



WorldFish
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Reducing poverty
and hunger by
improving fisheries
and aquaculture

2010
Publications
Catalog



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The WorldFish Center is an international, nonprofit, nongovernmental research organization dedicated to reducing poverty and hunger by improving fisheries and aquaculture. WorldFish is one of 15 members of the Consortium of International Agricultural Research Centers supported by the Consultative Group on International Agricultural Research (CGIAR). The CGIAR is a global partnership that unites organizations engaged in research for sustainable development with the funders of this work. The funders include developing and industrialized country governments, foundations, and international and regional organizations.

The WorldFish Center is committed to meeting two key development challenges: 1) improving the livelihoods of those who are especially poor and vulnerable in places where fisheries and aquaculture can make a difference and, 2) achieving large scale, environmentally sustainable increases in supply and access to fish at affordable prices for poor consumers in developing countries.

Publications Catalog 2010

This catalog lists publications published by The WorldFish Center and papers contributed by the Center's scientists in 2010. It reflects the outcomes of research carried out in collaboration with partners from 27 countries through the generous support from international investors. The majority of which are members of the CGIAR.



The catalog is divided into 4 sections:
Corporate publications
Staff Refereed publications
Staff Non-refereed publications
Other Key WorldFish publications

They are sorted alphabetically by the surname of the primary author and abstracts are provided. The index of WorldFish authors at the end of this catalog will lead you to specific pages for easy referencing. The accompanied CD-ROM provides access to the full text of the 2010 WorldFish publications. The number of contributions at the time of publishing this catalog is:

	2010
• Corporate publications	02
• Staff Refereed publications	73
• Staff Non-refereed publications	14
• Other Key WorldFish publications	30



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Corporate Publications

WorldFish report 2009/10. The WorldFish Center. Penang. 10 p.

This year report highlights a variety of approaches the WorldFish Center has adopted in achieving its goal of reducing hunger and poverty from adopting better aquaculture practices, to highlighting the nutritional benefits of eating fish, to strengthening community and ecosystem resilience and adaptive capacity.

2009 Publications catalog. The WorldFish Center. Penang. 57 p.

This catalog lists more than 100 refereed and non-refereed publications published by The WorldFish Center and papers contributed by the Center's scientists in 2009. It reflects the outcomes of research carried out in collaboration with partners from different countries through the generous support from international investors.

Abernethy, K.E. ; Trebilcock, P. ; Kebede, B. ; Allison, E.H. ; Dulvy, N.K. 2010.

Fuelling the decline in UK fishing communities?

ICES Journal of Marine Science 67(5): 1076–1085.

Volatile fuel prices are a threat to the viability of UK fishing communities. The economic and social impacts of rising fuel costs for fishers and communities in southwest England are examined. Fuel prices doubled between early 2007 and mid-2008, whereas fish prices remained relatively stable throughout as a result of the price-setting power of seafood buyers. It was the fishers who absorbed the increased costs, resulting in significant loss of income, reduced job security, and problems in recruiting crew. All gear types were affected, but fishers using towed gears were most adversely impacted. Fishing vessels with recent investment have greater fuel efficiency, so appeared to be more able to cope and to adapt to increased fuel costs. Fishing behaviour also altered as skippers attempted to increase fuel efficiency at the cost of reduced catches. Most skippers reported fishing closer to port, reducing their exploratory fishing, and ceasing experimentation with fishing gears with lesser environmental impact. Therefore, a threat to fishing community viability may have linked environmental effects. The impacts of this fuel price volatility foreshadow a likely future impact of rising fuel prices attributable to climate change adaptation and mitigation and forecasts of rising oil prices. Without proactive planning and policy development, rising fuel prices have the potential to cause job losses and economic hardship additional to problems that may arise from poor management and stock decline, in all fishing-related sectors of the industry.

Ahmed, N. ; Allison, E.H. ; Muir, J.F. 2010.

Rice fields to prawn farms: a blue revolution in southwest Bangladesh?

Aquaculture International 18(4): 555-574.

This paper examines freshwater prawn (*Macrobrachium rosenbergii*) farming in southwest Bangladesh where a large number of farmers have converted their rice fields to export oriented prawn farms, locally known as gher. The gher design potentially provides good opportunities for diversified production of prawn, fish, rice and dike crops, that has brought about a 'blue revolution'. The average annual yield of prawn, fish and rice was estimated at 467, 986 and 2,257 kg ha⁻¹, respectively. Large farmers produced higher production due to more inputs, larger farm size and longer experience of prawn farming than others. All farmers in different gher size categories (i.e., small, medium and large) made a profit, with seed and feed dominating variable costs. Despite a higher production costs per hectare, the average annual net return was higher in large farms (US\$2,426), compared with medium (US\$1,798) and small (US\$1,420) farms. Prawn production in

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Most farmers associate the blue revolution with increases in income and living standards. Socioeconomic benefits of the households of prawn farmers depend on resource ownership (i.e., farm size) and are very apparent. Nevertheless, a number of significant challenges, particularly social and environmental issues, are vital in translating its benefits effectively to the thousands of rural poor.

Ahmed, N. ; Troell, M. ; Allison, A.H. ; Muir, J.F. 2010.

Prawn postlarvae fishing in coastal Bangladesh: challenges for sustainable livelihoods.

Marine Policy 34(2): 218-227.

Fishing for prawn (*Macrobrachium rosenbergii*) postlarvae is a major contributor to the livelihoods of the coastal poor in Bangladesh, including women. A study of coastal livelihoods along the lower Pasur River in southwest Bangladesh indicates that on average 40% of total annual income comes from postlarvae fishing during the few months involved. However, indiscriminate fishing of wild postlarvae, with high levels of by-catch, has an impact on biodiversity in coastal ecosystems. This has provoked imposition of restrictions on postlarvae collection. The ban has, however, not been firmly enforced because of the lack of alternative livelihoods for coastal poor. A conceptual framework, drawn from an approach to poverty reduction known as the sustainable livelihoods approach, is applied to understanding the role of prawn postlarvae fishing. Evidence from this study suggests that postlarvae fishers faced a number of livelihood constraints, including poor livelihood assets. This paper concludes that wider livelihood options need to be found for postlarvae fishers to support their livelihoods.

Alam, M.J. ; Islam, M.L. ; Saha, S.B. ; Tuong, T.P. ; Joffre, O. 2010.

Improving the productivity of the rice-shrimp system in the South-west coastal region of Bangladesh.

p. 93-105. In: Chu, T.H. et al. (ed.) *Tropical deltas and coastal zones: food Production, communities and environment at the land-water Interface. Comprehensive Assessment of Water Management in Agriculture Series 9. Cabi International.*

The production of wet-season rice followed by dry-season shrimp (*Penaeus monodon*) is a common farming system in the south-western coastal region of Bangladesh. This chapter summarizes the experiments conducted in the farmers' fields during the rice and shrimp-growing seasons of 2004, 2005 and 2006, with the aim of improving the total farm productivity of the rice-shrimp system through technological intervention.

Aly, S.M. ; Mohamed, M.F. 2010.

Echinacea purpurea and Allium sativum as immunostimulants in fish culture using Nile tilapia (*Oreochromis niloticus*)

Journal of Animal Physiology and Animal Nutrition 94(5): e31-e39

This study aimed to evaluate and compare the efficiency of echinacea and garlic-supplemented diets as immunostimulants after different periods of application and after 4-month of withdrawal on some haematological and immunological parameters as well as the survival rate, growth performance and resistance of Nile tilapia (*Oreochromis niloticus*) to *Aeromonas hydrophila* infection and cold stress during the winter season through field hapa experiments.

Badjeck, M.C. ; Allison, E.H. ; Halls, A.S. ; Dulvy, N.K. 2010.

Impacts of climate variability and change on fishery-based livelihoods.

Marine Policy 34(3): 375-383.

There is increasing concern over the consequences of global warming for the food security and livelihoods of the world's 36million fisherfolk and the nearly 1.5 billion consumers who rely on fish for more than 20% of their dietary animal protein. With mounting evidence of the impacts of climate variability and change on aquatic ecosystems, the resulting impacts on fisheries livelihoods are likely to be significant, but remain a neglected area in climate adaptation policy. Drawing upon our research and the available literature, and using a livelihoods framework, this paper synthesizes the pathways through which climate variability and change impact fisherfolk livelihoods at the household and community level. We identify current and potential adaptation strategies and explore the wider implications for local livelihoods, fisheries management and climate policies. Responses to climate change can be anticipatory or reactive and should include: (1) management approaches and policies that build the livelihood asset base, reducing vulnerability to multiple stressors, including climate change;(2) an understanding of current response mechanisms to climate variability and other shocks in order to inform planned adaptation;(3) a recognition of the opportunities that climate change could bring to the sector; (4) adaptive strategies designed with a multi-sector perspective; and (5) a recognition of fisheries potential contribution to mitigation efforts.

Staff Refereed Publications

Badjeck, M.C. ; Diop, N. 2010.

The future is now: how scenarios can help Senegalese and Mauritanian fisheries adapt to climate change.

Nature & Faune 25(1): 62-68.

Localized changes in the productivity of marine and inland waters induced by climate change will pose new challenges to the fishery and the aquaculture sectors in West Africa. However, climate change does not occur in isolation of other drivers of change: processes of environmental, economic and social change can affect the fishery sector, potentially creating additional vulnerability to climate change. Scenarios are a useful tool to explore uncertainties and understand non-climatic drivers of change. Despite their prevalence in global environmental change research, few have focused on the fisheries sector. This article presents the construction of fisheries sector scenarios for Senegal and Mauritania required for the analysis of climate change adaptation policies.

Bailly, N. ; Chanet, B. 2010.

Scophthalmus Rafinesque, 1810: The valid generic name for the turbot, *S. maximus* (Linnaeus, 1758) [Pleuronectiformes: Scophthalmidae].

Cybius 34(3): 257-261.

In the past 50 years, the turbot is referred to either as *Scophthalmus maximus* (Linnaeus, 1758) or *Psetta maxima* (Linnaeus, 1758) in the literature. Norman (1931) had argued that the valid name for the turbot was *Scophthalmus maximus*. However, his recommendation was never universally accepted, and today the confusing situation exists where two generic names are still being used for this species. We address this issue by analysing findings from recently published works on the anatomy, molecular and morphological phylogenetic systematics, and ecology of scophthalmid fishes. The preponderance of evidence supports the strong recommendation to use *Scophthalmus* as the valid generic name for the turbot. Acceptance of this generic name conveys the best information available concerning the systematic relationships of this species, and also serves to simplify the nomenclature of scophthalmid flatfishes in publications on systematics, fisheries and aquaculture, fishery statistics, ichthyofaunal and field guides for the general public, and in various legal and conservation-related documents.

Balaghi, R. ; Badjeck, M.C. ; Bakari, D. ; De Pauw, E. ; De Wit, A. ; Defourny, P. ; Donato, S. ; Gommès, R. ; Jlibene, M. ; Ravelo, A.C. ; Sivakumar, M.V.K. ; Telahigue, N.;Tychon,B. 2010.

Managing climatic risks for enhanced food security: key information capabilities.

Procedia Environmental Sciences 1: 313-323.

Food security is expected to face increasing challenges from climatic risks that are more and more exacerbated by climate change, especially in the developing world. This document lists some of the main capabilities that have been recently developed, especially in the area of operational agroclimatology, for an efficient use of natural resources and a better management of climatic risks. It also lists some of the capabilities available to practitioners and decision-makers, starting with the dissemination of agroclimatic data analyses and advice.

Baran, E. ; Chheng, P. ; Warry, F. ; Toan, V.T. ; Hung, H.P. ; Hoanh, C.T. 2010.

Aquatic resources and environmental variability in Bac Lieu Province (Southern Vietnam).

p. 13-23. In: Chu, T.H. et al. (ed.) Tropical deltas and coastal zones: food Production, communities and environment at the land-water Interface. Comprehensive Assessment of Water Management in Agriculture Series 9. Cabi International.

The dynamics of aquatic resources in the canals of Sac Lieu Province, in southern Vietnam, are detailed and synthesized in this study. Nekton and eight environmental parameters were monitored in this province between 2004 and 2006, at 14 sites sampled three times a year. The study area, located along the coastal zone, is characterized by a variable environment subject to saline, freshwater and acidic pulses. The spatiotemporal dynamics of aquatic resources and their relationships with environmental parameters are detailed. The dominance of either freshwater or estuarine fauna, the dynamics of assemblages and the catches of fishers appear to be largely influenced by the management of sluice gates built along the coastal zone.

Staff Refereed Publications

Baran, E. ; Jantunen, T. ; Chheng, P. ; Hoanh, C.T. 2010.

Integrated management of aquatic resources: a Bayesian Approach to water control and trade-offs in Southern Vietnam.

p. 133-143. In: Chu, T.H. et al. (ed.) *Tropical deltas and coastal zones: food Production, communities and environment at the land-water Interface. Comprehensive Assessment of Water Management in Agriculture Series 9. Cabi International.*

The BayFish-Bac Lieu model presented in this chapter is a Bayesian model that aims to identify optimal water control regimes and trade-offs between water uses in order to improve management of water-dependent resources in the inland coastal area of Bac Lieu Province, Mekong Delta, Vietnam. The model was developed between 2004 and 2007 and integrated local databases, outputs from the Vietnam River Systems and Plains (VRSAP) model and stakeholder consultations. The model facilitates analyses of the consequences of different water management scenarios (quantitative and qualitative) on rice, fish, crab and shrimp production in the province. However, beyond production, trade-offs between household income, food security or environmental protection were also identified during the model development process. Subsequently, the BayFish-Bac Lieu model allows detailing of: (i) annual production probabilities in the case of a baseline scenario; (ii) outcomes of four different sluice gate operation modes; and (iii) trade-offs between household income, food security and environment outcomes for each scenario. The model shows that through improved shrimp farming and fish production, total household income benefits directly from open sluice gates allowing saline intrusion. However, this has the opposite effect on rice production, and on food security. Results suggest that a suitable compromise involving at least one sluice gate open at all times should be adopted for optimized outcomes.

Béné, C. ; Hersoug, B. ; Allison, E.H. 2010.

Not by rent alone: analysing the pro-poor functions of small-scale fisheries in developing countries.

Development Policy Review 28(3): 325-358.

The dominant view in academic and policy arenas is increasingly one in which the major contribution of capture fisheries to development should be derived from the capacity of society to maximise the economic rent of fishery resources. Drawing upon empirical experience from the South, this article highlights the potentially disastrous consequences that a universal implementation of the rent-maximisation model would have in developing countries, and argues that a more gradual approach would be preferable. The welfare function of small-scale fisheries, namely, their capacities to provide labour and cash income to resource-poor households, should be preserved until the appropriate macroeconomic conditions for rent-maximisation and redistribution are fulfilled.

Béné, C. ; Lawton, R. ; Allison, E.H. 2010.

Trade matters in the fight against poverty: narratives, perceptions, and (lack of) evidence in the case of fish trade in Africa.

World Development 38(7): 933-954.

