

Beardmore, J.A. & Porte, J.S. 2003. Genetically modified organisms and aquaculture. FAO Fisheries Circular. No. 989. Rome, FAO. 35 pp.

This document was written by John A. Beardmore and Joanne S. Porte, under the supervision of Devin Bartley (FIRI), as part of an overall presentation on the role of genetically modified organisms (GMOs) in aquaculture given at a special session organized by FAO and the World Aquaculture Society on 27 April 2002. The production of appropriate GMOs offers considerable opportunities for more efficient and more effective aquaculture across a wide range of species. Although this potential is being realized in crop production, with over 60 million ha under cultivation, there has been no commercial use of GMOs in aquaculture. The authors review the nature of GMOs, the range of aquatic species in which GMOs have been produced, the methods and target genes employed, the benefits to aquaculture, the problems attached to the use of GMOs, and the regulatory and other social frameworks surrounding them. They conclude with a set of recommendations aimed at best practice.

Lovatelli, A., Walters, R. & Anrooy, R. van. (eds.). 2003. *Report of the Subregional Workshop to Promote Sustainable Aquaculture Development in the Small Island Developing States of the Lesser Antilles*. Vieux Fort, Saint Lucia, 47 November 2002. FAO Fisheries Report. No. 704. Rome, FAO. 122 pp.

The workshop was organized by the FAO Subregional Office for the Caribbean in collaboration with the Development Planning and Inland Water Resources and Aquaculture Services of the FAO Fisheries Department, Rome. It was hosted by the Government of Saint Lucia and attended by 15 participants from seven countries, four regional institutions and the FAO Fisheries Department. The syntheses of the national experiences and status of aquaculture development in the Lesser Antilles reflected a significant level of diversity in the scale of activities among the island nations; they also revealed many similarities in the results and present status of aquaculture development in the subregion. The case studies elicited very positive comments and enquiries from the country representatives.

In the plenary deliberations, to identify the constraints to and opportunities for developing aquaculture sustainably in the subregion, participants recognized the need to rank the aquaculture development activities based on individual country-priorities and stage of development. The workshop agreed that participants would consult with the decision-makers in their respective countries and communicate a priority-list of needs for possible technical assistance to the technical secretary of the workshop. It was also agreed that such a list would be used to identify common themes that could form the basis for a possible subregional Technical Cooperation Programme (TCP) project proposal.

FAO Inland Water Resources and Aquaculture Service, Fishery Resources Division. 2003. *Review of the state of world fishery resources: inland fisheries*. FAO Fisheries Circular. No. 942, Rev.1. Rome, FAO. 60 pp.

The objective of this review is to present a broad view of the state of inland capture fisheries as of 2001. Status and trends are reported, along with coverage of selected sections on the impacts of dams on fisheries, fisheries in rice-based ecosystems, database on African water resources, indices of human development and environmental sustainability, and new approaches to improving inland fishery information.



Inland capture fisheries production was reported to FAO by 150 countries, with a total production of 8.7 million metric tonnes (mmt) in 2001. Inland capture fisheries accounted for 6.1 percent of the global total capture fisheries and aquaculture production. The 15-year (1986–2001) trend in production is mainly positive, with 109 of the 150 countries maintaining stable or increasing outputs; 81 percent of the production was from these countries where capture fisheries is stable or slowly increasing.

By continent, inland capture fisheries production was 5.8 mmt from Asia; 2.1 mmt from Africa; 0.3 mmt from Europe and South America each; 0.2 mmt from North America; and 22 thousand metric tonnes (tmt) from Oceania. Twenty countries accounted for 84 percent of the total global inland capture fisheries production, with the top producers being China (2.1 mmt), India (1.0 mmt) and Bangladesh (0.7 mmt). Based on production per se, most of the important inland fisheries countries are in Asia and Africa.

Inland capture fisheries are an important source of animal protein. In seven countries, inland fisheries provided the only source of fish; in 20 additional countries they accounted for 81 to 99 percent of total fish production from all sources; in four countries they accounted for 61 to 80 percent of total production from the aquatic sector. Seventy-one Low-Income Food-Deficit Countries (LIFDCs) produce 80 percent, nearly 7 mmt, of the world total inland capture fisheries output. In 27 of the LIFDCs, inland capture fisheries are the sole source of fish, and in an additional 22 countries they account for at least 81 percent of the total inland fish production. In an additional three countries, inland capture fisheries make up at least 61 percent of inland production.

