

Protection and co-management of inland fishery resources of Kalimantan, Java and Sumatra, Indonesia

Dede Irving HARTOTO

LIPI - 10212

Researcher,
Research Center for Limnology, Indonesian Institute of Sciences



Japanese Advisor : Toshio IWAKUMA
Professor, Hokkaido University

An inland water fishery reserve is a management tool to sustain capture fishery in adjacent inland water bodies by supplying brood stock and fingerlings and providing natural habitat for spawning, nursery, feeding and refuge. and to conserve fish diversity. Although inland fishery reserve has a long history of management in Indonesia, yet it lacks adequate scientific foundation for its development. Existing inland fishery reserves of Indonesia are mostly located in floodplain system of major rivers. Current development in limnology highlights the importance of information on ecological integrity and ecological connectivity of inland water as the basis of ecosystem approach in aquatic system management.

In Chapter 1, physico-chemical features of water column were studied as an indicator of ecological integrity of floodplain systems in Lake Loa Kang Fishery Reserve (LLFR, 930 ha in surface area) in East Kalimantan and to identify the features of physico-chemical temporal connectivity of an oxbow lake of Kahayan River (Lake Takapan, 50.42 ha in surface area) in Central Kalimantan.

The ecological integrity was studied in LLFR as one of the Mahakam River floodplain system. Ten samplings stations representing various ecological habitats were surveyed for six times in 2003-2004. Data on physico-chemical parameters, fractions of nitrogen and phosphorus nutrients, total and dissolved organic matters, humic acid, heterotrophic bacteria and sulfide ion was taken. Daily water level was monitoring (385 days) showed that the flood pulse of the Mahakam River was unimodal, with a short period of no response. No significant difference was found between stations for all parameters except for dissolved oxygen, although many of the parameters showed temporal variation. Randomization test indicate that with increasing water level, significant increases were observed for DOC, humic acid, $\text{NH}_4\text{-N}$ and TN/TP ratio, whereas significant decreases were found for $\text{NO}_3\text{-N}$, TN, TP, PP, TIP, TAHP, TOP, PIP, PAHP, DOP and POP concentrations. Confidence limits of several parameters were proposed as indicators of general water quality standards for assessing ecological integrity. Suspended solid and humic acid were the special key parameters because of correlations with many other parameters.

Daily changes of water level and water quality were monitored for 485 days in 1996-1997 in Lake Takapan. Nutrients were measured ten times for $\text{NH}_4\text{-N}$, $\text{NO}_2\text{-N}$, $\text{NO}_3\text{-N}$, TN and TP. The flood pulse, was polymodal with noises and a

longer period of no response. Randomization test showed that with increasing water level, pH, DO, ORP, TN/TP ratio decreased whereas NO₂-N and TP increased. The patterns of seasonal changes in the TN/TP ratio and TP were opposite as compared with those for LLFR.

In Chapter 2, experiences in the implementation of co-management were described especially in resolution of conflicts and scientific bases for utilization of inland fishery resources. The study was made in provinces of Central Java (Lake Rawa Pening, 2500 ha), West Sumatra (Lake Maninjau, 9738 ha) and Jambi (fishery reserves system in River Batanghari). Limnological survey, interviews with local community organizations, review of available publications and personal participation in planning and implementation of special training as a part of empowerment program for conflict resolution among stakeholders and in development of scientific and technical foundation for introduction of fishery reserves system. The lessons learned consist of the requirement for formal adoption of seven universal spiritual principles related to management of natural resources (i.e. human is the lender not the owner of natural resources, the spirit of everlasting progressiveness etc), the necessity to share as earliest as possible of limnological scientific facts with local resource users and the urgent needs in the



Photo of my self and my professor (Prof. Dr. Toshio Iwakuma) after the final presentation of my dissertation at Graduate School of Environmental Earth Science, Hokkaido University, Sapporo, 23 March 2007

empowerment on scientific principles of resources management for all stakeholders. The co-management system was proved to be effective for resolving problems related to the development of inland fisheries in Indonesia. Improvement of management guidelines for the developments of Indonesian inland fishery reserves was proposed based on the present results.