Two opposing views exist in the literature on the potential role that international fish trade plays in economic development. While some claim that fish trade has a pro-poor effect, others denounce the negative effect of fish export on local populations' food security and doubt its contributions to the macro-economy. In this paper, we explore this debate in sub-Saharan Africa. Our analysis did not find any evidence of direct negative impact of fish trade on food security; neither did it find evidence that international fish trade generates positive, pro-poor outcomes. This paper discusses the possible reasons for this apparent lack of development impact and highlights the unsupported assumptions underlying the current discourse about international fish trade. We suggest that, given lack of evidence for the development benefits of fish trade between Africa and developed countries, fisheries policy could consider support for regional (Africa-to-Africa) trade that meets the growing African demand for lower-value fish. Means of overcoming barriers to intra-African trade in fish are discussed.

Beveridge, M. ; Phillips, M. ; Dugan, P. ; Brummett, R. 2010.

Barriers to aquaculture development as a pathway to poverty alleviation and food security.

p. 345-359. In: Advancing the aquaculture agenda: workshop proceedings. OECD.

The importance of aquaculture production in developing countries is reviewed briefly. Two sets of barriers to realizing the potential of aquaculture to alleviate poverty and improve food security and nutrition are identified: those directly attributable to aquaculture development policies and those arising from a lack of policy coherence for development (PCD). The latter applies to a wide range of sectors, the most important from an aquaculture perspective being energy, environment, agriculture and food production, and trade and sanitary standards. Lack of PCD is apparent at many levels: within development cooperation policies, between aid and non-aid policies within a single donor and between donors, and donor-partner coherence to achieve shared development objectives.

Staff Refereed Publications

Bobba, A.G. ; Chambers, P. ; Rao, Y.R.S. ; Mondal, N.C. ; Nagabhatla, N. 2010.

Prediction of nutrients discharge from Krishna Delta to coast.

In: Sarala, C. et al. (eds.) Proceedings of 3rd International Conference on Hydrology and Watershed Management. With a focal theme on climate change: water, food and environmental security. Vol. 1. Center for Water Resources, Institute of Science and Technology, Jawaharlal Nehru Technological University, Hyderabad.

Krishna and Godavari deltas are rice bowl of India. The Krishna and Godavari districts of the Andhra Pradesh in India have a flourishing agricultural production and the farmers of these areas make use of the mineral rich alluvium of the Krishna river delta more effectively for the purpose. Farmers extensively pumped groundwater for irrigation, industries and extensively used fertilizers for crops. Saltwater intrusion may arise from natural causes or may be anthropogenic (such as excessive drawdown of freshwater for use in drinking, irrigation and industry, as has happened in the Krishna River delta). The nutrients are recharging to subsurface system and discharging to coast. Algal blooms are forming along the beaches due to higher nutrients discharge to coast. The objective of this paper is to predict subsurface groundwater and nutrient discharge to Krishna delta beach by numerical modelling.

Bopda, A.P. ; Brummett, R. ; Dury, S. ; Elong, P. ; Foto-Menbohan, S. ; Gockowski, J. ; Kana, C. ; Kengue, J. ; Ngonthe, R. ; Nolte, C. ; Soua, N. ; Tanawa, E. ; Tchouendjeu, Z. ; Temple, L. 2010.

Urban farming systems in Yaoundé: building a mosaic.

p. 39-60. In: Prain, G. ; Karanja, N. ; Lee-Smith, D. (eds.) African urban harvest: agriculture in the cities of Cameroon, Kenya and Uganda. Springer.

Urban agriculture is prevalent in Cameroon, the first country examined in this book of case studies, yet its role in urban life was little studied until the 1990s. At that time researchers began to look at some aspects of this complex phenomenon, such as the role of traditional leafy vegetables in the diet and incomes of the urban poor. Following their attendance at a regional stakeholder meeting organized by Urban Harvest in late 2000, scientists from different institutions came together in 2001 to move forward work they were pursuing independently on different topics related to urban agriculture in Yaoundé. This interdisciplinary collaboration produced the original empirical studies contained in this chapter and the two that follow, which aim at a deeper understanding of some of the complexities of urban farming in the country and indicate directions for further work, both in research and the development of public policy.

Brooks, S.E. ; Allison, E.H. ; Gill, J.A. ; Reynolds, J.D. 2010.

Snake prices and crocodile appetites: aquatic wildlife supply and demand on Tonle Sap Lake, Cambodia.

Biological Conservation 143(9): 2127-2135.

Commercial trade is a major driver of over-exploitation of wild species, but the pattern of demand and how it responds to changes in supply is poorly understood. Here we explore the markets for snakes from Tonle Sap Lake in Cambodia to evaluate future exploitation scenarios, identify entry points for conservation and, more generally, to illustrate the value of multi-scale analysis of markets to traded wildlife conservation. In Cambodia, the largest driver of snake exploitation is the domestic trade in snakes as crocodile food. We estimate that farmed crocodiles consume between 2.7 and 12.2 million snakes per year. The market price for crocodiles has been in decline since 2003, which, combined with rising prices for their food, has led to a reduced frequency of feeding and closure of small farms. The large farms that generate a disproportionate amount of the demand for snakes continue to operate in anticipation of future market opportunities, and preferences for snakes could help maintain demand if market prices for crocodiles rise to pre 2003 levels. In the absence of a sustained demand from crocodile farms, it is also possible that alternative markets will develop, such as one for human snack food. The demand for snakes, however, also depends on the availability of substitute resources, principally fish. The substitutability and low price elasticity of demand offers a relatively sustainable form of consumerism. Given the nature of these market drivers, addressing consumer preferences and limiting the protection of snakes to their breeding season are likely to be the most effective tools for conservation. This study highlights the importance of understanding the structure of markets and the behaviour of consumer demand prior to implementing regulations on wildlife hunting and trade.

Brooks, S.E. ; Kebede, B. ; Allison, E.H. ; Reynolds, J.D. 2010.

The balance of power in rural marketing networks: a case study of snake trading in Cambodia.

Journal of Development Studies 46(6): 1003-1025.

Producers in small-scale rural markets often receive unfavourable prices for their goods as a result of more powerful market participants. This study uses a combination of price analysis and interview data to assess the position of snake hunters in the aquatic snake market from Tonle Sap Lake in Cambodia. Despite the hunters' dependence on intermediary traders for market access and credit, the evidence implies that they are not powerless participants. Intermediary traders operate under high competition as a result of the increasing scarcity of snakes and therefore, despite interlocked credit and snake markets, offer relatively high prices to hunters.

Staff Refereed Publications

Brummett, R. Tiotsop, F. ; Abina, J.C. 2010.

The commercial fishery of the middle Nyong River, Cameroon productivity and environmental threats .

Smithiana Bulletin 11: 3-16.

Fishing methods, catches, fish species diversity, water quality and diets were examined in the middle Nyong River basin of south-central Cameroon over five years. Out of 79 indigenous species from the upper and middle Nyong in museum collections, 17 indigenous species added in this study (total =100) and two feral alien species, only 38 are regularly captured by commercial fishers, and only 18 of these are sufficiently abundant and large enough to be of importance as food fish. Two of the most important are the alien *Oreochromis niloticus* and *Heterotis niloticus*. Although quantitative data are lacking on the state of the ecosystem at the time of earlier fish collections, there is circumstantial evidence that indigenous species may have suffered from competition with introduced aliens and/or changes in the ecosystem resulting from poor land use management and the use of pesticides in fishing.

Brummett, R.E. ; Cargill, C. ; Lekunzé, L.M. ; Puddister, D. 2010.

Stream degradation, fish abundance and the potential viability of ornamental fisheries in south-western Cameroon.

African Journal of Aquatic Science 35(2): 155-164.

Fifteen sites on nine second- and third-order streams in the Mount Cameroon area, with varying degrees of human disturbance, were sampled during wet and dry seasons over 21 months in 2003-2005 to estimate their potential for sustainable exploitation of ornamental fishes. In total, 35 species of fish representing 22 genera and 14 families were captured. By biotope, fish populations per 20 m averaged 528 ± 318.5 fish (8.0 ± 3.02 species) in runs, 86 ± 60.9 fish (2.4 ± 1.06 species) in riffles and 819 ± 480.0 fish (7.8 ± 3.15 species) in pools. Riffles contained significantly fewer individuals and species than either runs or pools. Shannon's index was similar for runs and pools, averaging 1.646 ± 0.429 and 1.548 ± 0.345 , respectively, but differed significantly for riffles, averaging 0.652 ± 0.473 . There were no significant differences in number of individual fish, number of species or Shannon's index among stream order or season, reflecting the stability of these ecosystems throughout the year. Regression of number of fish per 20 linear m of stream, number of species and Shannon's index against a subjective scale related to stream degradation was significant. In particular, the polluted Limbe River sites had significantly fewer individual fish, fewer species and a lower Shannon index across all biotopes than other sites. Fishing efficiency of local gears was estimated at 27% for easily captured species and 14% for the more difficult ones, and could be used to make relative estimates of fish abundance as a means of monitoring changes in fish abundance. Although species diversity in south-western Cameroon was high, typical of tropical streams globally, total

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abundance was low, and therefore it is unlikely that a profitable ornamental fish trade could be sustained on the basis of fish captured exclusively from the wild.

Brummett, R.E. ; Lemoalle, J. ; Beveridge, M.C.M. 2010.

Can water productivity metrics guide allocation of freshwater to inland fisheries?

Knowledge and Management of Aquatic Ecosystem 399: 01

Water productivity (WP) metrics have proven useful in comparing production efficiency of various crops. Recently, it has also been proposed to facilitate more equitable allocation of scarce freshwater resources between irrigated agriculture and fisheries. Parameterizing water productivity metrics, however, proves to be very difficult in the real world of inadequate data and complex aquatic ecosystems, and is usually impossible to calculate for exploitation strategies, such as fisheries, that harvest products, but do not in and of themselves reduce the natural resource base from which those products were derived. In special cases, marginal water productivity (the variation in production for each unit variation in available water) can be estimated, but the complexity of its use under-values the social, ecological and economical importance of fisheries and so cannot be recommended for making inter-sectoral comparisons.

Brummett, R.E. ; Youaleu, J.L.N. ; Tiani, A.M. ; Kenmegne, M.M. 2010.

Women's traditional fishery and alternative aquatic resource livelihood strategies in the Southern Cameroonian Rainforest.

Fisheries Management and Ecology 17(3): 221-230.

To inform the development of alternative livelihoods, the women's traditional alok fishery in the Campo-Ma'an National Park and buffer zone of southern Cameroon were studied over 15 months. Participatory rural appraisal was used to characterise livelihood strategies among 45 households. Thirty-three cultured crops, nine farmed animal species and 65 non-timber forest products, including 31 bushmeat species are cultivated in, or harvested from, the forest. Transport is a major impediment to commercial trade of all local products. In 16 alok fishing events, average weight of fish harvested was 5.14 kg per 280 m of stream distributed among an average of 23 fishers for a return of 220 g person⁻¹ or 40 g fish h⁻¹ over 5 h of work. Fish and crustacean standing stock was 25 g per linear metre or 167 t when extrapolated to the zone. Implications for rainforest livelihoods in light of the Millennium Development Goals are discussed.

Staff Refereed Publications

Darwall, W.R.T. ; Allison, E.H. ; Turner, G.F. ; Irvine, K. 2010.

Lake of flies, or lake of fish? A tropic model of Lake Malawi.

Ecological Modelling 221: 713-727.

Ecosystem-focused models have, for the first time, become available for the combined demersal and pelagic components of a large tropical lake ecosystem, Lake Malawi. These provide the opportunity to explore continuing controversies over the production efficiencies and ecological functioning of large tropical lakes. In Lake Malawi these models can provide important insight to the effect of fishing on fish composition, and the potential competition that the lakefly *Chaoborus edulis* may have with fisheries production. A mass-balanced trophic model developed for the demersal fish community of the southern and western areas of Lake Malawi was integrated with an existing trophic model developed for the open-water pelagic. Input parameters for the demersal model were obtained from a survey of fish distributions, fish food consumption studies, and from additional published quantitative and qualitative information on the various biotic components of the community. The model was constructed using the Ecopath approach and software. The graphically presented demersal food web spanned four trophic levels and was based primarily on consumption of detritus, zooplankton and sedimented diatoms. Zooplankton was imported into the system at trophic levels three and four through fish predation on carnivorous and herbivorous copepods and *Chaoborus* larvae. It is proposed that the primary consumption of copepods was by fish migrating into the pelagic zone. *Chaoborus* larvae in the demersal were probably consumed near the lakebed as they conducted a daily migration from the pelagic to seek refuge in the sediments. This evidence for strong benthic-pelagic coupling provided the opportunity for linking the demersal model to the existing model for the pelagic community so producing the first model for the complete ecosystem. Energy fluxes through the resulting combined model demonstrated that the primary import of biomass to the demersal system was detritus of pelagic origin (72.1%) and pelagic zooplankton (10.6%). Only 15.8% of the biomass consumed within the demersal system was of demersal origin. Lakefly production is efficiently utilised by the lake fish community, and any attempt to improve fishery production through introduction of a non-native plantivorous fish species would have a negative impact on the stability and productivity of the lake ecosystem.

De Silva, S.S. ; Davy, F.B. ; Phillips, M.J. 2010.

Synthesis and lessons learned.

p. 187-199. In: De Silva, S.S. ; Davy, F.B. (eds.) *Success stories in Asian aquaculture*. Dordrecht, Springer.

Based on the selected case studies from various chapters in the book "Success stories in Asian aquaculture", this chapter further examined the broader set of lessons learned around successes in aquaculture in Asia with the aim of developing improved guidance or influencing strategies around possible steps to follow; steps in the further development of this set of ideas, and in the sector as a whole.

Dey, M.M. ; Kuman, P. ; Paraguas, F.J. ; Chen, O.L. ; Khan, M.A. ; Srichantuk, N. 2010.

Performance and nature of genetically improved carp strains in Asian countries.

Aquaculture Economics & Management 14: 3-29.

The WorldFish Center and its research partners have recently made efforts to develop genetically improved carp strains. This paper analyses the comparative performance of the genetically improved carp strains on both average and efficient farms in four carp-dominating Asian countries (Bangladesh, India, Thailand and Vietnam). The results show superior performance of improved strains in terms of body weight and survival rate on both average and efficient farms. On an average farm, the improved carp strain gives 15% higher body weight at harvest in India to 36% higher in Bangladesh. On an efficient farm also, the improved carp strain gives similar higher body weight at harvest. The improved carp strain has a higher survival rate on average farms, ranging from 7% in Thailand to about 27% in India. A higher carp yield is predicted for improved strains as compared to local strains under average as well as efficient farms. Genetically improved carp strains are generally neutral to feed use, and can be reared with the existing endowments of farmers and harvested for higher yield per unit area. It is expected that farmers would be able to sell the genetically improved carp fish at a lower market price. The study suggests that countries engaged in selective breeding program should continue their efforts in stock improvement and production of fish at lower cost to benefit both producers and consumers.

