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Preface

Coastal biodiversity and bioresources: variation and sustainability

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Abstract The 1st International Coastal Biology Congress (1st ICBC) was held in Yantai, China, in Sep. 26–30, 2014. Eighteen manuscripts of the meeting presentations were selected in this special issue. According to the four themes set in the ICBC meeting, this special issue include four sections, i.e., Coastal Biodiversity under Global Change, Adaptation and Evolution to Special Environment of Coastal Zone, Sustainable Utilization of Coastal Bioresources, and Coastal Biotechnology. Recent advances in these filed are presented.

Keyword: coastal biodiversity; bioresources; variation; sustainability; First International Coastal Biology Congress (1st ICBC)

Coastal zone is well known as an unstable environment under constant pressure of changes from natural agents of land and ocean, and more obviously, human activities. Coastal biology is a subject that describes and illustrates status and patterns of coastal lives for sustainable utilization of coastal bioresources. At present, this subject is developing fast with exciting achievements being realized in biological, chemical, and environmental sciences and technologies. To promote the development in this field, the 1st International Coastal Biology Congress (1st ICBC) was successfully held in Sep. 26–30, 2014 in Yantai, China, which brought together the international communities working on coastal biology issues, to help strengthen connections in this highly inter-disciplinary field, and to inspire new research and development from the scientific and industrial sectors.

The 1st ICBC included four themes to illustrate coastal biology: **Coastal Biodiversity under Global Change**, **Adaptation and Evolution to Special Environment of Coastal Zone**, **Sustainable Utilization of Coastal Bioresources**, and **Coastal Biotechnology**. In this special issue, papers are arranged accordingly in the same order.

Coastal zone areas harbor abundant bioresources of both on-land and aquatic environments. However, the abundance and distribution patterns of biodiversity are constantly changing under both global change and human activities. In Theme 1 **Coastal Biodiversity under Global Change**, there are 3 papers that describe and reflect the variation status and trend of coastal biodiversity.

As one of the main primary productivity in coastal zone area, seaweed plays an important role in sustaining the coastal ecosystem, in which nematode includes the most multiple species and contributes greatly to the role. Their diversities varied with the coastal environment changes. Three new species of seaweed and nematode are reported by Ding et al. (2016), Cao et al. (2016), and Wang and Huang (2016); authors offered critical clues to the indication of the changes in both coastal environment and bioresources. In addition, as morphological identification tends to be despised in recent studies, the three papers give good examples in seaweed and nematode identification by the combination of morphological and molecular methods.

A coastal zone area is the interface where land and ocean interact dynamically. How coastal organisms adapt to and evolve in the environment is one of the most appealing scientific questions. In Theme 2

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Adaptation and Evolution to Special Environment of Coastal Zone, the latest progresses in this field from microbes to higher plants in coastal zone are summarized in five papers.

Allelopathy as a widespread ecological/physiological phenomenon is very important to the composition of species, community structure, biomass, and growth dynamics, especially in red-tide blooms (Fistarol et al., 2003, 2004; Yamasaki et al., 2009). He et al. (2016) studied the allelopathic interaction between microalgae *Karenia mikimotoi* and *Dunaliella salina* in laboratory culture, and gave suggestions to reveal the mechanism of the formation and/or maintenance of harmful algae blooms.

Wang and Tang (2016) studied the allelopathy effect between macroalgae *Corallina pilulifera* and microalgae *Heterosigma akashiwo* in different environmental factors. The results provide scientific evidence to understanding the allelopathic effect on harmful red-tide microalgae through changes in environmental factors.

Additional to the interspecific effects among microalgae, the one between macroalgae and aquatic animals is noticed to illustrate the mechanism of organisms' adaptation to coastal environment. Xu et al. (2016a) reported kelp supplying as a vital organic carbon source to scallop *Chlamys farreri* in an integrated multi-trophic aquaculture (IMTA) bay in Chinese northern marine regions, as indicated in stable carbon isotope. Results suggest that, kelp in the IMTA ecosystem can supply food as an additional source to cultured bivalves.

Seagrass bed is one of the important coastal habitat types adding structural complexity to a shallow soft bottom system and providing food, refuge, and living space for a variety of organisms, thereby enhancing estuarine and coastal productivity and biodiversity. Although some marine protected areas or natural reserves have been established to protect this vulnerable coastal habitat, scientific researches into species, especially the fish and invertebrate living in seagrass bed environment remains seldom reported (Rueda et al., 2008). Xu et al. (2016b) studied the seasonal variation in species composition and abundance of demersal fish and invertebrates of a seagrass natural reserve in the eastern coast of the Shandong Peninsula, China. They confirmed that temporal changes in the species and abundance of fishes and invertebrates was clearly water-temperature dependent, while the relationship with *Zostera* structure (shoot density, leaf length, and biomass) was not obvious.

Fresh water environment is another important part of coastal environment. Chen et al. (2016) studied a *GST*(*phi*) gene from macrophyte *Lemna minor* L. (duckweeds) involved in the response to cadmium exposure and revealed the adaptation mechanism of organisms in coastal fresh water environment. This free-floating macrophyte species is able to grow well in eutrophic and polluted water and to tolerate stresses caused by pollutants including heavy metal. Therefore, it was used as a potential scavenger for the purification of wastewater contaminated by heavy metals, herbicides, etc. (Arthur et al., 2005). Authors explored the molecular mechanism of responding by the plant to various pollutants under different stresses at gene level. The achievement shall be helpful for monitoring heavy metal pollution efficiently, and searching for high-sensitivity and pollutant-specific biomarkers.

