

## STOCK ENHANCEMENT AND SEA RANCHING; PRACTICES AT ZHANGZIDAO ISLAND IN THE NORTHERN YELLOW SEA

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Zhangzidao Island is located in the northern Yellow Sea and is comprised of nine islets. The land area is only 14 km<sup>2</sup>, but the islets are surrounded by ~60,000 ha of inshore coastal seas. The environment is characterized by less influence from the mainland, unobstructed currents, suitable water temperatures, stable salinity, muddy and sandy bottom, and relatively high primary productivity. These conditions make the Zhangzidao coastal area ideal for stock enhancement and sea ranching.

The Zhangzidao Fishery Group Co., Ltd, was authorized to farm a coastal area of nearly 40,000 ha. Currently, 26,500 ha are used for stock enhancement of scallop *Patinopecten yessoensis*, 660 ha for sea cucumber *Apostichopus japonicus*, 100 ha for abalone *Haliotis discus hannai*, and 10,000 ha for arkshell *Scapharca broughtonii* enhancement. Zhangzidao has several hatcheries, with a total water volume of 15,000 m<sup>3</sup> used to produce larva/seeds for stock enhancement and sea ranching. In 2005, 20 million abalone seed, 200 million sea cucumber seed, 2,000 million scallop seed, 15 million sea urchin seed and 5 million conch seed were produced and released into the sea. Total harvest reached 28,000 tons, with a value of more than \$60 million (\$US), and a profit of \$18 million (\$US).

Tremendous efforts have been made to “optimize” or improve ecological conditions, including propagation and planting of seaweeds and artificial reef construction. Up to now, about 13,300 ha have been optimized, including 1,300 ha for stock enhancement of abalone, sea cucumber and sea urchins, 10,000 ha for scallops, and 2,000 ha for fishes.

Based on scientific investigations and planning, a coastal preserve covering 650 ha was established for protecting natural stocks of abalone (*Haliotis discus hannai*), sea cucumber (*Apostichopus japonicus*), sea urchin (*Anthocidaris crassispina*) and other native species. Scallop *Patinopecten yessoensis* was introduced into the northern Yellow Sea from Japan in 1980, and the stock also was preserved in this area. The natural stocks preserved in this area ensure availability of broodstock for larval rearing and hatchery-releases.

Successful stock enhancement and sea ranching depend upon scientifically-based management and planning. Zhangzidao established a Technology R&D Center to undertake stock enhancement and sea ranching related research, and established close cooperative relationships with universities and research institutes. Expertise from these institutions has provided timely technical support for developing strategies and implementing stock enhancement and sea ranching activities by the Zhangzidao Fishery Group.