Staff Refereed Publications

Dey, M.M. ; Paraguas, F.J. ; Kambewa, P. ; Pemsl, D.E. 2010.

The impact of integrated aquaculture-agriculture on small-scale farms in Southern Malawi.

Agricultural Economics 41(1): 67-79.

Sustainable agricultural intensification is an urgent challenge for Sub-Saharan Africa. One potential solution is to rely on local farmers' knowledge for improved management of diverse on-farm resources and integration among various farm enterprises. In this article, we analyze the farm-level impact of one recent example, namely the integrated aquaculture-agriculture (IAA) technologies that have been developed and disseminated in a participatory manner in Malawi. Based on a 2004 survey of 315 respondents (166 adopters and 149 nonadopters), we test the hypothesis that adoption of IAA is associated with improved farm productivity and more efficient use of resources. Estimating a technical inefficiency function shows that IAA farms were significantly more efficient compared to nonadopters. IAA farms also had higher total factor productivity, higher farm income per hectare, and higher returns to family labor.

Evans, L.S. 2010.

Ecological knowledge interactions in marine governance in Kenya.

Ocean and Coastal Management 53: 180-191.

Proponents of integrated, collaborative, and adaptive governance advocate the inclusion of a diversity of stakeholders and their knowledge and values in governance processes. This paper examines knowledge interactions at different scales of decision-making within two marine social-ecological systems in southern Kenya. Ecological knowledge systems are shown to be diverse and fluid even within broad conceptual classifications. Knowledge interactions at the local level are mediated by socio-cultural, institutional, and historical factors, whilst knowledge integration within district to national levels is primarily structured by institutional factors linked to centralised decision-making. In policy arenas, knowledge bounded to the marine environment is subjugated by knowledge dealing with terrestrial parks, inland fisheries, and wildlife tourism.

Ferse, S.C.A. ; Costa, M.M. ; Schwerdtner Máñez, K. ; Adhuri, D.S. ; Glaser, M. 2010.

Allies, not aliens: increasing the role of local communities in marine protected area implementation.

Environmental Conservation 37(1): 23-34.

Various management approaches have been proposed to address the alarming depletion of marine coastal resources. Prominent among them are community based management and the establishment of marine protected areas (MPAs). The overall poor performance of MPAs can be traced to a failure to effectively include local communities in the design and implementation of relevant measures. Recent efforts have incorporated aspects of community-based management into a hybrid form of management, which ideally builds upon existing local management practices. A key challenge lies in the development of appropriate frameworks that allow for the successful participation of local communities in management. A review of studies on MPA design and community-based marine resource management and fieldwork observations provides suggestions on how to address current socioeconomic shortcomings in MPA design and implementation, successfully involving local communities in order to provide a better local basis for effective larger MPA networks. A combination of MPA tools as the formal frame and community-based natural resource management as the adaptive core that recognizes local communities as allies, not aliens, is needed to develop successful conservation approaches.

Garces, L.R. ; Pido, M.D. ; Pomeroy, R.S. ; Koeshendrajana, S. ; Prisantoso, B.I. ; Fatan, N.A. ; Adhuri, D. ; Raiful, T. ; Rizal, S. ; Tewfik, A. ; Dey, M. 2010.

Rapid assessment of community needs and fisheries status in tsunami-affected communities in Aceh Province, Indonesia.

Ocean & Coastal Management 53(2): 69-79.

This paper describes the application of the methodology called Rapid Appraisal of Fisheries Management System (RAFMS) to assess quickly the situation in tsunami-affected coastal fisheries in Aceh Province, Indonesia. As a diagnostic tool, the RAFMS is introduced in terms of its conceptual framework and procedures. The RAFMS was used to appraise the status of the fisheries sector in selected 15 villages. Information generated concerning level of fishing effort, marketing patterns and community perspectives on livelihood options are used as three illustrative examples. The paper also provides some insights in applying the RAFMS methodology in the context of disasters and in the broader context of tropical fisheries management.

Staff Refereed Publications

Garces, L.R. ; Silvestre, G.T. 2010.

An evaluation of resource overlaps among fishing gears in the coastal fisheries using multivariate techniques.

Journal of the Marine Biological Association of India 52(1): 1-7.

Southeast Asian fisheries such as in San Miguel Bay, Philippines operate in a multi-gear and mixed-species situation. Marine capture fisheries in the Philippines are conventionally sub-divided into municipal (small-scale) and commercial (large-scale) based on vessel gross tonnage (GT) and arbitrarily delineated spatially on the basis on area where fishing operations are undertaken. Fisheries management interventions are usually focused on the effort control by fishing gear type or specific fisheries (or species). Catch and effort data have been collected in most of the stock assessment studies, however, there have been limited assessments in differential fishing pressure on various species from available data. The apparent gear interactions and their influence on the high exploitation levels of the major fishery resources have been assessed qualitatively. The approach being illustrated can help management clarify effort reduction or allocation measures and identify which fishing gears should be regulated. Classification (TWINSPAN) and ordination (DCA) techniques commonly used in community structure analysis were utilized to examine the catch composition of 17 dominant fishing gears monitored during 1992 and 1993 and illustrate the extent of competition among the fishing gears in terms of their target species. The results indicate separation of two gear groups i.e., nearshore/coastal and offshore. The fishing gears employed in the nearshore/coastal areas indicate high degree of gear competition due to similarity in target species. The catch composition of the fishing gear group is also presented. Finally, this study provides an example how three fishing gears (i.e., trawl, filter net and gillnet) exploit different size groups of croaker (*Otolithes ruber*), which is one of the dominant species in the Bay.

Haque, M. ; Ahmed, F. ; Ahmed, M. ; Mustafa, G. 2010.

Variation of fish catch composition in relation to different types of 'katha' materials in the Updakhali river of Netrokona district, Bangladesh.

Bangladesh Journal of Life Sciences 22(2): 17-24

Three types of Fish Aggregating Devices (FAD) locally known as "kathas" (sanctuary) with tree roots, bamboo roots and tree branches (traditional) and one additional control "katha" without any attracting materials were set up within 2 km area of Updakhali river in Netrokona district. The trial aimed to investigate the preference of fish to different "katha" materials. 'Prescription' can be made regarding fishes' choice of sanctuary materials so that those fishes can be conserved naturally in various rivers by supplying "katha" materials as per their respective choices.

Haque, M.M. ; Little, D.C. ; Barman, B.K. ; Wahab, M.A. 2010.

The adoption process of ricefield-based fish seed production in Northwest Bangladesh: an understanding through quantitative and qualitative investigation.

Journal of Agricultural Education and Extension 16(2): 161-177.

The purpose of the study was to understand the adoption process of ricefield based fish seed production (RBFSP) that has been developed, promoted and established in Northwest Bangladesh. Quantitative investigation based on regression analysis and qualitative investigation using semi-structured interview were carried out to enhance understanding of the adoption process of RBFSP.

Ibrahem, M.D. ; Fathi, M. ; Mesalhy, S. ; Abd. El-Aty, A.M. 2010.

Effect of dietary supplementation of inulin and vitamin C on the growth, hematology, innate immunity, and resistance of Nile tilapia (*Oreochromis niloticus*).

Fish and Shellfish Immunology 29: 241-246.

The aim of the current study was to evaluate the in vivo potential effect of inulin (5 g kg⁻¹) and Ascorbic acid (500 mg kg⁻¹) on improving the performance as well as the immunity of Nile tilapia (*Oreochromis niloticus*). Their possible protective effect against an experimental challenge infection using *A. hydrophila* has been also investigated.

Ibrahim, N. ; El-Naggar, G. 2010.

Water quality, fish production and economics of Nile Tilapia, *Oreochromis niloticus*, and African catfish, *Clarias gariepinus*, monoculture and polyculture.

Journal of the World Aquaculture Society 41(4): 574-582.

Tilapia is the main cultured fish species in Egypt, contributing 43.5% of farmed fish production and 24% of total fisheries production. The main problem facing tilapia producers is early reproduction before fish reach marketable size, leading to overpopulation and smaller fish at harvest. Approaches to this problem include the use of all-male hybrids and hand-sexing to remove females. An alternative for controlling the effects of unwanted population, polyculture of tilapia with a predator that eats tilapia fry and fingerlings has been proposed by Guerrero (1980), De Graaf (1996), El-Gamal et al. (1998), and Fagbenro (2004). Among the most popular predators used for biological control of tilapia reproduction is the African catfish, *Clarias gariepinus*. In addition to controlling tilapia reproduction, polyculture increases productivity by a more efficient utilization of the ecological resources in the pond. Stocking two or more complementary

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species can increase the maximum standing crop of a pond by taking advantage of a wider range of available foods and ecological niches. Nile tilapia, *Oreochromis niloticus*, is an omnivorous filter feeder and African catfish is considered as a predator targeting fish fry and fingerlings. The aim of this study was to identify the optimal stocking ratio of tilapia and African catfish with respect to water quality, growth and economic performance under Egyptian conditions.

Joffre, O. ; Prein, M. ; Tung, P.B.V. ; Saha, S.B. ; Hao, N.V. ; Alam, M.J. 2010.

Evolution of shrimp aquaculture systems in the coastal zones of Bangladesh and Vietnam: a comparison.

p. 48-63. In: Chu, T.H. et al. (ed.) *Tropical deltas and coastal zones: food Production, communities and environment at the land-water Interface. Comprehensive Assessment of Water Management in Agriculture Series 9. Cabi International.*

Based on on-farm surveys implemented in the Ganges Delta in Bangladesh and the Mekong Delta in Vietnam, the dynamics of shrimp aquaculture in salinity-influenced coastal areas were analysed. Qualitative data were collected through interviewing both individual and group farmers in 2005 and 2006, as well as key informants and value chain stakeholders, to obtain an overview of the dynamics of salinity-influenced aquaculture in these two deltas. These two cases were studied to highlight the main factors that fuelled their dynamics and the evolution of human intervention and to understand how farmers coped with various constraints (e.g. soil quality, variability in salinity, diseases, market forces, infrastructure investment, knowledge availability, access to capital and social conflict). The chapter presents an analysis of the evolution of aquaculture and agriculture production systems in salinity-influenced areas in each delta, and the different options for farmers to develop and evolve these production systems in such variable and diversified environments.

Joffre, O.M. ; Schmitt, K. 2010.

Community livelihood and patterns of natural resources uses in the shrimp-farm impacted Mekong Delta.

Aquaculture Research 41(12): 1855-1866.

This case study looks at changing livelihood strategies of the coastal population in Soc Trang Province in the Mekong Delta, Vietnam, and their impacts on natural resources. It provides an opportunity not only to document the impact of shrimp farming on coastal livelihood but also to better understand the link between brackish water aquaculture development and natural resource use. The approach includes a socio-economic survey in six villages of the province focusing on risk strategies and livelihood diversification. Shrimp

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farming was found to be less risky and more profitable for households and private companies with a higher investment capacity than for poorer households. Households facing a high risk in shrimp farming diversified their aquaculture production, with other high-value species like mud crab and elongated goby as a coping mechanism. The use of natural resources' collection is shifting from home consumption towards market-oriented sales of juvenile mud crabs, clams or fish (elongated goby) to supply seed for brackish water aquaculture developments.

Johnston, R. ; Lacombe, G. ; Hoanh, C.T. ; Noble, A. ; Pavelic, P. ; Smakhtin, V. ; Suhardiman, D. ; Kam, S.P. ; Choo, P.S. 2010.

Climate change, water and agriculture in the Greater Mekong Subregion.

IWMI research report 136. International Water Management Institute, Colombo, Sri Lanka. 60 p.

The report reviews the current status and trends in water management in the Greater Mekong Subregion (GMS); assesses likely impacts of climate change on water resources to 2050 based on historical patterns and simulated projections; examines water management strategies in the context of climate and other changes; and identifies priority actions for governments and communities to improve resilience of the water sector and safeguard food production.

Kalikoski, D.C. ; Allison, E.H. 2010.

Learning and adaptation: the role of fisheries comanagement in building resilient social-ecological systems.

p.69-88. In: Armitage, D. ; Plummer, R. (eds.) Adaptive capacity and environmental governance. Springer series on environmental management. Springer.

This chapter focuses on how robust self-organizations can be formed within fisheries co-management systems. Over the last 30 years, co-management has been increasingly advocated as a blueprint solution for small-scale fisheries crisis. Many governments, NGOs, and international and donor organizations are catalyzing projects for implementing fisheries co-management. On the one hand, the international attention devoted to promoting and supporting co-management is an important accomplishment; it recognizes that without the help and support of fishers, government can do little to help achieve sustainable, equitable, and resilient fisheries management. On the other hand, as co-management becomes "mainstream," it risks being regarded as a straightforward technical and organizational process, through which states devolve both rights and responsibilities for the difficult tasks of resource conservation and livelihood improvement.

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Kawarazuka, N. ; Béné, C. 2010.

Linking small-scale fisheries and aquaculture to household nutritional security: an overview.

Food Security 2(4): 343-357.

Small-scale fisheries and aquaculture have been recognized as important opportunities to enhance household food security in developing countries. While interventions aiming at promoting these activities reveal many positive effects, their direct and indirect impacts on nutritional status have not yet been fully documented. The objective of this paper is to identify more specifically the potential pathways that exist between fish-related livelihoods (small-scale fisheries, fish farming) and household nutritional security. The existing literature reveals scattered but increasing evidence of the contribution of fish to nutritional security through three distinct pathways. The first one is the direct nutritional contribution from fish consumption: because fish are rich in essential nutrients such as vitamin A, calcium, iron and zinc, households engaged in small-scale fisheries or aquaculture are, in theory, able to improve their own nutritional intakes by consuming some of the fish they capture or farm. The second relates to income: increased purchasing power through the sale of fish is recognized as critical for households to be able to access other foods and to improve their overall dietary intake. Finally, because the degree of control exercised by women over family income impacts directly on household food security and nutritional outcomes, enhancing the economic status of women through their involvement in aquaculture and/or fisheries-related activities (fish processing and trading) is also identified as another important pathway to improve household nutritional security. For these three pathways, however, evidence is often only anecdotal and therefore, the paper concludes by highlighting areas where further research and data are needed.

Khaw, H.L. ; Ponzoni, R.W. ; Hamzah, A. ; Nguyen, N.H. ; Abu-Bakar, K.R. ; Yee, H.Y. 2010.

Genetic analysis of the GIFT strain (Nile Tilapia, *Oreochromis niloticus*) in Malaysia.

Proceedings of the 9th World Congress on Genetics Applied to Livestock Production, Leipzig, Germany.

The Genetically Improved Farmed Tilapia (GIFT) strain is well known worldwide because of its high performance. A first phase of the project ended in 1997 after five generations of selection. In 2002, the GIFT population in the WorldFish Center Malaysia was established based on the sixth generation of GIFT from Philippines. In Malaysia, the breeding program continued the selection for live weight at harvest time (LW) to improve the growth rate. The GIFT population has already undergone seven generations of selection since it was introduced in Malaysia. A review of its progress and performance is timely in order to decide the program's future direction. In this paper we report phenotypic

and genetic parameters for live weight based on the data collected over eight generations, as well as the selection response achieved during that period .