With coastal biodiversity and biomass changes, the sustainably utilization of unstable bioresources becomes a very important issue. Theme 3 **Sustainable Utilization of Coastal Bioresources** is composed of four papers on four new coastal bioresources.

Ren et al. (2016) reported the optimization of four types of antimicrobial agents for increasing the inhibitory ability of mouthwash made from marine *Arthrobacter oxydans* KQ11 dextranase. This work may promote the design and development of future marine dextranase oral care products.

Yang et al. (2016) isolated and studied alkaloids from an algicolous strain of *Talaromyces* sp. The study offers a valuable reference to the research on enantiomeric mixtures with low or no signals in the chiroptical determination.

Jerusalem artichoke has been widely planted in saline-alkali soil as an economic crop. The utilization is of great significance. Compared with grain crops, J. artichoke is able to grow well in arid soil and saline land and resist many plant pests and diseases (Bajpai and Bajpai, 1991). Liu et al. (2016b) studied the pectin extraction of the plant and the antioxidant activities, and provided a basis for further structural analysis and evaluation on bioactivity of the pectin for potential application in food and medicinal industries.

Jellyfish *Cyanea nozakii* Kishinouye is a large plankton species. In recent years, it spreads widely from the East China Sea, the Yellow Sea, to the Bohai Sea of China and proliferates from late summer to early autumn. Although the tentacle venom of *C. nozakii* can pollute seawater and result in halobios

death, it is a potential marine bioresource, on which Li et al. (2016) investigated the hemolytic activity of the venom to canvass its potential utilization in medicinal fields.

Dealing with high-value utilization of coastal bioresources requires an integrative biotechnology approaches. Six papers are included in Theme 4 **Coastal Biotechnology** on the latest advancement in the fields of isolation and configuration of microbial natural products, and biomarker technology of coastal macrofauna.

Microbial natural products are an important source of both available and novel drugs (Solanki et al., 2008). In Zhang et al. (2016), a novel isobenzofuran derivative was isolated from the secondary metabolites of marine *Streptomyces* sp. W007, and its cytotoxicity was evaluated. The authors showed its selective inhibitory activities against human gastric cancer cells BGC-823, breast cancer cells MCF7, and lung cancer cells A549.

Marine microalgae are not only a primary producer at the base of marine food chain, but also an important source of marine bioactive materials (Samarakoon and Jeon, 2012). Marine diatom *Phaeodactylum tricornutum* is a potential livestock for combined production of eicosapentaenoic acid (EPA) and fucoxanthin. In Wu et al. (2016), six strains of marine diatoms *P. tricornutum* were cultured and compared in total lipid, fatty acid composition, and major photosynthetic pigments. One of them (strain SCSIO828) was found promising as a candidate for combined production of EPA and fucoxanthin.

Additional to fucoxanthin, C-phycocyanin (C-PC) is a unique light-harvesting protein in some algae, showing several pharmacological activities. Xia et al. (2016) revealed that the phycocyanin could inhibit alcohol-induced acute liver cell damage effectively in dose-dependent manner as demonstrated in mice test.

Members of the DnaJ family provide instructions for making proteins that play a pivotal role in various cellular processes, such as protein folding, protein transporting, and the cellular responses to stress (Walter and Buchner, 2002). In Liu et al. (2016a), the full-length DnaJ cDNA sequence as isolated from ESTs of *Pyropia yezoensis* (PyDnaJ) through RACE was identified and characterized. The results indicate that PyDnaJ was an authentic member of the DnaJ family in plant and algal, and is pivotal in mitigating the damage in *P. yezoensis* during desiccation.

With the development of photosynthetic measurement technologies, photosynthetic instruments, such as CO_2 and H_2O infrared analyzers, have been more widely applied for plant research in laboratory. These instruments can be used to determine dozens of photosynthetic parameters (Pons and Welschen, 2002). However, in coastal zone area, the photosynthetic parameters of non-flat leaves/green stems can hardly be acquired with photosynthetic instruments due to unusual morphology of the leaf/stem. To solve the problem, a simple, practical, and effective method was proposed by Qiu et al. (2016) to measure and calculate the photosynthetic parameters, by which photosynthetic parameter determination of the non-flat leaves/green stems plants can be realized.

The clam *Ruditapes philippinarum* (Adams & Reeve, 1850) is the native species in the Indian-Pacific region and has been widely cultivated as an important commercial shellfish in Chinese coastal waters. The quality and yield of *R. philippinarum* is highly susceptible to pollutants (Yang, 2007). Zhu et al. (2016) introduced the use of the antioxidant enzymes of the clam as biomarker to polycyclic aromatic hydrocarbon pollution.

We appreciate very much all the authors for their excellent studies and outstanding contributions to the scientific researches, and indebted to all the reviewers for their professional peer-review evaluations. Without these, this publication of special issue would not be possible. We hope the publication of the special issue will arouse recognition of scientists and technologists in their researches towards these important issues, and as well, for the government, to well blueprint the development of this critical zone for better human living with precious and sustainable natural resources.

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