Development of a new method for recovering *Zostera* bed in cooperation with fisherman

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Zostera marina Linnaeus has a wide distribution in the northern hemisphere in temperate zone. It grows in the calm and inner coastal areas and forms a dense population called '*Zostera* bed' on the sandy or muddy bottom. This bed performs a major role as a primary producer in the coastal ecosystem and serves coastal fish and other animals with an important nursery ground. In Japan, *Z. marina* distributes in almost of all coastal regions, but since the 1950s the beds have decreased drastically. So, recovering programs have started since the 1960s in various regions for conservation of the coastal environment and propagation of fishery recourses. There are several effective methods for recovering the bed, but the procedures of these operations are difficult and complex as routine works because of using special machines or technologies and much SCUBA diving efforts. In this study, I introduce a simple, convenient and effective method for recovering *Zostera* bed, applying co-work with fisherman in Ago Bay, central Japan.

For the first time, we must collect a lot of seeds from late spring to summer in flowering season of the plants. Reproductive shoots with developing seeds were pick up from the beds, and enclosed in mesh bags for promoting maturation of seeds in sea water for about a month. Fully matured seeds were reserved under low temperature condition of 0-4 C. In late autumn when water temperature decrease to lesser than 20 C, the seeds begin to germinate. We developed a new base to scatter seeds and grow plants, named '*Zostera* mat'. This mat was 50 x 50 cm in width, 2 cm in thickness and about 1.2 kg in weight, and constructed by four layers, iron mesh net of 4 cm, jute mesh net of 2 mm, jute fiber mat of 5 mm in thickness and iron mesh net of 4 cm, on sequentially. Seeds were sowed between jute mesh net and jute fiber mat. Then, many bases were connected with cotton ropes in a row at intervals of 50 cm. So, the bases were settled on the sea bottom continuously on the straight from small boat. Many seeds germinated after a month, and grew to adult plants after three months. We set 250 and 400 bases of *Zostera* mat in 2004 and 2005, respectively. Growth pattern and seasonal changes in density of *Zostera* bed were surveyed. Optimal and upper limit temperatures for germination and growth of this plant were also studied in the laboratory.

There are several advantages of this *Zostera* mat as followings. When seeds germinate, seedlings can put the roots in the jute mat and help to attached tightly to the bottom. To connecting with ropes in a row, it is easy to set many bases on the sea bottom without much SCUBA diving efforts. Fisherman can do all procedures of the routine works, such as collecting mature plants, promoting maturation of seeds, reserving seeds, sowing seeds in the base and settlement of bases on the sea bottom without special machines and difficult technologies. This base is made by natural materials such as iron, jute and cotton, i.e. environment-friendly resources.

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