The Human Development Index (HDI) measures a country's achievements in three aspects of human development: longevity, knowledge and a decent standard of living. In 33 countries with low HDIs, inland capture fisheries are the sole source of inland fish in 16 and account for at least 81 percent of inland fish production in an additional 14 countries. Inland capture fisheries production is very important in the fish supply of nearly all of the countries with low HDIs. A threat to the sustainability of inland fisheries is degradation of the environment.

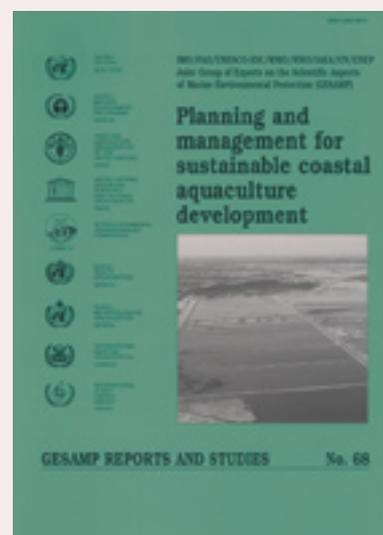
The Environmental Sustainability Index (ESI) is a measure of overall progress towards environmental sustainability that has been developed for 142 countries, of which 133 reported inland capture fisheries production. Globally, 94 of the inland capture fisheries countries have ESIs that range from moderate to high, while there are only 39 that range from moderately low to low. Thirty-four (59 percent) of the countries that are highly dependent (i.e. inland fisheries provide at

least 81 percent of the total fish supply) on inland fish production for their fish supply have at least a moderate ESI. Of potential concern are the inland fisheries countries for which the ESI ranges from moderately low to low and for which the 15-year trend in production is slowly or moderately decreasing; ten countries fall into this category.

GESAMP (IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection) 2001. Planning and management for sustainable coastal aquaculture development. Rep. Stud. GESAMP, (68): 90 pp.

The coastal zone is characterized by ambiguities of resource ownership and complex interactions between resources, ecosystems and resource users. It has been widely recognized that to address these complexities and to promote sustainable development in the coastal zone, a more integrated approach is needed, ideally within the framework of Integrated Coastal Management (ICM).

The rationale for more integrated approaches to aquaculture development is powerful: coastal aquaculture has brought significant economic and employment benefits to both national economies and coastal people throughout the world; aquaculture is highly vulnerable to pollution caused by other resource users; if poorly designed or managed, it may cause pollution or the spread of disease; its impacts are often limited but incremental and cumulative; and it often takes place in areas where resource ownership or use rights are ill



defined and ambiguous. Efforts to integrate aquaculture into coastal management can contribute to improvements in selection, protection and allocation of sites and other resources for existing and future aquaculture developments.

This report is based on a review of literature and experience relating to the planning and management of aquaculture development and its integration into coastal area management. It explores in detail how more planned and integrated approaches can be applied to aquaculture development. These approaches range from "enhanced sectoral" initiatives, to incorporation within comprehensive ICM programmes.

No simple, effective and widely applicable models have been identified. The most appropriate approach will depend upon a wide range of local factors, including available skills and resources, the urgency of the problems or opportunities, and the nature of existing planning and development frameworks. The less comprehensive approaches may be the only realistic option in some situations, but should be seen as a starting point for, and stimulus to, more comprehensive ICM. These approaches should contribute to more systematic planning and improved management of individual aquaculture operations, as well as to the coastal aquaculture sector as a whole.

This report is available in English at:  
<ftp://ftp.fao.org/fi/document/gesamp/y1818e00.pdf>  
and Chinese at:  
<ftp://ftp.fao.org/docrep/fao/006/y1818c/1818c00.pdf>

The FAO Fisheries no. 886 revision 2 (FIRI/C886(rev.2) "Review of the state of world aquaculture" is now also available in the four languages, Arabic, Chinese, French and Spanish.