Loucks, C. ; Barber-Meyer, S. ; Hossain, M.A.A. ; Barlow, A. ; Chowdhury, R.M. 2010.
Sea level rise and tigers: predicted impacts to Bangladesh's Sundarbans mangroves: a letter.

Climatic Change 98: 291-292.

The Sundarbans mangrove ecosystem, shared by India and Bangladesh, is recognized as a global priority for biodiversity conservation. Sea level rise, due to climate change, threatens the long term persistence of the Sundarbans forests and its biodiversity. Among the forests' biota is the only tiger (*Panthera tigris*) population in the world adapted for life in mangrove forests. Prior predictions on the impacts of sea level rise on the Sundarbans have been hampered by coarse elevation data in this low-lying region, where every centimeter counts. Using high resolution elevation data, we estimate that with a 28 cm rise above 2000 sea levels, remaining tiger habitat in Bangladesh's Sundarbans would decline by 96% and the number of breeding individuals would be reduced to less than 20. Assuming current sea level rise predictions and local conditions do not change, a 28 cm sea level rise is likely to occur in the next 50-90 years. If actions to both limit green house gas emissions and increase resilience of the Sundarbans are not initiated soon, the tigers of the Sundarbans may join the Arctic's polar bears (*Ursus maritimus*) as early victims of climate change-induced habitat loss.

Mesalhy, S. A. ; El-Naggar, G.O. ; Mohamed, M.F. ; Mohamed, W.E. 2010.
Effect of garlic, Echinacea, organic green and vet-yeast on survival, weight gain and bacterial challenge of overwintered Nile Tilapia fry (*Oreochromis niloticus*).

Journal of Applied Aquaculture 22(3): 210-215.

The purpose of this study was to examine the effect of some immunostimulants and probiotics on the survival rate, final weight, and disease resistance of overwintered tilapia fry. There were five treatments: T1 (control) fed a balanced diet (35% protein) without additives. Treatments 2 to 5 were fed diets supplemented with 4% garlic, 4 g/kg Echinacea, 4 g/kg Organic Green or 4 g/kg Vet-Yeast, respectively. Growth and resistance to disease challenge with *Aeromonas hydrophila* and *Pseudomonas fluorescens* were not different among treatments, but survival of overwintered fry increased in treatments fed probiotics or immunostimulents. The use of garlic in overwintering feeds could allow hatchery operators to increase their prices for fry and fish farmers to stock production ponds earlier, increasing hatchery revenues by 74% and improving land use efficiency and productivity for the Egyptian aquaculture industry.

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Murshed-e-Jalan, K. ; Ahmed, M. ; Belton, B. 2010.

The impacts of aquaculture development on food security: lessons from Bangladesh.

Aquaculture Research 41(4): 481-495.

Fish contribute a significant amount of animal protein to the diets of people in Bangladesh, about 63% of which comes from aquatic animals. In Bangladesh, fish is mainly derived from two sources: capture and culture. Aquaculture has shown tremendous growth in the last two decades, exhibiting by about 10% average annual growth in production. Capture fisheries, although still the major source of supply of fish, have become static or are in decline due to over-fishing and environmental degradation, and it is now believed that aquaculture has the greatest potential to meet the growing demand for fish from the increasing population. At present, aquaculture production accounts for about one-third of the total fish production in Bangladesh. This paper examines the impact of an aquaculture development project in Bangladesh on food security, with particular emphasis on the poor. The analysis shows a positive impact of aquaculture development on employment, income and consumption. A number of implications for policy in areas that might strengthen these outcomes are discussed and recommendations are presented.

Nagoli, J. ; Holvoet, K. ; Remme, M. 2010.

HIV and AIDS vulnerability in fishing communities in Mangochi district, Malawi.

African Journal of AIDS Research 9(1): 71-80.

The fisheries sector contributes significantly to Malawi's national economy and to the livelihoods of the poor as certain activities in the sector have relatively low barriers to entry. Various studies have shown that the fisheries sector suffers from high HIV prevalence in many low-income countries. In Malawi, HIV prevalence as well as the causes and impact of HIV infections among fisherfolk are yet to be assessed. Participatory action research was conducted in Mangochi District, in the southern part of Lake Malawi, between December 2007 and January 2008, to identify critical HIV-risk points along the value-chain for the Lake Sardine or usipa (*Engraulicypris sardella*) fishery. Data were collected through interviews with key informants and from focus group discussions at the community, institution, district and market levels. An analysis of vulnerability resulted in the formulation of mechanisms to redress HIV and AIDS prevention and mitigation at each point of vulnerability. The findings show that HIV and AIDS vulnerability in the fishery's market-chain is highest where fish processing and trading influence sexual relationships between fishermen and female fish traders. The period of high usipa catches (December to March) coincides with a period of foodshortage and fishing offers income-generating opportunities for many food-insecure households. This increases competition in

processing and trading fish, a socio-economic situation that may result in increased instances of transactional sex. The interactions along the usipa fishery's market-chain, from rural to urban settings, also favour the transmission of HIV from areas of high prevalence to areas with otherwise low HIV risk.

Nguyen, N.H. ; Ponzoni, R.W. ; Abu-Bakar, K.R. ; Hamzah, A. ; Khaw, H.L. ; Yee, H.Y. 2010.

Correlated response in fillet weight and yield to selection for increased harvest weight in genetically improved farmed tilapia (GIFT strain), *Oreochromis niloticus*.

Aquaculture 305(1/4): 1-5.

A data set consisting of 5532 slaughter records collected over three generations from a selection program for increased harvest body weight in the GIFT strain of Nile tilapia (*Oreochromis niloticus*) was used to estimate genetic parameters and correlated responses in body (live weight, standard length, body width and body depth) and carcass (fillet weight and fillet yield) traits. A multi-trait model using restricted maximum likelihood method was applied to a full pedigree comprising a total of 18,970 animals. The estimates of heritability for body and carcass traits were of moderate magnitude (0.20 to 0.33). The proportions of variance explained by the maternal and common environmental effects were small, ranging from 4 to 8% for body traits and fillet weight, but were negligible for fillet yield. Genetic correlations among body traits were high (0.78 to 0.95), except between standard length and body width (0.56). High genetic correlations (0.78 to 0.96) were also obtained between body traits and fillet weight, whereas those between body traits and fillet yield were generally low (0.35 to 0.44). Genetic changes were measured as the difference in least squares means between the selection and control lines. The correlated increase in fillet weight was 23% in the latest generation studied or 0.97 phenotypic standard deviation units (sP). The correlated response in fillet yield was negligible. In conclusion, selection for high growth significantly increased fillet weight. Strategies for the improvement of fillet yield in the GIFT strain are discussed.

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Nguyen, N.H. ; Ponzoni, R.W. ; Hamzah, A. ; Yee, H.Y. ; Abu-Bakar, K.R. ; Khaw, H.L.2010.
Genetics of flesh quality in fish.

Proceedings of the 9th World Congress on Genetics Applied to Livestock Production, Leipzig, Germany.

Flesh quality has gained importance among consumers and in the aquaculture industry because it is directly related to human health and nutrition. Flesh quality comprises several different (freshness, appearance, smell, flavor, texture, taste, firmness, juiciness, and processing and hygienic) characteristics. Due to the large number of traits involved and the ensuing complexity, genetic improvement for flesh quality has been almost neglected in breeding programs for aquaculture species. We studied four groups of traits in the Genetically Improved Farmed Tilapia (GIFT) strain: i) carcass (fillet) traits, ii) flesh composition (protein, fat, moisture and ash content), iii) flesh quality attributes (pH, color), and iv) fatty acid composition. In this paper we review the effects of non-genetic factors, and we report genetic parameters and correlated responses in flesh quality traits to selection for high growth in GIFT. The discussion includes other farmed aquaculture species.

Nguyen, N.H. ; Ponzoni, R.W. ; Yee, H.Y. ; Abu-Bakar, K.R. ; Hamzah, A. ; Khaw, H.L. 2010.
Quantitative genetic basis of fatty acid composition in the GIFT strain of Nile tilapia (*Oreochromis niloticus*) selected for high growth.

Aquaculture 309(1-4): 66-74.

The quantitative genetic basis of fatty acid composition was examined in the Genetically Improved Farmed Tilapia (GIFT) strain of Nile tilapia selected for high breeding value for body weight and in the contemporaneous control selected for average breeding value. Gas chromatography analysis of 514 frozen fillet samples, obtained from the offspring of 104 sires and 154 dams from two generations in 2006 and 2007, showed that the fish possess all important fatty acids (FA), with the amount of omega-3 polyunsaturated fatty acids being 3.6%. The ratio of unsaturated to saturated fatty acids was greater than one (1.4) in the GIFT fillets, which is in line with the current dietary recommendation. Genetic analysis of FA was combined with 5532 performance and fillet records, and 2000 fillet samples analyzed for flesh composition and flesh quality attributes. A restricted maximum likelihood method applied to bivariate or trivariate mixed model was carried out in a full pedigree comprising a total of 18,970 animals to estimate genetic parameters and correlated responses in FA composition to the selection program. The estimates of heritability for individual FA varied from zero to medium, suggesting that FA composition of the GIFT fillet can respond to selection. Genetic correlations among FA within the same group (saturated, monounsaturated or polyunsaturated FA) were generally synergistic, but were antagonistic between groups. There were also both favourable

and unfavourable genetic associations between important high chain polyunsaturated fatty acids and performance, fillet and flesh quality traits. Correlated changes in FA composition were measured by comparing least square means of the selection and control lines. Overall, selection for high growth resulted in very little change in FA composition. One notable change was that the content of heptadecanoic acid (C17:0) decreased in the selection relative to control line, which is beneficial for human health. In summary, the set of genetic parameters estimated and the response realized in the GIFT strain indicate that FA composition of tilapia or fish in general can be altered by genetic means.

Nouh, W.G. ; Aly, S.M. ; Abdel-Rahman, K. ; Amer, O.H. 2010.

Histopathological, parasitological and molecular biological studies on metacercariae from *Oreochromis niloticus* and *Clarias gariepinus* cultured in Egypt

Zagazig Veterinary Journal 38(4): 92-105

Oreochromis niloticus and *Clarias gariepinus* collected from June 2008 to May 2009 from three different types of fish farms in Egypt and subjected for encysted metacercariae infestation microscopically, biologically and by PCR test. The objectives of the study were to screen, identify and compare the prevalence of metacercarial infection among *Oreochromis niloticus* and *Clarias gariepinus* taken from different farming systems in Egypt. Both biological studies and PCR were used for detecting and identifying the common heterophyid metacercariae, especially those of zoonotic importance and public health hazard.

Ofori, J.K. ; Abban, E.K. ; Karikari, A.Y. ; Brummett, R.E. 2010.

Production parameters and economics of small-scale tilapia cage aquaculture in the Volta Lake, Ghana.

Journal of Applied Aquaculture 22(4): 337-351.

To calculate the potential for cage aquaculture to create economic opportunities for small-scale investors on the Volta Lake, Ghana, a local NGO with technical support from the Government of Ghana ran two trials (one of four and one of six units) of small-scale cage aquaculture in the town of Dzemeni. Cages were built locally from available materials at a cost of approximately US\$1000 per 48 m³ cage. An indigenous line of Nile tilapia, *Oreochromis niloticus*, was stocked either as mixed sex (first trial) or all-males (second trial) at an average rate of 103 fish/m³ and grown on locally available pelleted feeds for approximately six months. Total costs averaged US\$2038 per six-month production cycle. Gross yield ranged from 232 to 1176 kg/cage, averaging 460 kg/cage (9.6 kg/m³). Final average weight of mixed sex populations

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(253.05 ± 47.43g) was significantly less than of all-males (376.7 ± 72.30g). Likewise, percentage of fish over 300 g at harvest was significantly lower in mixed-sex (38.3%) compared to all-male (75.7%) populations. Mortality resulting primarily from poor handling during transport and stocking averaged 70% and was a major determinate of production and profitability. To break even, harvested biomass of fish needed to exceed 15 kg/m³. At 25 kg/m³, small-scale cage aquaculture generated a net income of US\$717 per cage per six months (ROI = 30.2%) on revenues of US\$3,500. Water quality in the area surrounding the cages was not negatively affected by aquaculture at the scale tested (5 tons of feed per six months).

Pattanaik, C. ; Narendra Prasad, S. ; Nagabhatla, N. ; Sellamuttu, S.S. 2010.

CBD 2010 target: a case study of Kolleru Wetland (Ramsar Site), India using remote sensing and GIS.

IUP Journal of Earth Sciences, 4(2): 70-77.

Regular monitoring of wetlands is an essential element of management for 'wise use'. Indeed, the Ramsar convention requires routine monitoring in order to detect changes in the ecological character at listed sites. However, there are few examples of monitoring of tropical wetlands on a sustained basis in the world. In the present study, we quantified land use/land cover changes in the lone Ramsar site, the Kolleru Wildlife Sanctuary of Andhra Pradesh, India between 1977 and 2007 using remote sensing and GIS techniques. It was found that there was a significant increase in aquaculture farming (158.5 sq km) from 1977 to 2000, which put the habitat of flora and fauna in adverse conditions. The natural function of lake was being restored after the demolition of fish ponds ordered by the Honorable Supreme Court of India in 2006. This study highlights the firsthand information to the user community after demolition, and offers suggestions for the future conservation of the lake. We suggest that remote sensing and GIS tools have a significant role in meeting the reported requirements for the CBD 2010 target.

Pemsl, D.E. ; Seidel-Lass, L. 2010.

Informal networks in policy processes: the case of community-based fisheries management in Bangladesh.

Journal of Development Effectiveness 2(4): 486-503.

A significant share of research for development aims at improving policy. The authors use the case of community-based fisheries management in Bangladesh to demonstrate how social network analysis can be applied to explore policy influence. Influence is an important intermediary step to impact. Data were collected in expert surveys conducted in 2007. The informal network that emerged during the project directly links local non-governmental organisations and grass-root organisations to development and administrative government organs. Decision-makers at the government planning level stated they received information from project partners, thus providing evidence for the policy influencing role of the analysed project.

Perry, A.L. ; Lunn, K.E. ; Vincent, A.C.J. 2010.

Fisheries, large-scale trade, and conservation of seahorses in Malaysia and Thailand.

Aquatic Conservation: Marine and Freshwater Ecosystems 20(4): 464-475.

All seahorse species (genus *Hippocampus*) are listed under CITES Appendix II, requiring that exports of these fishes must be regulated for sustainability. Preliminary trade surveys and anecdotal reports suggested Malaysia and Thailand represented an important source for seahorses used globally in traditional medicine, curios, and aquarium display, but few historic trade or fisheries data are available. The objectives of this study were to: (1) determine seahorse species in trade; (2) identify trade routes, including source and destination markets; (3) quantify numbers and/or volumes of seahorses, both live and dried, that were caught, consumed, and traded; and (4) assess trends in seahorse catch rates, supply, demand, domestic use, imports, and exports, particularly where such patterns might indicate declines in Malaysian and Thai seahorse populations.

