Ocean Ecosystem Conservation and Seafood Security for Future Generation
－ A Case Study of Ecosystem Approach to Fisheries and the Adaptive Management of the Shiretoko World Natural Heritage Site

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1. Human dimensions of global change in marine ecosystem

Marine ecosystems are impacted by global-scale climate variability and change. It was recognized, however, that human activities such as intensive fishing also have strong impacts on marine ecosystems, which may occur on more immediate time scales than those of climate change. The recent international ocean research programs such as IMBER (Integrated Marine Biogeochemistry and Ecosystem Research) focus on the human dimensions of global change in marine ecosystems, and expand on the concept of coupled marine social-ecological systems. Fisheries management is evolving towards ecosystem-based approaches from the study and management of single species. Efforts are now being made to measure and alleviate the ecosystem effects of fishing (Hall 1999) and focus is very much on how an Ecosystem Approach to Fisheries (EAF) may be implemented (Garcia and Cochrane 2005).

Further, a full social-ecological system approach to the management of marine resources must involve multiple-scale (from government to local fishing sectors) objective setting based on societal choices, including ecological, economic and social considerations. Operational objectives need to be established, requiring the identification of indicators and reference points for sector impacts. Decision support and performance evaluation rules need to be established, including their uncertainties. Future change in marine systems will not be due to climate alone, but to the interactions of climate variability, climate change, and direct-human effects, and future marine research and management must take account of this reality. How to evaluate the ecological status of the world's exploited marine ecosystems subject to multiple drivers is to bring together a broader group of experts to further explore, test and expand the development of a suite of robust ecosystem indicators for detecting ecosystem change in response to fishing and environmental impacts.

2. EAF and adaptive fisheries management of the Shiretoko World Natural Heritage Site, Hokkaido, Japan

Marginal seas contribute a substantial share to the world fisheries catch are hence significantly impacted by human exploitation. Additionally these areas are increasingly affected by climate variability and change. For log-term sustainable utilization of marine resources in marginal sea, local fisher’s awareness change regarding the EAF and adaptive fisheries management may be needed. Adaptive management predicts and monitors changes in the ecosystem and subsequently reviews and adjusts the management and use of natural resources (Matsuda et al., 2009). Such predictions and monitoring are best accompanied by feedback controls, such as the verification of hypotheses based on the results of monitoring in order to review and

modify management activities.

Fisheries management in Japan is characterized by seeking balance between sustainable use and ecosystem conservation and involving the co-management of fishers' organizations (Makino et al., 2008). Fisheries in Japan face several important challenges, e.g., (i) exclusive use by fisherman with fishery rights/licenses (there are few exceptions for free-fisheries and recreational angling), (ii) lack of full transparency in management procedures, (iii) lack of objective benchmarks or numerical goals in management plans, and (iv) strong dependency on political pressure from abroad. Here, we elaborate upon these characteristics of and issues facing the management of marine ecosystems in Japan (Matsuda et. al., 2009).

We will present the Marine Management Plan for the Shiretoko World Natural Heritage Site, Japan, as a case study of adaptive marine ecosystem management and co-management of coastal fisheries.

The Oyashio shelf region and the seasonally ice-covered areas north of Hokkaido including Shiretoko are highly productive, supporting a wide range of species such as marine mammals, seabirds and commercially important species in the western subarctic Pacific (Sakurai, 2007). Shiretoko is the third World Natural Heritage Site registered in Japan and earned this title because of its (i) formation of seasonal sea ice at some of the lowest latitudes in the world, (ii) high biodiversity, and (iii) many globally threatened species. The natural resource management plan of the Shiretoko site is characterized by transparency and consensus building, because (i) UNESCO and IUCN require that the plan be sustainable; and (ii) the Government of Japan has guaranteed local fisheries that there will be no additional regulations included in the plan. The Marine Management Plan describes which species and factors are monitored, how these data are evaluated, and how the benchmarks specified by ecosystem management are determined. The Plan will provide a valuable example for the establishment of "environment-friendly fisheries" in Japan and other countries, because it includes voluntary activities by resource users that are suitable for use in a local context, flexible to ecological/social fluctuations, and efficiently implemented through increased legitimacy and compliance. This approach is appropriate for developing coastal countries where a large number of small-scale fishers catch a variety of species using various types of gear (Matsuda et al., 2009).

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