Larinier M. , Travade F. & Porcher J.P. 2002. Fishways: biological basis, design criteria and monitoring. Bull. Fr. Pêche Piscic., 364 Suppl., 208 pp. Published by FAO, Cemagref Editions & CSP.

The authors outline in this paper the basic principles that can be used as a guide for planning fish passage facilities at dams or obstructions. The first part addresses the negative effects of barriers across rivers on natural fish populations, contributing to the reduction of abundance and even the extinction of species. French statutory legislation on fish passage at obstructions is given. Functional features and design parameters are described for different types of fish facilities, focusing on the advantages, the limits and the cost of each type: pool-type fish passes, baffle fish passes, fish locks, fish elevators, natural bypass channels and pre-barrages. Stress is laid on the importance of the location of the fishway, hydraulic conditions and the low discharge at the entrance. Special mention is made of fish facilities for shad, young eels and elvers. Various monitoring techniques to evaluate fish passage efficiency are presented (trapping, automatic counters, video recording, telemetry). Fish passage through culverts, rock weirs and at estuarine obstructions is addressed. Finally, downstream migration problems at hydroelectric power plants are discussed: evaluation of fish mortality in spillways and hydraulic turbines, design of fish screening and alternative behavioural diversionary techniques used to prevent entry of downstream migrants into intakes. Special mention is made of the most popular technology in France, i.e. surface downstream bypasses associated with conventional trashracks, focusing on their design criteria, advantages and limits.

Dams, fish and fisheries. Opportunities, challenges and conflict resolution. (Marmulla, G., ed.). 2001. FAO Fisheries Technical Paper. No. 419. Rome, FAO. 166 pp.

The four papers presented in this publication address major fishery issues in relation to dams as identified by the World Commission on Dams (WCD) and FAO for the purpose of WCD's global reviews on "Dams and Development". Characteristics of river and reservoir fisheries in various regions of the world are reviewed. Production figures for reservoirs in Africa, Asia, Latin America and the Caribbean, as well as for the Commonwealth of Independent States, are given. Fish production figures for large

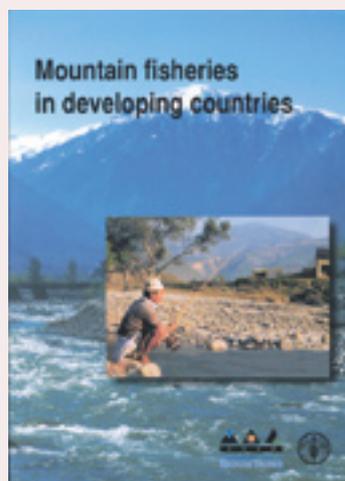


rivers are also provided, emphasizing the importance of floodplains for fish production. A non-exhaustive review of the current status of the use of fish facilities at dams throughout the world is presented, with the main target species considered from North America, Europe, Latin America, Africa, Australia,

New Zealand, Japan and Asia. Fisheries management capacity and information base requirements are reviewed for the six phases of the dam project cycle, i.e. identification, design, project appraisal, construction, operation and decommissioning. Effective environmental assessment and management coupled with improvements in design of civil engineering structures have made some recent dam projects more fish friendly and environmentally acceptable. The need for drafting legal instruments that will facilitate modification of dam structures to incorporate mitigation measures and help alter dam operation rules to be more beneficial to fish biodiversity and fisheries is emphasized.

Petr, T. 2003. *Mountain fisheries in developing countries*. Rome, FAO. 55 pp.