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Perry, R.I. ; Ommer, R.E. ; Allison, E.H. ; Badjeck, M.C. 2010.

Interactions between changes in marine ecosystems and human communities.

p. 221-251. In: *Barange, M. et al. Marine ecosystems and global change. Oxford University Press.*

This chapter discusses how small-scale fisheries dependent human communities are interactive with marine ecosystems. It has shown how changes in the marine ecosystems can impact human fishing communities, and also how the responses to these human communities can exacerbate or ameliorate ecosystem changes.

Phillips, M. ; Subasinghe, R. 2010

Small-scale shrimp farmers: challenges & opportunities for better market access.

p. 35-46. In: *Alday-Sanz, V. ed. The shrimp book. Nottingham, Nottingham University Press.*

This chapter gives an overview of the small scale shrimp farming sector in the Asian region.

Pomeroy, R. ; Garces, L. ; Pido, M. ; Silvestre, G. 2010.

Ecosystem-based fisheries management in small-scale tropical marine fisheries: emerging models of governance arrangements in the Philippines.

Marine Policy 34: 298-308.

There has been a gradual evolution in fisheries management over the past decades from a focus on sustainability of a single species or stock and resources to a focus on marine ecosystems. Among the issues to be addressed for effective implementation of ecosystem based fisheries management (EBFM) are the appropriate governance arrangements and scale for management. The purpose of this paper is to examine these issues of governance and scale as related to EBFM in tropical developing countries through an analysis of approaches being taken in the Philippines to manage fisheries on a multi-jurisdictional level. The management of fisheries and coastal resources in a number of bays and gulfs, which represent marine ecosystems, is presented. The opportunities and constraints to ecosystem based fisheries management in the Philippines are discussed and lessons for broader application of these governance structures in tropical developing country marine ecosystems are presented.

Pongthana, N. ; Nguyen, N.H. ; Ponzoni, R.W. 2010.

Comparative performance of four red tilapia strains and their crosses in fresh and saline water environments.

Aquaculture 308: S109-S114.

A complete diallel cross involving four strains of red tilapia (*Oreochromis spp.*) from Malaysia, Stirling, Taiwan and Thailand was performed with the aim to establish a foundation population for genetic improvement. The mating involved 16 parental breeders per sex per strain, producing 64 full-sib families in total. Statistical analyses were carried out on data consisting of records from 1280 individuals reared in both freshwater (0 ppt) and saline water (30 ppt) environments. Among the purebreds, and across the testing environments, the Malaysian strain exhibited the highest additive genetic performance for harvest weight. Whereas the Stirling strain was the poorest (7.4% above and 13.4% below the overall mean of pure strains, respectively). The average level of heterosis was generally low (4.2%) and the average of all crossbreds was not statistically different from the mean of the pure strains. Overall, the growth performance of red tilapia was significantly lower in saline than in freshwater environments ($P < 0.001$). The high correlation between additive genetic and total performance suggests that improvement of red tilapia can be effectively based on the exploitation of additive genetic variation (i.e. through selective breeding). A synthetic base population was therefore formed with the best performing individuals regardless of their genetic makeup and of the environments tested. Strategies for the future breeding program in red tilapia are discussed.

Ponzoni, R. ; Khaw, H.L. ; Nguyen, N.H. ; Hamzah, A. 2010.

Inbreeding and effective population size in the Malaysian nucleus of the GIFT strain of Nile tilapia (*Oreochromis niloticus*).

Aquaculture 302(1/2): 42-48.

A fully pedigreed population of the GIFT (Genetically Improved Farmed Tilapia) strain of Nile tilapia (*Oreochromis niloticus*) was established in Malaysia during 2001 and 2002. The selection program was focused on the improvement of growth rate to harvest weight and the mate allocation strategy was aimed at avoiding inbreeding and ensuring that most sire families were represented as parents of the next generation. We examined the build up of inbreeding and we estimated the effective population size by different methods (namely, from: the number of selected parents, the variance in family size, the inbreeding coefficient, and the co-ancestry among selected individuals). The rate of inbreeding was 0.0037 per generation and the effective population size calculated from the rate of increase in the co-ancestry was 88. We conclude that the mate allocation strategy has been successful in containing inbreeding and that the effective population size is satisfactory for the sustainability of the selection program. By contrast, the effective population size is below the minimum (e.g. 500) necessary for the retention of evolutionary

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potential, hence the population would be unlikely to adapt and cope with severe environmental challenges. The results are discussed in relation to the development and maintenance of selection lines in farmed aquatic animals.

Pouomogne, V. ; Brummett, R. ; Gatchouko, M. 2010.

Impacts of aquaculture development projects in Western Cameroon.

Journal of Applied Aquaculture 22(2): 93-108.

To measure the impact of past projects on the sustained adoption and development of aquaculture, and to assess the potential for future growth, a participatory rural appraisal (PRA) based on the Research Tool for Natural Resource Management, Monitoring and Evaluation (RESTORE) of 100 farmers (62 with fishponds, 38 without) was undertaken between January and August 2001 in the Noun Division of Western Province, Cameroon. The average household of 14 persons possessed 5.5 ha of land. Educational level is low (less than 35% above primary, 24% illiterate). Most fish producers were small-scale farmers (79%). Of the 360 fish farmers possessing 445 fish ponds (250 m² average surface area), only 23% were active. Production is primarily based on earthen ponds stocked with mixed-sex tilapia (*Oreochromis niloticus*) grown alone (42%) or in polyculture (54%) with the African catfish (*Clarias gariepinus*). Most ponds are poorly managed, containing underfed fish despite the availability of large quantities of agricultural by-products that could be used as pond inputs. Average annual yield is 1,263 kg/ha. Despite a number of aquaculture development projects over 30 years, there were no significant differences ($P < 0.05$) in household economics and farming systems between fish farming and non-fish farming families. According to active fish farmers, the major constraints to increasing aquaculture production to make it economically interesting are: lack of technical assistance (46%) and lack of good fingerlings (30%). Recent political and economic changes have altered the outlook for aquaculture in Cameroon, and a development strategy based on new rural development policies is discussed.

Prasad, P.R. ; Nagabhatla, N. ; Dutt, C.B.S. 2010.

Intra-variability analysis in the heterogeneous tropical island system of South Asia.

p. 223-230. IN: Recent trends in biodiversity of Andaman and Nicobar Islands.

Zoological Survey of India, India. Andaman and Nicobar Islands houses vivid ecological habitats with diverse set of ecosystems varying from low altitude sandy beach forest to high altitude dense humid evergreen forests. The islands on account of their isolation, harbors a phenomenal degree of endemic plants and animals species along with rich marine life. The present study, using the application of earth observation system and geospatial tools aims to compare and explore the intra variability of landscape structure as well as the diverse vegetation pattern in North Andaman and Baratang Islands of the Andaman group.

Prasad, P.R.C ; Nagabhatla, N. ; Reddy, C.S. ; Gupta, S. ; Rajan, K.S. ; Raza, S.H. ; Dutt, C.B.S. 2010.

Assessing forest canopy closure in a geospatial medium to address management concerns for tropical islands: Southeast Asia.

Environmental Monitoring and Assessment 160(1/4): 541-553.

The present study outlines an approach to classify forest density and to estimate canopy closure of the forest of the Andaman and Nicobar archipelago. The vector layers generated for the study area using satellite data was validated with the field knowledge of the surveyed ground control points. The framework developed would serve as a significant measure to forest health and evaluate management concerns whilst addressing issues such as gap identification, conservation prioritisation and disaster management--principally to the post-tsunami assessment and analysis.

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Purcell, S.W. 2010.

Diel burying by the tropical sea cucumber *Holothuria scabra*: effects of environmental stimuli, handling and ontogeny.

Marine Biology 157(3): 663-671.

Understanding concealment behaviour of marine animals is vital for population surveys and captive-release programmes. The commercially valuable sea cucumber *Holothuria scabra* Jaeger 1833 (*Holothuroidea*) can display a diel burying cycle, but is it widely predictable? Circadian burying of captive *H. scabra* juveniles, and both juveniles and adults in the wild, was examined in New Caledonia. Groups of ten cultured juveniles in mesh chambers in a tank were monitored for 24 h. Small juveniles (1-5 g) displayed an expected diel cycle of epibenthic foraging in the afternoon and night then burial in sediments in the morning. Burial was related significantly to both light and temperature in combination. Similar groups of juveniles were handled once or three times a day for 1 week then frequency of emergence during another week was compared to unhandled controls. Handling stress, whether occasional or frequent, significantly suppressed the frequency of their afternoon emergence from sediments for 4 days. In a coastal seagrass bed, burial and emergence of *H. scabra* were monitored during days of opposing tidal cycles in three seasons. Adults seldom buried during the day except in the cool season. At that site, most small hatchery-produced *H. scabra* juveniles were buried during most of the day, while larger juveniles showed little diurnal burying. This study underscores that the circadian behaviours of marine animals can exhibit substantial spatial variation, may be absent at certain sites or seasons, and can be mediated by a complexity of factors that vary over short time scales.

Satria, A. ; Adhuri, D.S. 2010.

Pre-existing fisheries management systems in Indonesia, focusing on Lombok and Maluku.

p.31-55. In: Ruddle, K. ; Satria, A. (eds.) *Managing coastal and inland waters: pre-existing aquatic management systems in Southeast Asia* Springer. 188 p.

In Indonesia pre-existing systems of fisheries management were delegitimized during the 'New Order Era' (1966-1998), and revived after the 'Reform Era' began, in 1998. Three such systems are examined; the awig-awig and sawen of North Lombok, and the petuanan and sasi of Maluku. Based on the pre-existing system that contained sawen, with its basic values and norms for integrated management of forest, farmland and coastal resources, local people took the initiative to revive three awig-awig, and adapted them to both combat destructive fishing practices and implement sustainable fisheries management. Sea tenure in Maluku is based on the concept of petuanan laut, the sea territory of a particular social group, to which 'the right to eat' (compounded from the rights of access, usage and exploitation) and 'the right of ownership' are attached. Sasi

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refers to the beliefs, rules and rituals regarding temporal prohibitions for a petuanan laut. The performance of pre-existing fisheries management systems is evaluated and national policy for them examined.

Szuster, B. ; Hoanh, C.T. ; Kam, S.P. ; Ismail, A.M. ; Noble, A. ; Borger, M. 2010.

Policy, planning and management at the land-water interface.

p. 1-12. In: Chu, T.H. et al. (ed.) *Tropical deltas and coastal zones: food Production, communities and environment at the land-water Interface. Comprehensive Assessment of Water Management in Agriculture Series 9. Cabi International.*

Historically, land and water management within many coastal deltas has focused on the exclusion of saline water flows that move upstream from the coast. However, this approach fails to recognize the diversity of rural livelihoods and ecosystems in coastal deltaic areas, the environmental consequences of altering natural saline water flows and the emergence of new activities such as shrimp farming that require brackish water. Focusing on the developing countries of Asia, Africa and South America, chapters explore the diverse livelihoods of people in these areas, the impact of land-water management on environments, new techniques and methodologies and lessons learned in land and water management to solve the conflicts between agriculture, aquaculture and fisheries.

Thanh, N.M. ; Nguyen, N.H. ; Ponzoni, R.W. ; Vu, N.T. ; Barnes, A.C. ; Mather, P.B. 2010.

Estimates of strain additive and non-additive genetic effects for growth traits in a diallel cross of three strains of giant freshwater prawn (*Macrobrachium rosenbergii*) in Vietnam.

Aquaculture 299: 30-36.

Additive genetic, heterotic and strain reciprocal effects were estimated using a diallel cross of two local wild strains of the giant freshwater prawn (*Macrobrachium rosenbergii*) in Vietnam (Dong Nai and Mekong) and a third domesticated Hawaiian strain, newly introduced to Vietnam. While some minor heterotic outcomes were detected in specific crosses, strain additive genetic and reciprocal effects were more significant sources of variation for all growth traits measured. Strain additive genetic effects were highest for the Hawaiian strain (+10.2%) and lowest for the Mekong strain (-11.6%) for harvest body weight. A similar pattern of strain additive genetic effects was observed for carapace and standard length. Average heterotic outcomes for all growth traits were small and not significantly different from zero ($P > 0.05$), and ranged from +0.7 for carapace length to +1.5% for body weight. The reciprocal effect had a positive effect on growth rate, because crosses between the Dong Nai (D) or Mekong (M) strains as

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dam and the Hawaiian (H) strain as sire grew faster than did their reciprocal crosses (HD and HM). The relative high correlation between strain additive performance and total performance for all traits ($r=0.71$ to 0.77) suggests potential for exploiting strain additive variation to improve *M. rosenbergii* culture stock via direct selection among strains. A breeding strategy for genetic improvement of giant freshwater prawn in Vietnam is discussed.

Umesh, N.R. ; Chandra Moham, A.B. ; Ravibabu, G. ; Padiyar, P.A. ; Phillips, M.J. ; Mohan, C.V. ; Vishnu Bhat, B. 2010.

Shrimp farmers in India: empowering small-scale farmers through a cluster-based approach.

p. 41-66. In: *De Silva, S.S. ; Davy, F.B. (eds.) Success stories in Asian aquaculture. Dordrecht, Springer.*

The great bulk of shrimp farming in India, as in most of Asia, as well as that of aquaculture in general in the region, is based on small scale farming activities, and in this regard, is no exception to other primary sector activities. The work on the development of better management practices (BMPs) on the shrimp culture sector commenced with the recognition of the need to place the sector on a firmer footing, while combating the problems of frequent disease occurrences, and to ensure its long term sustainability. The process commenced with the organization of small scale farmers into groups - clusters and/or aquaclubs - grouping farmers in a given area, drawing on common resources such as a common water supply channel, and inducing the farmers to act collectively rather than individually to the betterment and benefits of all. Such clusters and/or aquaclubs were later transformed into Societies with a legal standing, with the establishment of the National Center for Sustainable Aquaculture in 2007, with a purview to monitor society functioning and dissemination of technical know-how to other areas. The outcomes include improved shrimp yields, less impact on the environment, improved product quality, and better relations among players in the market chain.

Villanueva, R.D. ; Edwards, A.J. ; Bell, J.D. 2010.

Enhancement of grazing gastropod populations as a coral reef restoration tool: predation effects and related applied implications.

Restoration Ecology 18(6): 803-809.

In this study, we aimed to evaluate the efficacy of adding *T. niloticus* to control epilithic algal biomass and enhance coral recruitment on artificial substrata at a heavily fished reef in northwestern Philippines. Our main hypothesis was that with addition of trochus, the growth of algae would be lower and the number of coral recruits would be higher. The reason for trying to control algal growth through trochus grazing was to reduce preemption of space for settlement of coral larvae. Trochus was used as a grazer because it can be cultured easily and released effectively, allowing the production of juveniles and subadults in adequate numbers for local stock enhancement. We also examined any interactions between the possible beneficial effects of trochus and “seeding” the substrate with small transplanted coral colonies to promote recruitment of coral and attract fishes and any effects of trochus on the survival of the transplanted coral colonies. Aside from assisting coral recruitment, grazing of benthic algae by trochus was expected to limit competitive effects of macroalgae on coral transplants because different functional groups of benthic algae can cause coral mortality by overgrowth, shading, abrasion, and allelopathy.

