



## Protective exploitation of marine bioresources in China

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### ABSTRACT

The China Seas possess a variety of marine bioresources; however, many problems have been caused by exploitation and mismanagement of the resources, ecosystem and environment. In present study, the status of Chinese marine bioresources, as well as the issues of exploitation and utilization of resources were analyzed and discussed. Over-fishing, pollution and other anthropogenic activities have resulted in the destruction of bioresources, especially acute degradation of fisheries, as well as a series of impacts such as deterioration of the environment, loss of habitat, decline of biodiversity, imbalance of the marine ecosystem and a reduction of productivity. Precious marine bioresources have been diminished by commercial inadequate processing and insufficient utilization. The principle of protective exploitation and other feasible strategies and management measures were proposed for the conservation, rehabilitation and utilization of marine bioresources in China. There is an urgent need for research on the bioresources and eco-environment of the China Seas, in order to establish controls and administration for protection of the marine environment and conservation of bioresources. It will be necessary to ensure compliance with fishing quota licenses to preserve marine fishery resources. Any exploitation of marine bioresources must be managed scientifically and implement the use of the latest advances in marine biotechnology.

### 1. Introduction

Marine bioresources have enormous potential for exploitation and utilization. Over-exploitation of marine resources, however, is a problem worldwide. Marine ecosystems and the corresponding exploited resources are exposed to considerable anthropogenic pressure worldwide, despite attempts to impose regulations in terms of economic and control instruments, and measures of stocks and catches (Doyen et al., 2007). The observation of marine ecosystems, and management and conservation of marine fishery resources, as well as other living marine resources, have attracted worldwide attention (Baran and Hambrey, 1998; Buzzelli, 1998; Chakalall et al., 2007; Cinner and Aswani, 2007; Davies et al., 2007; Engel et al., 1999; Floeter et al., 2006; Huang et al., 2001, 2003; Islam and Tanaka, 2004; Klaus et al., 2003; Rosenberg et al., 2006; Shleinik and Troyanovsky, 1998; Wang, 2015). Many international programs and projects have been launched to address the problems confronting the world's marine ecosystems and bioresources

(Cinner and Aswani, 2007; Davies et al., 2007; Huang et al., 2001; Klaus et al., 2003; Shleinik and Troyanovsky, 1998; Wang, 2015).

In the China Seas, the marine ecological environment is complex and diverse, which contains prolific biological resources. However, many problems have occurred as the result of uncontrolled exploitation and utilization of these bioresources by humans. Marine bioresources are linked broadly to marine and coastal environments as well as estuaries, and it is necessary to consider the problems on a large scale. Herein, the status of Chinese marine bioresources, as well as the issues of exploitation and utilization of resources was analyzed and discussed. Strategies of protective exploitation and feasible measures for the development of Chinese marine bioresources are proposed.

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Fig. 1. The main marine fishery grounds in China Seas, 1: The Bohai-Yellow Sea fishery ground, main fishery products: *Larimichthys polyactis* (Bleeker), *Trichiurus japonicus* (Temminck & Schlegel), *Engraulis japonicus* (Temminck & Schlegel), *Scomberomorus niphonius* (Valenciennes), *Setipinna taty* (Valenciennes), *Portunus trituberculatus* (Miers), *Fenneropenaeus chinensis* (Osbeck), *Trachypenaeus curvirostris* (Stimpson); 2: The East China Sea fishery ground, main fishery products: *L. polyactis* (Bleeker), *T. japonicus* (Temminck & Schlegel), *S. niphonius* (Valenciennes), *Scomber japonicus* (Houttuyn), *P. trituberculatus* (Miers), *T. curvirostris* (Stimpson), *Uroteuthis edulis* (Hoyle), *Sepiella maindroni* de Rochebrune; 3: The South China Sea fishery ground, main fishery products: *Decapterus maruadsi* (Temminck & Schlegel), *T. japonicus* (Temminck & Schlegel), *Saurida tumbil* (Bloch), *S. undosquamis* (Richardson), *Priacanthus tayenus*, *Lutianus erythropterus* (Bloch), *Trachurus japonicus* (Temminck & Schlegel), *U. chinensis* (Gray).

## 2. The status of marine bioresources in the China Seas

### 2.1. The marine bioresources in the China Seas

The vast China Seas, a specific biogeographic region with complex and multifarious ecological environments, possesses abundant marine biological resources. The continental shelf fishery area of the China Seas is  $280 \times 10^4 \text{ km}^2$  in total, and is divided into three fishery grounds: the Bohai-Yellow Sea fishery ground, the East China Sea fishery ground, and the South China Sea fishery ground (Fig. 1). The Bohai Sea, a semi-enclosed inner sea encircled by terrain from north, west and south, is an important fish spawning area. The Yellow Sea, a shallow epicontinental sea between China, Korea and South Korea, is an indispensable region for fish shoals living through the winter to swim back to the coast to search for food and to lay eggs. The East China Sea,

an open sea located at the northwest of the Northwest-Pacific Ocean, is the most profuse fishery ground in China with the highest productivity. While the South China Sea, an abyssal plain more than 4000 m deep between the Pacific Ocean and the Indian Ocean with high air temperature propitious for the propagation of plankton, is an enormous tropical fishery ground with numerous species of fish and other tropical marine organisms.

The average biological productivity in the China Seas is about  $2.67 \text{ t/km}^2$ , and the total biological productivity is up to 12.61 million tons (Fu et al., 2006). The predominant geographic environment of the China Seas contains many forms of eco-environment, showing marine biodiversity and ecosystem diversity. In the China Seas there are six major ecosystems possessing various categories of marine organisms; (1) the Bohai Sea, (2) the Yellow Sea, (3) the East China Sea, (4) the South China Sea, (5) the estuary, and (6) the Japan Current ecosystems

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