Southern bank of the Bay between spring 2010 and winter 2011. A total of 58 invertebrate taxa were identified, the majority of which belong to the taxonomic groups Polychaeta, Crustacea and Mollusca. These three groups alone accounted for approximately 97% of the mean total abundance as well as approximately 96% of the mean total biomass. The average number of species per site was 19, with *Laternula marilina*, *Heteromastus filiformis*, *Sinocorophium* sp., *Nippoleucon* aff. *projectus*, *Scolelepis* sp. and *Sinoediceros* sp. dominating. The highest total abundance (11,575 ind/m<sup>2</sup>) was measured in summer whereas the highest total biomass (29.70g/m<sup>2</sup> AFDW) was registered in autumn. Site 4 (in proximity to the Hangzhou Bay Bridge) showed greatest species richness with 43 different species, almost half of which belonging to the arthropods. Diversity indices revealed highest species diversity in the middle-tide zone, compared to the other two tidal zonations.

This is to our knowledge the first comprehensive investigation to date on the macrobenthos of the Southern bank of the Hangzhou Bay and further studies are necessary to gain more insight into this quickly changing environment.

**Keywords:** Macrobenthos; Hangzhou Bay; Biodiversity; Spatial variation; Temporal variation; China.



## **Influence of triangular club-rush *Schoenoplectus triqueter* on the macrobenthic community of the Hangzhou Bay, China**

Ha Trieu Hung LIU, Peier WANG, Xiao Xia TU, Jifang YANG, Ragnhild ASMUS, Harald ASMUS - *WETLANDS* 34: 489-499. DOI: 10.1007/s13157-014-0515-4

### **Abstract**

This study focuses on the macrobenthic community of an unvegetated mudflat and that of a *Schoenoplectus triqueter* (synonym: *Scirpus triqueter*) marsh in the Southern Bank of the Hangzhou Bay, China. Samples were collected between April 2010 and January 2011 in order to evaluate possible effects of seasonality on the species composition for each habitat. Twenty-three species were found in each habitat, with higher crustacean and insect richness in the vegetated area, compared to a higher number of polychaete and mollusc species observed in the mudflat area. The highest macrofaunal abundance was recorded in summer whilst the lowest was registered in autumn. *Heteromastus filiformis* and *Laternula marilina* were the main contributors to the high abundance in the Hangzhou Bay. The results show higher mean macrobenthic abundances in the *S. triqueter* marsh (1,707 ind/m<sup>2</sup> ±1,669 SD) compared to that of the mudflat area (1,172 ind/m<sup>2</sup> ±1,115 SD). However, the highest mean biomass was found in the mudflat habitat (0.73 g/m<sup>2</sup> ±0.84 SD as opposed to 0.64 g/m<sup>2</sup> ±0.59 SD from the *S. triqueter* marsh) indicating the occurrence of larger specimens. Multivariate analyses indicate significant differences in the species composition between both habitats, confirming the importance of habitat structure on macrofaunal assemblages.

**Keywords:** Macrobenthos, Hangzhou Bay, *Schoenoplectus triqueter*, *Scirpus triqueter*, triangular club-rush.



## The trophic structure of the macrobenthos of a macro tidal flat in the Southern bank of the Hangzhou Bay, China

Ha Trieu Hung LIU, Zhi Huan XU, Gong Guo LI, Jifang YANG, Ragnhild ASMUS, Harald ASMUS - *Chinese Journal of Oceanology and Limnology (in prep.)*

### Abstract

The food web structure of the macrobenthos from the Southern bank of the Hangzhou Bay (HZB) was investigated through stable carbon and nitrogen isotope analyses. Sampling was performed between September 2010 and August 2011 in order to evaluate the feeding habits and hence the trophic levels for this often neglected, but important group of animals in the Hangzhou Bay. Thirty-one species were analysed with  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  ranging from -18.0‰ to -11.4‰ and 6.5‰ to 13.6‰, respectively. The macrobenthos cover three trophic levels (2.01-4.08) with a food chain length (FCL) of 4.09. Results suggest that the macrobenthic community relies mainly on microphytobenthos (MPB) as an important carbon source, whereas suspended particulate organic matter (sPOM) and material derived from macrophytes, particularly *Schoenoplectus triquetus* (triangular club-rush) are of minor importance in their diet.

Proceeding and intensive reclamation activities on the intertidal mudflats of the Hangzhou Bay may severely decrease benthic production, hence changing the energy pathway and affecting local fisheries. This investigation bridges the knowledge gap in the trophic structure of the macrobenthos and provides a baseline for future research and monitoring programmes to better understand and protect the valuable coastal areas with all its components and services.

**Keywords:** Stable isotopes; Carbon; Nitrogen; Food web; Hangzhou Bay; Macrobenthos;





## Eidesstattliche Erklärung

Hiermit erkläre ich, dass die vorliegende Dissertation "Macrobenthos diversity and ecology of a Chinese mudflat in the East China Sea" selbstständig von mir angefertigt wurde und dass sie nach Form und Inhalt meine eigene Arbeit ist. Sie wurde keiner anderen Stelle im Rahmen eines Prüfungsverfahrens vorgelegt. Die Arbeit wurde nur unter Zuhilfenahme der angegebenen Hilfsmittel und Quellen verfasst und unter Einhaltung der Regeln guter wissenschaftlicher Praxis der Deutschen Forschungsgemeinschaft entstanden. Teile dieser Arbeit wurden als Manuskripte in wissenschaftlichen Fachzeitschriften veröffentlicht beziehungsweise eingereicht. Dies ist mein einziges und bisher erstes Promotionsverfahren.

Kiel, Februar 2015



Ha Trieu Hung Liu