Visser, L.E. ; Adhuri, D.S. 2010.

Territorialization re-examined: transborder marine resources exploitation in Southeast Asia and Australia.

p. 83-96. IN: Jong, W.D. ; Snelder, D. ; Ishikawa, N. (eds.) *Transborder governance of forests, rivers and seas. Earthscan, London.* 217 p.

This chapter re-examines the concept of territorialization to provide a framework for the anthropological analysis of the new phenomenon of transborder access to and appropriation of marine resources. The authors expand the subject of territorialization from land-based forestry to the control of people and their relations to marine resources, and reexamine the concept by addressing the everyday dynamics of the social, economic and political interactions taking place at multiple individual and institutional scales between central, provincial and district government agencies, trade networks, and resource appropriators. They also discuss two case studies involving transborder fisheries in Southeast Asia (Malaysia--Indonesia) and Australia (Indonesia--Australia), and compare them with transborder appropriation and exploitation of fisheries and other marine resources elsewhere.

Staff Refereed Publications

Walker, B. ; Sayer, J. ; Andrew, N.L. ; Campbell, B. 2010.

Should enhanced resilience be an objective of natural resource management research for developing countries.

Crop Science 50: S10-S19.

Productivity enhancement has traditionally been the main focus of agricultural research to alleviate poverty and enhance food security of poor farmers in the developing world. Recently, the harmful impact of climate change, economic volatility, and other external shocks on poor farmers has led to concern that resilience should feature alongside productivity as a major objective of research. The applicability of recent work on resilient social-ecological systems to the problems of poor farmers is reviewed, and proposals are made for issues that need to be addressed in determining when and how enhanced resilience might become an objective of research.

Weeratunge, N. 2010.

Developing youth entrepreneurs: a viable youth employment strategy in Sri Lanka?

p. 167-198. IN: Gunatilaka, R. ; Mayer, M. Vodopivec, M. (eds.) The Challenge of youth employment in Sri Lanka. World Bank, Washington, D.C. 274 p.

Entrepreneurship training that leads to increased business creation and expansion is considered a viable employment strategy for youth globally. Many organizations in Sri Lanka have provided entrepreneurship training for more than two decades, and while some established programs attract large proportions of youth, training directed specifically at young people is limited. With no central agency coordinating entrepreneurship training and related data collection, the overall numbers of youth who have received this type of training remain unknown. This chapter provides an assessment of the current approaches and implementation of entrepreneurship programs in Sri Lanka in relation to youth employment and argues for a better incorporation of sociocultural issues in the design and delivery of future programs.

Weeratunge, N. 2010.

Being Sadharana: talking about the just business person in Sri Lanka.

p. 328-348. IN: Lambek, M. (ed.) Ordinary ethics: anthropology, language and action. Fordham University Press, New York. 458 p.

The ethics of business is a very old problem, debated extensively by philosophers, writers and social scientists, and it underpins current concepts of social justice within a market economic system. In rural societies, where most people engage in agriculture or fishing, disdain for those who make a living by trade has a long history. Sri Lanka is no exception. Current global discourses on business ethics and the profit motive tend to focus on the practices of large corporations rather than on micro, small and medium businesses, which form the economic fabric of most countries. In this essay, the author examines the discourse of doing sadharana ("just") business in order to determine how rural people perceive and talk about businesses in their communities and regions, and what it is about business and business people that they find problematic.

Weeratunge, N. ; Snyder, K.A. ; Choo, P.S. 2010.

Gleaner, fisher, trader, processor: understanding gendered employment in fisheries and aquaculture.

Fish and Fisheries 11(4): 405-420.

Most research on gender difference or inequities in capture fisheries and aquaculture in Africa and the Asia-Pacific focuses on the gender division of labour. Emerging research on globalization, market changes, poverty and trends in gendered employment within this sector reveals the need to move beyond this narrow perspective. If gleaning and post-harvesting activities were enumerated, the fisheries and aquaculture sector might well turn out to be female sphere. A livelihoods approach better enables an understanding of how employment in this sector is embedded in other social, cultural, economic, political and ecological structures and processes that shape gender inequities and how these might be reduced. We focus on four thematic areas—markets and migration, capabilities and well-being, networks and identities, governance and rights—as analytical entry points. These also provide a framework to identify research gaps and generate a comparative understanding of the impact of development processes and socioecological changes, including issues of climate change, adaptation and resilience, on gendered employment. Without an adequate analysis of gender, fisheries management and development policies may have negative effects on people's livelihoods, well-being and the environment they depend on, or fail altogether to achieve intended outcomes.

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Welcomme, R.L. ; Cowx, I.G. ; Coates, D. ; Béné, C. ; Funge-Smith, S. ; Halls, A. ; Lorenzen, K. 2010.

Inland capture fisheries.

Philosophical Transactions of the Royal Society B: Biological Sciences 365 (1554): 2881-2896.

The reported annual yield from inland capture fisheries in 2008 was over 10 million tonnes, although real catches are probably considerably higher than this. Inland fisheries are extremely complex, and in many cases poorly understood. The numerous water bodies and small rivers are inhabited by a wide range of species and several types of fisher community with diversified livelihood strategies for whom inland fisheries are extremely important. Many drivers affect the fisheries, including internal fisheries management practices. There are also many drivers from outside the fishery that influence the state and functioning of the environment as well as the social and economic framework within which the fishery is pursued. The drivers affecting the various types of inland water, rivers, lakes, reservoirs and wetlands may differ, particularly with regard to ecosystem function. Many of these depend on land-use practices and demand for water which conflict with the sustainability of the fishery. Climate change is also exacerbating many of these factors. The future of inland fisheries varies between continents. In Asia and Africa the resources are very intensely exploited and there is probably little room for expansion; it is here that resources are most at risk. Inland fisheries are less heavily exploited in South and Central America, and in the North and South temperate zones inland fisheries are mostly oriented to recreation rather than food production.

Witt, R. ; Pemsl, D.E. ; Waibel, H. 2010.

Collecting data for poverty and vulnerability assessment in remote areas in Sub-Saharan Africa.

Survey Methodology 36(2): 217-222.

Data collection for poverty assessments in Africa is time consuming, expensive and can be subject to numerous constraints. In this paper we present a procedure to collect data from poor households involved in small-scale inland fisheries as well as agricultural activities. A sampling scheme has been developed that captures the heterogeneity in ecological conditions and the seasonality of livelihood options. Sampling includes a three point panel survey of 300 households. The respondents belong to four different ethnic groups randomly chosen from three strata, each representing a different ecological zone. In the first part of the paper some background information is given on the objectives of the research, the study site and survey design, which were guiding the data collection process. The second part of the paper discusses the typical constraints that are hampering empirical work in Sub-Saharan Africa, and shows how different challenges have been resolved. These lessons could guide researchers in designing appropriate socio-economic surveys in comparable settings.

Bailly, N. ; Reyes, R. Jr. ; Atanacio, R. ; Froese, R. 2010.

Simple identification tools in Fishbase.

p. 31-36. In: Nimis, P.L. ; Vignes Lebbe, R. (eds.) Proceeding of the International Congress on tools for identifying biodiversity: progress and problems. Paris, Sept 20-22.

Simple identification tools for fish species were included in the Fish Base information system from its inception. Early tools made use of the relational model and characters like fin ray meristics. Soon pictures and drawings were added as a further help, similar to a field guide. Later came the computerization of existing dichotomous keys, again in combination with pictures and other information, and the ability to restrict possible species by country, area, or taxonomic group. Today, www.FishBase.org offers four different ways to identify species. This paper describes these tools with their advantages and disadvantages, and suggests various options for further development. It explores the possibility of a holistic and integrated computer aided strategy.

Baran, E. 2010.

Mekong fisheries and mainstream dams: fisheries sections.

In: ICEM. Mekong River Commission Strategic environmental assessment of hydropower on the Mekong mainstream. International Centre for Environmental Management, Hanoi, Vietnam. 145 p.

Twelve hydropower schemes have been proposed for the Lao, Lao-Thai and Cambodian reaches of the Mekong mainstream. Implementation of any or all of the proposed mainstream projects in the Lower Mekong Basin (LMB) could have profound and wide-ranging socio-economic and environmental impacts in all four riparian countries. The main report document was prepared for the Mekong River Commission Secretariat (MRCS) by ICEM-International Centre for Environmental Management engaged to facilitate preparation of a Strategic Environment Assessment (SEA) of proposals for mainstream dams in the Lower Mekong Basin. This current report is an excerpt of the whole study, and focuses on fish resources only.

Non Refereed Publications

Dugan, P.J. ; Barlow, C. ; Agostinho, A.A. ; Baran, E. ; Cada, G.F. ; Chen, D.Q. ; Cowx, I.G. ; Ferguson, J.W. ; Jutagate, T. ; Mallen-Cooper, M. ; Marmulla, G. ; Nestler, J. ; Petrere, M. ; Welcomme, R.L. ; Winemiller, K.O. 2010.

Fish migration, dams, and loss of ecosystem services in the Mekong Basin.

Ambio 39: 344-348.

The past decade has seen increased international recognition of the importance of the services provided by natural ecosystems. It is unclear however whether such international awareness will lead to improved environmental management in many regions. We explore this issue by examining the specific case of fish migration and dams on the Mekong river. We determine that dams on the Mekong mainstem and major tributaries will have a major impact on the basin's fisheries and the people who depend upon them for food and income. We find no evidence that current moves towards dam construction will stop, and consider two scenarios for the future of the fisheries and other ecosystems of the basin. We conclude that major investment is required in innovative technology to reduce the loss of ecosystem services, and alternative livelihood strategies to cope with the losses that do occur.

Dupont-Nivet, M. ; Prunet, P. ; Bégout, M.L. ; Pellegrini, P. ; Khaw, H.L. ; Millot, S. ; Péan, S. ; Aupérin, B. ; Valotaire, C. ; Rolland, J. ; Kerneis, T. ; Goardon, L. ; Quillet, E. 2010.

Genetics of adaptation in rainbow trout: a multi disciplinary approach.

p. 397-398. Proceedings of the Aquaculture Europe 10. 5-8 Oct 2010, Porto, Portugal.

Ability of fish to adapt to changing environments and stressors is a key trait for breeders, especially when they sell eggs or young fish all over the world. So far, this ability has not been introduced in any breeding program. Indeed, sensibility to environment is difficult to describe. Most often, either physiological traits, or behavioral traits are considered but each of them represent only a partial representation of the situation. In this study, we carried out a multidisciplinary approach to better understand the genetics of adaptation and prospect for possible selection strategies.

Non Refereed Publications

Hall, S.J. ; Dugan, P. ; Allison, E.H. ; Andrew, N.L. 2010.

The end of the line: who is most at risk from the crisis in global fisheries?

Ambio 39: 78-80.

This synopsis praises the film "The end of the line" in bringing attention to fisheries and food crisis faced by the world. However, not enough focus has been placed on African fisheries where food fish is a key component of the protein intake by a large population. To help tackle the global fisheries crisis, the synopsis recommends two more strategies i) use aid to help secure the productivity of the fish stocks upon which the world's poor depend and ii) invest in developing sustainable aquaculture solutions that meet the food needs of the poor in developing countries.

Joffre, O. ; Sheriff, N. ; Weeratunge, N. 2010.

Understanding adoption and discontinuance for greater impact.

Innovation and Sustainable Development in Agriculture and Food. ISDA 2010.

Montpellier, France 28 Jun-1 Jul.

Floodplains are characterized by a period of several months when the land is not available for agriculture and large, open areas are used for fisheries. The enclosed part of these flooded areas can be utilized for fish production aside from naturally occurring self recruited species through a community-based management system. Experiences in the Vietnamese and Cambodian Mekong Delta and Ganges Delta in Bangladesh between 2006 and 2009 highlighted the potential of this model and its limitations. Comparative analysis between countries at community and household levels provide indications about enabling and constraining factors affecting the success of this model in a range of factors (governance, economic, social and, environmental/technical) using both qualitative and quantitative data. The analysis shows that the Bangladesh context is more suitable than that of Vietnam and Cambodia to develop such collective action, with a more adapted socio-economic and natural environment. Absence of trust between participants and low capacity to develop collective action were found as important constraints in Vietnam, where individual economic benefit was the main driving factor and possibly the cement of community based action. The study of so called "failures" of technical interventions helped us to understand the different requirements needed to develop Community Based Fish Culture and how such technology can be integrated in other agro-ecosystems and socio-economic environments.

Non Refereed Publications

Johnston, R.M. ; Hoanh, C.T. ; Lacombe, G. ; Noble, A.N. ; Smakhtin, V. ; Suhardiman, D. ; Kam, S.P. ; Choo, P.S. 2010.

Rethinking agriculture in the Greater Mekong subregion: how to sustainably meet food needs, enhance ecosystem services and cope with climate change.

International Water Management Institute, Colombo, Sri Lanka. 26 p.

Nations of the Greater Mekong Subregion need to ‘rethink’ their agricultural industries to meet future food needs, given the social shifts and climate changes that are forecast for the coming decades. With better farming practices, and by managing agriculture within the wider context of natural ecosystems, nations could boost production and increase the wealth and resilience of poor people in rural communities. Demand for food is forecast to double by 2050, as populations swell and people’s dietary choices change. If governments act now, they will be better placed to meet this target and withstand the more severe climatic changes likely to affect the GMS beyond 2050. These are the main messages of the summary report.

Kam, S.P. ; Badjeck, M.C. ; Phillips, M. ; Pomeroy, R. (contributors). 2010.

Aquaculture [in Vietnam].

Section four Aquaculture. p. 29-42. In: The World Bank. Economics of adaptation to climate change: Vietnam. The World Bank Group, Washington D.C.

This report provides a synthesis of key findings of sector studies undertaken in Vietnam in the context of the Economics of Adaptation to Climate Change (EACC) study. Sectors studied include agriculture, forestry, coastal port and aquaculture. Aquaculture, especially in the Mekong River Delta, is an important source of employment and rural income. The main impacts of climate change on aquaculture seem likely to be a consequence of increased flooding and salinity.

Non Refereed Publications

Mannini, P. ; Beveridge, M. ; Curtis, L. 2010.

Adapting to climate change: the ecosystem approach to fisheries and aquaculture in the Near East and North Africa region.

FAO Aquaculture Newsletter No. 45: 14-15.

The FAO/WorldFish Center Workshop on Adapting to Climate Change: the Ecosystem Approach to Fisheries and Aquaculture in the Near East and North Africa took place in November, 2009 to identify and address the impacts created by climate change in the region, and how the Ecosystem Approach to Fisheries (EAF) and Aquaculture (EAA) can be utilized for the management and adaptation of fisheries and aquaculture in the face of these impacts. The workshop was structured through working group sessions divided into three main topic areas, namely: a) identifying climate change impacts on fisheries and aquaculture; b) identifying adaptation/management strategies for priority impacts/issues; and c) understanding regional and sub-regional capacities for the implementation of adaptation strategies.