With the present document, which reviews the current status of capture fisheries and aquaculture in the mountains of developing countries of Asia, Latin America, Africa and the Pacific, the FAO Fisheries Department contributes to the efforts of the United Nations to promote sustainable mountain development. Mountains of the world cover about one fifth of the land surface, are home to one tenth of the world's population, and provide livelihood to some of the poorest communities in the world. Mountain lakes and streams are a source of freshwater for countless riparian human communi-

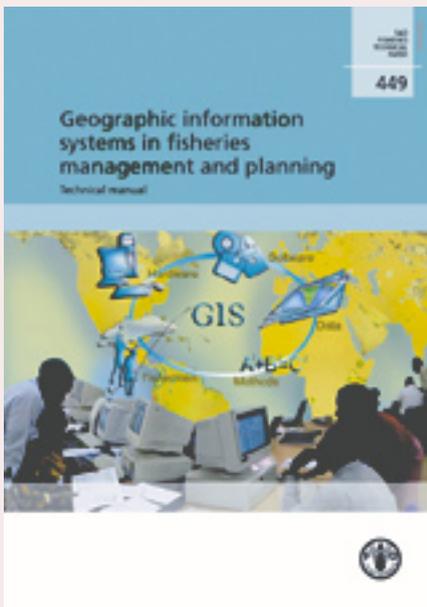


ties, support industries, and provide water for irrigation and hydropower electricity production and for fish. Some countries situated in mountain areas are landlocked, with no access to marine fishery resources; hence, the fish of lakes, streams, rivers and reservoirs are an important source of animal protein, always in short supply in mountain countries. As fisheries play an important role in providing food and income to people in mountain areas, they must be integrated into rural development and water resource development initiatives. Several problem areas are common to neighbouring countries in mountain regions and fishery resources, such as migratory fish stocks, may have to be shared. Specific action programmes for mountain countries, with collaborative actions on a regional scale, may become the most cost-effective way to address those common problems and share experiences.

De Graaf, G., Marttin, F.J.B., Aguilar-Manjarrez J. & J. Jenness. FAO. 2003. *Geographic Information Systems in fisheries management and planning*. Technical manual, FAO Fisheries Technical Paper. No. 449. Rome. 173 pp.

Many fishery biologists and policy makers involved in inland fisheries management and planning are unaware of GIS technology and its potential for fisheries planning and management. The FAO Inland Water Resources and Aquaculture Service (FIRI) has been active for the last 19 years in promoting the use of GIS and remote sensing in fisheries and aquaculture. Promotional activities have been carried out through training, projects, field missions, and oral presentations and publications. However, a manual to use along with GIS software for the fisheries biologist in the field explaining GIS in a way that is understandable to non-GIS users had not been produced until now. This manual was written to overcome this knowledge-gap; it is a "do-it-yourself" manual giving a short introduction to GIS software and its applications in fishery science.

The overall objective of this manual is to encourage fishery managers to use this tool (GIS) to foster the sustainable use of natural resources. The manual is aimed at fisheries biologists, aquatic resource managers and decision makers in developing countries who have no knowledge about GIS. The manual was written for use with ESRI's ArcView 3.x and Spatial Analyst software.



There are five main sections in the manual:

- GIS concepts and functions and key tools provided by ArcView 3.x,
- Geographic coordinate system and map projections,
- Raster data and analysis,
- Regression analysis, and
- Application case studies.

All sections are accompanied by exercises that have been designed to illustrate key applications of GIS in inland and marine fisheries management. Also, a custom-designed ArcView grid regression extension is included to show the integration of GIS with surplus production models.

At the end of the training with this manual, readers should be able to: apply learned principles and GIS to their own professional situations, perform analyses on their own data, be aware of the vast possibilities that GIS can provide and be able to communicate with GIS expert counterparts.

The manual is useful for a broad range of fishery applications. However, it by no means covers all possibilities of GIS, it merely touches upon some of the most important features for fisheries management and planning.

Arthur, J.R., Phillips, M.J., Subasinghe, R.P., Reantaso, M.B. & MacRae, I.H. (eds.) 2002. Primary aquatic animal health care in rural, small-scale, aquaculture development. Technical proceedings of the Asia Regional Scoping Workshop. Dhaka, Bangladesh, 27-30 September 1999. FAO Fisheries Technical Paper. No. 406. Rome, FAO. 382 pp.

