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Development of Coastal Management Method to Realize the Sustainable Coastal Sea

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Key words: ICM, Sustainability, Trans-disciplinary study

This study on coastal management methods for realizing clean, productive, prosperous and sustainable coastal seas was carried out from 2014 to 2018. The conclusions are summarized as follows:

1) The cleanliness and productivity of a coastal sea is quantitatively defined by the appropriate transparency corresponding to the chl.a concentration at which zooplankton grazing saturates. The prosperity and sustainability of a coastal sea is defined by the integrated value of combined natural and social scientific indexes.

2) Expanding the sea-grass bed area is found efficient for preventing red tide and hypoxia occurrences in eutrophicated estuaries.

3) A trans-disciplinary study was carried out in Shizukawa Bay, Tohoku, Japan, to establish sustainable aquaculture based on discussions among scientists, fishermen, local government officials and related NPOs.

4) A three-step management structure, which is local, regional and intergovernmental structures, is proposed for the environmental conservation of international coastal seas such as the Japan Sea.

5) An economic assessment was carried out in the Seto Inland Sea to evaluate temporal variation in its economic value in connection with the relationship between humans and nature.

6) An integrated numerical model of coastal seas is developed by combining the land, open ocean, seabed and air areas, and the natural, social and human scientific results.

A successful integrated coastal management method for the Japanese *satoumi* (a coastal sea with high biological productivity and high biodiversity due to harmonized human activities) is proposed in Fig. 1. The results of this project have been published in a Japanese book (Yanagi, ed., 2019a) and an English book (Yanagi, ed., 2019b) (Fig. 2).

Yanagi, T., ed. (2019a) *Satoumi Kanriron* (Satoumi Management), Nourin-Tokei Kyokai, Tokyo, 367 pp. (in Japanese)

Yanagi,T., ed. (2019b) *Integrated Coastal Management in the Japanese Satoumi; Restoring Estuaries and Bays*, Elsevier, London, 241 pp.

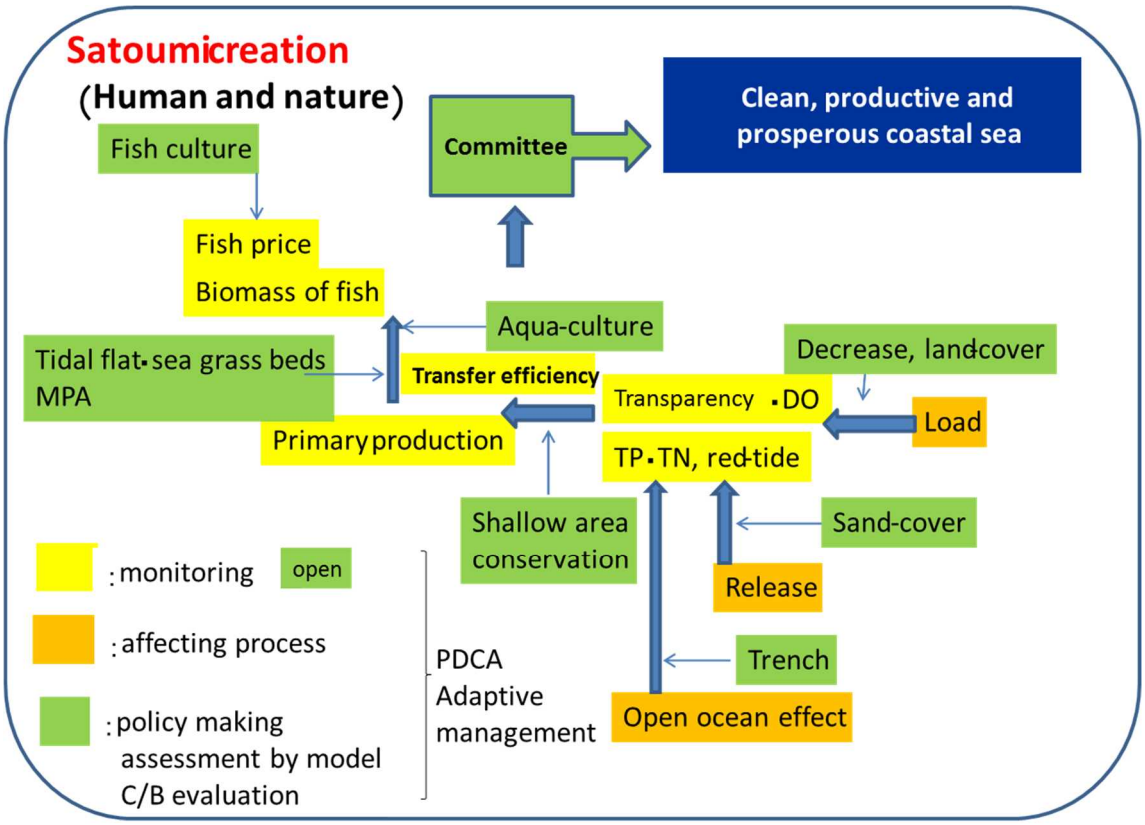

Fig. 1 Management method for achieving a clean, productive, prosperous and sustainable coastal sea.

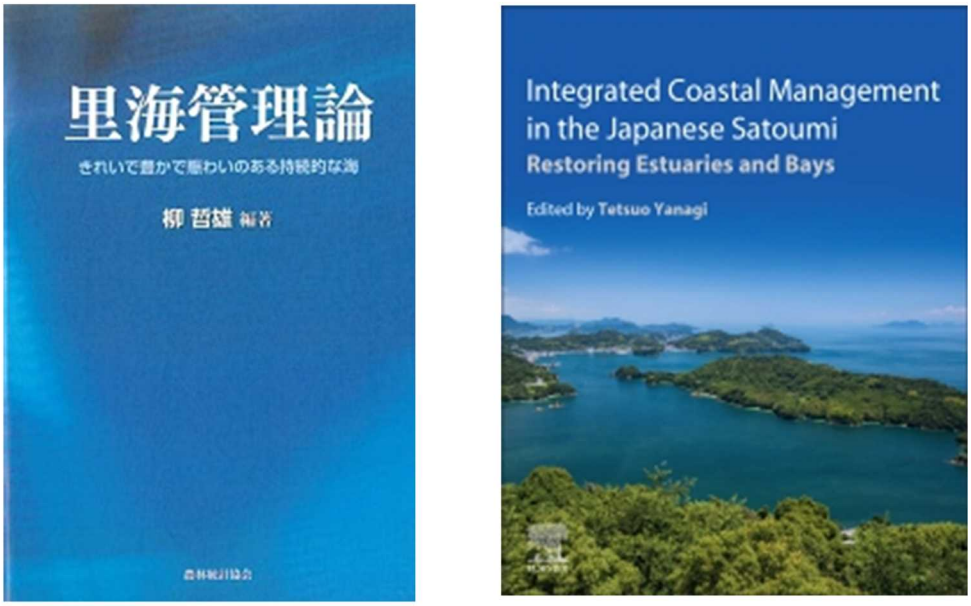

Fig. 2 Published books (left: 2019a, right: 2019b).