Nguyen, N.H. ; Ponzoni, R.W. 2010.

Genetic improvement of fillet traits and flesh quality in aquaculture species.

16th DSM Aquaculture Conference, Bangkok, Thailand, November 17-20, 2010, Abstract.

Flesh quality has gained importance among consumers and in the aquaculture industry because it is related to consumer preference as well as human health and nutrition. This paper studied four groups of flesh quality traits in the Genetically Improved Farmed Tilapia (GIFT) strain: i) Carcass (fillet) traits, ii) Flesh composition (protein, fat, moisture and ash content), iii) Flesh quality attributes (pH, color), and iv) Fatty acid composition.

Ponzoni, R.W. ; Khaw, H.L. ; Yee, H.Y. 2010.

GIFT: the story since leaving ICLARM (now known as the WorldFish Center): socioeconomic, access and benefit sharing and dissemination aspects.

FNI Report 14/2010. Fridtjof Nansen Institute, Norway. 47 p.

The aim of the overall project of which this report is part is to identify possible solutions for regulating access to aquatic genetic resources and legal protection of the results of research and development in aquaculture using such resources. The case study of the collaborative program on Genetic Improvement of Farmed Tilapias (GIFT) serves as a basis for comparison with two other case studies from Norway on salmon and cod. This study

Non Refereed Publications

aims to address the following questions: How has the legal regime for GIFT material developed since leaving WorldFish? How has this affected the use and dissemination of GIFT material by the aquaculture sector (private and public sectors)? How has the transfer from WorldFish affected access and benefit sharing of GIFT material? And what are the effects on further developments and innovation of this breeding material? The report concludes that there is no doubt that the GIFT project has had an impact worldwide. Both the technology and the genetically improved fish have been widely distributed and are now known. Whereas we believe that it is fair to say that in many instances the improved fish have reached and benefitted the poor, it is also an area where gross mistakes were made. Such mistakes separated events from a path that could have benefitted the poor much more. The first miscalculation was to assume that GIFT Foundation International Inc. (GFII) was going to rapidly become financially self-reliant and that it did not require further support. This mistake led to another even greater error of judgement, the alliance between GFII and GenoMar, whereby the latter profit-oriented company obtained the right to breed and market GIFT. This decision brought about a change of focus of GFII from breeding and dissemination of GIFT fish to poor and small scale farmers to meeting the business objectives of GenoMar instead.

Ratner, B.D. ; Meinzen-Dick, R. ; May, C. ; Haglund, E. 2010

Resource conflict, collective action and resilience: an analytical framework.

CAPRI Working Paper no. 100. International Food Policy Research Institute, Washington D.C.

In developing countries where access to and use of renewable natural resources essential to rural livelihoods are highly contested, improving cooperation in their management is increasingly seen as an important element in strategies for peacebuilding, conflict prevention, and longer-term social-ecological resilience. While researchers have made important advances in recent years in assessing the role of environmental resources as a causal factor in civil conflict, analysis of the positive potential of collective natural resource management efforts to reduce broader conflict is less developed. In particular, there is a need for analytical tools that not only describe stakeholder interactions and outcomes but also yield practical guidance on what development practitioners and policy makers can do to promote such goals. Addressing this need, we present a framework focused on the links between collective action, conflict prevention, and social-ecological resilience. Building on the institutional analysis and development (IAD) model, and incorporating principles from the sustainable livelihoods approach and resilience theory, the framework is applicable across multiple scales of analysis, linking local stakeholder dynamics to the broader institutional and governance context.

Non Refereed Publications

Subasinghe, R.P. ; Phillips, M.J. 2010.

Small-scale aquaculture: organization, clusters and business.

FAO Aquaculture Newsletter No. 45: 37-39,55.

Aquaculture now contributes nearly half of the global food fish production and, by the year 2030, estimates are that an additional 27 million tonnes, or over 50 percent from the current production, will be needed to meet the growing demand for food fish. This article summarises the role aquaculture plays in contributing to the global food supplies and highlights the related economic benefits.

Weirowski, F. ; Liese, A. 2010.

Fishing for private expertise.

New Agriculturist [online publication].

Aquaculture currently produces more than 50 per cent of all fish and seafood products that are consumed worldwide. With ongoing intensification and global networking, aquaculture is creating an increasing demand for infrastructure and supporting public services, resulting in a diversity of public-private partnerships (PPPs).

Other Key WorldFish Publications

Banda Nyirenda, D. ; Sampa, M. ; Husken, S.M.C. 2010.

Baseline study: nutritional status, food security and fish consumption among people living with HIV/AIDS in Zambia.

Regional Programme Fisheries and HIV/AIDS in Africa: Investing in Sustainable Solutions. Project report. The WorldFish Center, Penang, Malaysia. 62 p.

Under the regional programme Fisheries and HIV/AIDS in Africa, the University of Zambia, in collaboration with the WorldFish Center, has undertaken a baseline survey of the nutritional status and fish consumption of people living with HIV/AIDS in Zambia. Factors examined include household composition, education level, livelihood strategies, household food security, asset ownership, common ailments, sources of medication, the reason why children died, consumption of fish and other animal source foods, and level of nutrition education.

Brown, E.O. ; Perez, M.L. ; Garces, L.R. ; Ragaza, R.J. ; Bassig, R.A. ; Zaragoza, E.C. 2010.

Value chain analysis for sea cucumber in the Philippines.

WorldFish Center Studies and Reviews 2120. The WorldFish Center, Penang, Malaysia. 44p.

This study examined the sea cucumber industry in the Philippines through the value chain lens. The intent was to identify effective pathways for the successful introduction of sandfish culture as livelihood support for coastal communities. Value chain analysis is a high-resolution analytical tool that enables industry examination at a detailed level. Previous industry assessments have provided a general picture of the sea cucumber industry in the country. The present study builds on the earlier work and supplies additional details for a better understanding of the industry's status and problems, especially their implications for the Australian Center for International Agricultural Research (ACIAR) funded sandfish project "Culture of sandfish (*Holothuria scabra*) in Asia-Pacific" (FIS/2003/059).

Other Key WorldFish Publications

Chiwaula, L. ; Witt, R. ; Béné, C ; Ngoma, P. ; Turpie, J. ; Waibel, H. 2010.

Technical guidelines for economic valuation of inland small-scale fisheries in developing countries.

Report for the project "Food security and poverty alleviation through improved valuation and governance of river fisheries in Africa". The WorldFish Center, Penang, Malaysia. 40 p.

These "Technical Guidelines for Economic Valuation of Inland Small-scale Fisheries in Developing Countries" are one of the outputs of the project on "Food security and poverty alleviation through improved valuation and governance of river fisheries in Africa". The guidelines draw upon research results and experience gained during the course of the project. The project was coordinated and implemented by the WorldFish Center and was carried out in cooperation with the National Agricultural Research Institutes (NARs) from the participating countries: the Nigeria Institute for Freshwater Fisheries Research, the Departments of Fishery of Niger, Malawi and Zambia, and the Cameroonian Ministère de l'Élevage, des Pêches et de l'Industrie Animale; and three advanced research institutes (ARIs): the Leibniz University of Hannover in Germany, the Institute for Sustainable Development and Aquatic Resources in UK, and the University of Cape Town in South Africa.

Dugan, P. ; Delaporte, A. ; Andrew, N. ; O'Keefe, M. ; Welcomme, R. 2010.

Blue harvest: inland fisheries as an ecosystem service.

The WorldFish Center, Penang, Malaysia. 63 p.

Global food production has increased greatly in recent years and rural livelihoods are much improved in many regions. Yet, despite this clear progress rural poverty and food insecurity remain deeply entrenched in many areas, especially in South Asia and sub-Saharan Africa. In response the international community has renewed calls for increased commitment to meeting the needs of the world's poor. This report, commissioned as a contribution to the 10th Conference of the Parties to the Convention on Biological Diversity taking place in Nagoya, Japan, not only underlines the value of freshwater fisheries but provides guidance on how the ecosystem approach can be applied in order to sustain future harvests.

Other Key WorldFish Publications

Halls, A. 2010.

Estimation of annual yield of fish by guild in the Lower Mekong Basin: report for the NIES/the WorldFish Center project: Scenario-based assessment of the potential effects of alternative dam construction schemes on freshwater fish diversity in the Lower Mekong Basin.

The WorldFish Center, Malaysia. 24 p.

This consultation is a contribution to an assessment of the impacts of basin development on fish production in the Lower Mekong Basin (LMB). Fish of different species respond to development activities, in particular hydropower development, in different ways depending upon their migratory behaviour and their ability to adapt to and tolerate new environmental conditions. In order to better assess the impact of hydropower development on fish production in each country and along main Mekong tributaries, it is necessary to assess i) how migratory a given species is (longitudinal/lateral migrations; scale of migration, resilience to environmental change), i.e. what guild it belongs to; ii) what contribution this species makes to fish catches basinwide.

Joffre, O. ; Kura, Y. ; Pant, J. 2010.

Aquaculture for the poor in Cambodia.

The WorldFish Center, Phnom Penh, Cambodia. 16 p.

This lesson learned reviewed the current status of aquaculture in Cambodia. It primarily covers inland fish farming development and coastal aquaculture projects targeted at poverty alleviation and food security. It focuses on approaches aimed at developing low cost systems, and less on high input aquaculture systems that are usually inaccessible to poor families.

Other Key WorldFish Publications

Kalunga Mawazo, B. ; Ngoy Mwana, A. ; Nkulu Kamuyeke, K. ; Mutala, S. ; Hüsken, S.M.C. 2010.

Analysis of socio-economic factors and vulnerability of fishermen and female fish traders to HIV/AIDS in fishing camps in the Kasenga-Luapula-Moero region, Katanga Province, Democratic Republic of Congo: final report.

Regional Programme Fisheries and HIV/AIDS in Africa: Investing in Sustainable Solutions. Project Report 1984. The WorldFish Center, Penang. 38 p.

This report present the matrix and foundation of the study conducted in Katanga, based on the assumption that communities of fishermen in the Kasenga-Luapula-Moero area are vulnerable to HIV/AIDS due to a mix of several socio-economic factors and the presence of female fish traders in the fishing areas (fishing camps). The present study targeted all the fishing areas extending from Kasenga city through Luapula River to Lake Moero The present study seeks to identify socio-economic factors which are the root causes of the vulnerability of fishermen and female fish traders to HIV/AIDS in the fishing camps. From this perspective, an appropriate intervention will be developed and applied to the Kasenga -Luapula-Moero region with a view to reducing vulnerability factors to HIV/AIDS. Finally, the research team will make recommendations on the implementation of a pilot project geared towards protecting female fish traders and improving their living conditions with regard to their health and business.

Katikiro, R. ; Schwerdtner Máñez, K. ; Flitner, M. ; Badjeck, M.C. 2010

Fisheries production systems, climate change and climate variability in West Africa: an annotated bibliography.

The Leibniz Center for Tropical Marine Ecology, Bremen, Germany ; The WorldFish Center, Penang, Malaysia. 62 p.

This bibliography is intended for people who are involved in fisheries, aquaculture, climate change, disaster management and policy development in West Africa or interested in one or more of these issues. The literature in this bibliography includes peer-reviewed journals, books and book chapters, grey reports and institutional technical papers, but is restricted to literature in English. They were gathered through an extensive web search using fisheries, fish, coastal, inland, aquaculture and/or in combination with climate change and impacts, climate variability, specific country names, West Africa and Gulf of Guinea as the main keywords.

Other Key WorldFish Publications

Kawarazuka, N. 2010.

The contribution of fish intake, aquaculture, and small-scale fisheries to improving nutrition: A literature review.

The WorldFish Center Working Paper no. 2106. The WorldFish Center, Penang, Malaysia. 51 p.

Much of fish consumed by the poor are caught by household members and traded in local markets. These fish are rarely or poorly included in national statistics, and it is therefore difficult to estimate precisely the real contribution of fish to the rural poor households. This report is the first global overview of the role played by fish in improving nutrition. Fish consumption patterns of the poor, the nutritional value of fish, and small-scale fisheries and aquaculture activities are considered. It also highlights the gap in knowledge where more research is needed.

Khaw, H.L. ; Ponzoni, R. (compil.) 2010.

Proceedings of the genetic improvement of freshwater prawn, *Macrobrachium rosenbergii* (De man)

The WorldFish Center, Penang. 111 p.

This proceedings listed PowerPoint slides presented at the Second Workshop of Genetic Improvement of Freshwater Prawn held at Central Institute of Freshwater Aquaculture, Bhubaneswar, India.

Lungu, A. ; Hüsken, S.M.C. 2010.

Assessment of access to health services and vulnerabilities of female fish traders in the Kafue Flats, Zambia: analysis report.

Regional Programme Fisheries and HIV/AIDS in Africa: Investing in Sustainable Solutions. Project report. The WorldFish Center, Zambia. 47 p.

Under the regional programme Fisheries and HIV/AIDS in Africa: Investing in Sustainable Solutions, the WorldFish Center conducted this study on access to health services and vulnerabilities of female fish traders in the Kafue Flats floodplains in Zambia. This report outlines and analyses the particular vulnerabilities of female fish traders in the Kafue Flats fishery and formulates recommendations to facilitate stakeholder uptake of strategic responses to tackle the drivers of the epidemic in fishing communities and improve the livelihoods of fisher folk and fish traders in the Kafue Flats and other fisheries in Zambia.

Other Key WorldFish Publications

Mononi, F. ; Beya, A. ; Husken, S.M.C. 2010.

Comprendre et réduire la vulnérabilité des femmes commerçantes de poisson à Kasenga, RD Congo.

Rapport finale du projet pilote. Programme régional Les pêches et le VIH/SIDA en Afrique: investir dans des solutions durables. Rapport de projet, The WorldFish Center.

Ce projet pilote découle des résultats de l'étude menée par le Professeur Kalunga et son équipe dans la cité de Kasenga et ses environs. Cette étude fait partie d'un programme régional qui a pour titre : Les pêches et le VIH/SIDA en Afrique-investor dans les solutions durables. Il est mis en oeuvre par WorldFish Center en collaboration avec World Vision DRC.

Mthetwa, V.C. 2010.

The fish trader+ model: a guide for implementation.

The WorldFish Center, Zambia. 50 p.

The WorldFish Center, in partnership with FAO, is implementing the regional programme "Fisheries and HIV/AIDS in Africa: investing in sustainable solutions". This programme aims at strengthening the capacity in the region to develop sustainable solutions to enhance the contributions of fish and fisheries to economic and human development. In particular, the programme is building a strategic response to HIV/AIDS in the fisheries sector that will generate benefits for vulnerable groups in wider society. Under the Zambia component of this regional programme, research for development activities took place in the Kafue Flats fishery. This guide is one of the technical outputs, providing practical steps to implementing organisations working to improve the well-being of fisher men and fish traders in Zambia and beyond.