This document is the Technical Proceedings of the Asia Regional Scoping Workshop on "Primary Aquatic Animal Health Care in Rural, Small-scale, Aquaculture Development," held in Dhaka, Bangladesh from 27 to 30 September 1999. The workshop was organized by the Department for International Development of the United Kingdom (DFID), the Food and Agriculture Organization of the United Nations (FAO) and the Network of Aquaculture Centres in Asia-Pacific (NACA), and hosted by the Ministry of Fisheries and Livestock of the Government of Bangladesh (GoB). The objectives of the workshop were two fold: (1) to review information on socio-economic impacts, risks of disease incursions and health management strategies in rural, small-scale aquaculture and enhanced fisheries programmes; and (2) to identify potential interventions for their better health management and appropriate follow-up actions. The workshop was attended by 48 participants from 12 countries and is complementary to the efforts of FAO, NACA and others to assist countries within the Asian Region to develop effective policies and improve capacities to minimize the impacts of aquatic animal disease outbreaks. The workshop was preceded by several case studies in countries of the Asian Region that explored the social and economic impacts of aquatic animal disease on the livelihoods of people involved in small-scale aquaculture and enhanced fisheries. The



workshop largely focused on understanding the impacts of aquatic animal health risks in small-scale rural, low-input aquaculture and enhanced fisheries and evaluating their impacts on rural livelihoods. The workshop also attempted to derive appropriate management interventions to deal with health risks within rural livelihood programmes involving aquaculture and enhanced fisheries.

The workshop was a unique event bringing together experienced aquatic animal health specialists, aquaculturists, sociologists, economists, extension specialists and rural development practitioners in the Asian Region. Although quantitatively estimating the overall impacts of disease on rural livelihoods was difficult due to lack of adequate socio-economic information, the consensus among the workshop participants was that aquatic animal health problems are a risk to the livelihoods of people involved in small-scale aquaculture and enhanced fisheries in Asia. From the information derived from specific case studies, it was clear though that health problems impact on the livelihoods of rural, resource-poor aqua-farmers, fishers and their dependants, through loss of production, income and assets. A necessity to better quantify the livelihood impacts was clearly identified. The workshop agreed that the risks to sustainable livelihoods from the introduction of aquatic animal pathogens and health problems originate from several fundamental inadequacies, with lack of knowledge in understanding and managing risks being a major basis for concern. The workshop considered that health management interventions should be a component within programmes aimed at harnessing aquaculture's potential for rural development. It was also recognized that aquatic animal health problems in inland enhanced fisheries systems are often beyond the control of rural communities, making the livelihoods of rural poor most at risk when serious disease outbreaks occur. While the risks and impacts of disease in small-scale aquaculture and enhanced fisheries vary between countries and localities, and the management interventions for mitigation may differ, the workshop identified a number of strategies with the potential to reduce risks to livelihoods from such problems. This Technical Proceedings, including the case study papers, presentations, discussions and findings from the workshop, represents a valuable and unique collection of information on aquatic animal health in small-scale aquaculture and enhanced fisheries within the Asian Region.

Travaglia, C., Profeti, G., Aguilar-Manjarrez, J. & Lopez, N.A. 2004. Mapping coastal aquaculture and fisheries structures by satellite imaging radar: *Case study of the Lingayen Gulf, the Philippines*. FAO Fisheries Technical Paper. No. 459, FAO, Rome. 44 pp.

Inventory and monitoring of coastal aquaculture and fisheries structures provide important baseline data for decision-making in planning and development, including regulatory laws, environmental protection and revenue collection. Mapping these structures can be performed with good accuracy and at regular intervals by satellite remote sensing, which allows observation of vast areas, often of difficult accessibility, at a fraction of the cost of traditional surveys.

Satellite imaging radar (SAR) data are unique for this task not only for their inherent all-weather capabilities, very important as aquaculture activities mainly occur in tropical and subtropical areas, but essentially because the backscatter from the structure components allows for their identification and separation from other features.

The area selected and object of the study has been Lingayen Gulf, sited in Northwestern Luzon Island, the Philippines, where all these structures of interest occur.

Field verification of the methodology resulted in the following accuracy: fishponds 95 percent, fish pens 100 percent. Mapping accuracy for fish cages was estimated at 90 percent and for fish traps at 70 percent.

The study is based on interpretation of SAR satellite data and a detailed image analysis procedure is described. The report aims at the necessary technology transfer for an operational use of the approach indicated in other similar environments.