Mujinga, W. ; Lwamba, J. ; Mutala, S. ; Hüsken, S.M.C. 2010.

An inventory of fish species at the urban markets of Lubumbashi, Democratic Republic of Congo.

Regional Programme Fisheries and HIV/AIDS in Africa: Investing in Sustainable Solutions. Project Report 1983. The WorldFish Center, Penang. 30 p.

This study, which aims at analyzing the nutritional value of fish products sold on the fish markets of Lubumbashi, has been conducted by the World Fish center as part of its regional programme "Fisheries and HIV/AIDS in Africa : investing in sustainable solutions". This report contains a map of fish markets of Lubumbashi with analyses of fish species found at these markets, and information about the most common fish species. In addition, a photographic guide of the various types of fish and fish products in their order of importance, depending on the amounts that are available on Lubumbashi markets was also compiled.

Other Key WorldFish Publications

Nagabhatla, N. ; van Brakel, M. 2010.

Landscape level characterization of seasonal floodplains under community based aquaculture: illustrating a case of the Ganges and the Mekong Delta.

CBFC Working paper no. 4. The WorldFish Center, Penang. 84 p.

The project 'Community-based Fish Culture in Seasonal Floodplains' (henceforward the community-based fish culture project), CGIAR Challenge Program on Water and Food, aims to enhance fish production in seasonal floodplains to improve and sustain rural livelihoods in Bangladesh, Cambodia, China, Mali and Vietnam. Based on the premise that production from these water bodies could be enhanced by stocking locally important fish species, the community-based fish culture project seeks to develop technologies and institutional arrangements to support collective fish culture in the flood season. The current report provides a landscape level characterization of seasonal floodplains in two of these areas. We compare the Ganges seasonal floodplain agro-ecology in Bangladesh to that in the Mekong Delta of Cambodia and Vietnam. In both areas the project has been under implementation since the outset, but has met with contrasting results.

Rahman, M.F. ; Barman, B.K. ; Van Brakel, M. ; Dewan, S. 2010.

Impacts of technological interventions on fish production and biodiversity of seasonal floodplains in Bangladesh.

CBFC Working paper no. 1. The WorldFish Center, Penang. 18 p.

The Community-based Fish Culture in Seasonal Floodplains and Irrigation Systems (CBFC) project is a five year research project supported by the Challenge Program on Water and Food (CPWF), with the aim of increasing productivity of seasonally occurring water bodies through aquaculture. The project has been implemented in Bangladesh, Cambodia, China, Mali and Vietnam, where technical and institutional options for community based aquaculture have been tested. The project began in 2005 and was completed in March 2010. The objective of the study was to determine the impacts of technological interventions in the floodplains on fish yield and biodiversity benefiting the poor fisher folk and other community people. Technological interventions for fish culture in the floodplains included (a) the installation of low-cost large meshed bamboo fencing at water inlet and outlet points, and setting of ring culverts for maintaining suitable levels of water for fish culture without hampering the production of rice in the upland areas of the floodplains (b) stocking of larger fingerlings at suitable stocking densities of endemic (rohu, catla, mrigal) and exotic (silver carp, bighead carp, common carp/mirror carp) species at 31-48 kg/ha (c) post stocking management; use of extra fencing during over flooding and mobile guarding using boats (d) harvesting management; regulations in harvest for certain period, use of multiple harvesting techniques. These interventions were carried out through CB participation with initial technological and financial support from the Challenge Program Project (CP35).

Other Key WorldFish Publications

Russell, A.J.M. ; Coulibaly, S. 2010.

Assessment of potential mare stocking impacts on resource access rights and livelihoods in Komio village, Niger River Delta, Mali.

CBFC Working paper no. 2. The WorldFish Center, Penang. 42 p.

The Community-based Fish Culture in Seasonal Floodplains and Irrigation Systems (CBFC) project is a five year research project supported by the Challenge Program on Water and Food (CPWF), with the aim of increasing productivity of seasonally occurring water bodies through aquaculture. The project has been implemented in Bangladesh, Cambodia, China, Mali and Vietnam, where technical and institutional options for community based aquaculture have been tested. The project began in 2005 and was completed in March 2010. In the context of the CP-35 project, this visit follows up on a preliminary assessment of livelihoods and institutions in Komio village, Mali conducted by consultants Joffre and Lajaunie. The objective of the visit was to determine how stocking mares around Komio village may impact livelihoods and access rights to aquatic resources. Additional insights were gained from the governance experiences and livelihood impacts of village irrigation schemes (PIVs).

Russell, A.J.M. ; Coulibaly, S. ; Sinaba, F. ; Kodio, A. ; Joffre, O. ; Sheriff, N. 2010.

Institutional histories, seasonal floodplains (mares), and livelihood impacts of fish stocking in the Inner Niger River Delta of Mali.

CBFC Working paper no. 5. The WorldFish Center, Penang. 23 p.

The Community-based Fish Culture in Seasonal Floodplains and Irrigation Systems (CBFC) project is a five year research project supported by the Challenge Program on Water and Food (CPWF), with the aim of increasing productivity of seasonally occurring water bodies through aquaculture. The project has been implemented in Bangladesh, Cambodia, China, Mali and Vietnam, where technical and institutional options for community based aquaculture have been tested. The project began in 2005 and was completed in March 2010. The seasonally flooded depressions in the Inner Niger Delta (known as mares) represent a critical fishery resource for the inhabitants of the village of Komio, and at present, access is open to all residents. A proposal to build stocked fish enclosures in the main village mare presents potential benefits and risks. On one hand, overall productivity in the mare could be significantly increased, providing important sources of protein and cash during the annual drought period, when few livelihood activities can be performed and when village livelihoods are at their most vulnerable. Enhanced productivity in mares may also decrease local household pressures for seasonal labor migration. On the other hand, a resulting increase in the value of these mares may encourage elite capture of project benefits or rentseeking by certain village leaders of the landowning Marka ethnic group.

Other Key WorldFish Publications

Using qualitative interviews and focus group discussions, the study provides evidence of how local institutional and leadership capacity for equitable common property resource management have evolved since the introduction of irrigated farming systems (known as Périmètres Irrigués Villageois or PIVs) in the 1990s.

Sheriff, N. ; Schuetz, T. 2010.

Benefits and challenges of applying outcome mapping in an R4D project.

CBFC Working paper no. 6. WorldFish Center, Penang. 8 p.

The Community-based Fish Culture in Seasonal Floodplains and Irrigation Systems (CBFC) project is a five year research project supported by the Challenge Program on Water and Food (CPWF), with the aim of increasing productivity of seasonally occurring water bodies through aquaculture. The project has been implemented in Bangladesh, Cambodia, China, Mali and Vietnam, where technical and institutional options for community based aquaculture have been tested. The project began in 2005 and was completed in March 2010. There is an increasing demand for researchers to demonstrate the impact of the work within project time frames, yet development is a complex, non-linear process emerging from changes that traditional, managerial approaches to development fail to capture or to understand. Methods to address unanticipated change and increasingly important ‘soft’ outcomes, such as improved governance have not yet been widely tested or adopted. In response to this gap, this paper describes lessons learned during the pilot testing of Outcome Mapping as part of an action research process in Vietnam, and presents an abridged OM methodology for application at the community level.

The WorldFish Center. 2010.

Cage aquaculture in Malawi.

Briefing note no. 2119. The WorldFish Center, Penang, Malaysia. 4 p.

This briefing note summarizes the current status of the cage aquaculture industry in Malawi, development opportunities, and economic social and environmental concerns that need to be addressed to ensure sustainability of the industry.

Other Key WorldFish Publications

The WorldFish Center. 2010.

Genetic improvement of farmed aquatic animals at the WorldFish Center.

Brief no. 2134. The WorldFish Center, Penang, Malaysia. 8 p.

Aquaculture is the fastest growing food production sector in the world today, supplying half of global fish consumption. Production from capture fisheries has stagnated and is unable to meet the anticipated growth in demand. Current indications are that Asian and African aquaculture will need to grow substantially to meet future demand for fish and must do so largely by increasing production per unit of land and water used. In response, WorldFish and partners are placing increasing emphasis on developing technologies that can support national and regional efforts to meet this need. This brief highlights the research and development of GIFT (Genetically Improved Farmed Tilapia) programs undertaken at the WorldFish Center.

The WorldFish Center. 2010.

Wetlands of the Yellow River Delta: a heritage to conserve and treasure.

Issues brief no. 2107. The WorldFish Center, Penang, Malaysia. 6 p.

The wetlands of the Yellow River delta face a situation common in many developing countries where the quest for rapid economic growth brings development to the doorstep of natural ecosystems and threatens their health and survival. This brief examines the several issues relating to wetlands in the Dongying municipality. Can the wetlands in Dongying coexist with the modern development that is creeping towards them? Is there sufficient appreciation that these wetlands are worth caring for? How can Dongying achieve its aspiration to combine rapid economic growth with sound environmental management?

Other Key WorldFish Publications

The WorldFish Center. 2010.

Wetlands of the Yellow River Delta: a heritage to conserve and treasure [chinese version].

Issues brief no. 2112. The WorldFish Center, Penang, Malaysia. 6 p.

The wetlands of the Yellow River delta face a situation common in many developing countries where the quest for rapid economic growth brings development to the doorstep of natural ecosystems and threatens their health and survival. This brief examines the several issues relating to wetlands in the Dongying municipality. Can the wetlands in Dongying coexist with the modern development that is creeping towards them? Is there sufficient appreciation that these wetlands are worth caring for? How can Dongying achieve its aspiration to combine rapid economic growth with sound environmental management?

The WorldFish Center. 2010.

Gender and fisheries: do women support, complement or subsidize men's small-scale fishing activities?

Issue brief 2108. The WorldFish Center, Penang, Malaysia. 8 p.

Women's involvement in fisheries is more significant than often assumed. According to current estimates from nine major fish producing countries, they comprise 46% of the labor force in smallscale capture fisheries-related activities, including pre-and post-harvesting work. Their current engagement is shaped by rapidly dwindling fisheries stocks on one hand, and the increased global demand for fish on the other. At the WorldFish Center, research on gender and fisheries currently focuses on:

1. Markets, trade and migration
2. Capabilities and well-being
3. Identities and networks
4. Governance and rights
5. Climate change, disasters and resilience

Other Key WorldFish Publications

The WorldFish Center. 2010.

Community-based adaptive resource management in Solomon Islands: lessons learned.

Lesson Learned 2122. The WorldFish Center, Penang. 12 p.

This brief presents a review of lessons learned and good practices in developing management plans within the context of community based resource management (CBRM) in Solomon Islands. The lessons are based on work done by the WorldFish Center, the Foundation of the Peoples of the South Pacific International (FSPI) and the Solomon Islands Ministry of Fisheries and Marine Resources. The document is intended to complement other initiatives in the country and through the Solomon Islands Locally Managed Marine Area Network add to lessons learned by other organizations in order to help the people and the government of the Solomon Islands meet their marine resource management goals.

The WorldFish Center. 2010.

Creating rural livelihoods in Solomon Islands through an environmentally friendly trade of marine ornamentals for the aquarium trade: lessons learned.

Lesson Learned 2121. The WorldFish Center, Penang. 8 p.

The marine ornamental trade became active in Solomon Islands in the mid-1980s, primarily through the wild harvest of corals and fish. The initiation of more sustainable techniques (cultured giant clams and farmed corals) did not occur until the late-1990's through projects initiated under the auspices of ICLARM (former WorldFish). This brief highlights the key features of a 5-year project funded by New Zealand and undertaken by the WorldFish Center and the WWF-SI, working with local villagers to establish marine ornamentals for the aquarium trade as a sustainable supplementary livelihood activity for rural coastal communities.

Other Key WorldFish Publications

The WorldFish Center. 2010.

Vulnerability in inland fishing communities in Africa: lessons learned.

Lesson learned 2105. The WorldFish Center, Penang. 6 p.

A critical first step in understanding vulnerability in inland fishing communities is to move away from classical fishery definitions that consider only the resource and harvest methods and, instead, recognize that fisheries operate across broad domains including the natural resource and its ecosystem, people and livelihoods, institutions and governance systems, and external drivers. This lesson learned provides an overview of the outcome of recently completed 2-year project funded by the Challenge Program on Water and Food and undertaken by the WorldFish Center with the Institut de Recherche pour le Développement in France and Mali, the Nigerian Institute for Freshwater Fisheries Research, and the Institut d'Economie Rurale in Mali. The project aimed to address the concerns about the nature of vulnerability and possible ways to strengthen the resilience of inland fishing communities.

The WorldFish Center. 2010.

Adaptation of floodplain fishing communities to hydro-climatic changes in the Niger basin: lessons learned.

Lesson learned 2104. The WorldFish Center, Penang. 8 p.

The river floodplain ecosystems of the Sahelian region have recently undergone two major hydrological changes: (i) increased interannual variation in rainfall and (ii) a steep reduction of flood peaks and floodplain inundation following the construction of a number of dams and increased water abstraction. Fishers have little freedom of movement within the delta to help them cope with environmental changes. The only new opportunities are those offered by new reservoirs. Most fisherfolk farm traditional rice as a secondary activity, but farming cannot replace fishing, which brings in steady, substantial cash income for much of the year. Fishing and rice farming are complementary, but fishers cannot shift completely from one to the other. Although migration and diversification are often presented as strategies to reduce vulnerability, recent data from the Inner Niger Delta demonstrates that these strategies alone are insufficient to cope with the worsening constraints that come with changes in hydro-climatic conditions.

Other Key WorldFish Publications

The WorldFish Center. 2010.

Implementing resilience management: lessons from fishing communities in the Niger basin.

Policy brief 2103. The WorldFish Center, Penang. 8 p.

Small inland fisheries are important to the livelihoods of the poor in Africa, contributing both food security and income to millions of households living near freshwater lakes, reservoirs, rivers and floodplains. These inland fisheries have complex exploitation systems with large numbers of fishers operating in the informal sector. These systems are highly vulnerable to external disturbance, making them extremely difficult to assess and manage. As resilience management is a way to strengthen systems' ability to absorb perturbations and shocks while coping with uncertainty and risks, it has potential use in managing small fisheries. Recent research conducted on the shores of the Lake Kainji in Nigeria and in the Inner Niger Delta in Mali confirms that, when considered pragmatically, the concept of resilience provides a useful framework to identify and implement appropriate interventions to reduce fishing communities' vulnerability to shocks and threats. The resilience of a fishery is not exclusively related to the status of the resource. Where fishing communities are especially destitute, interventions need to prioritize communities' basic needs, thereby allowing them to turn their attention to fishery sustainability.

The WorldFish Center. 2010.

Public private partnership in small-scale aquaculture and fisheries.

Policy brief no. 2135. The WorldFish Center, Penang, Malaysia. 8 p.

This policy brief explores the question "which aspects of past public private partnerships (PPPs) in aquaculture and fisheries were useful, effective and replicable?". We ask what general principles should lie behind new PPPs that are set up to promote sustainable human development through aquaculture and fisheries, and we address the key governance role of the public sector in developing countries in facilitating their effective application.

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