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SELECTED ABSTRACTS

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Abstract: Using the Contingent Valuation Method (CVM) and the Travel Cost Method (TCM) this study estimates the value of recreational benefits of coral reefs in the Philippines. Ninety-two and eighty-eight respondents were interviewed for the TCM and CVM surveys respectively. The respondents to the surveys consist of domestic and foreign visitors to resorts along the Lingayen Gulf, Bolinao, Philippines. The analysis of the TCM survey conforms to the theoretical prediction that visitation rate decreases as travel cost increases. The results revealed that income shows a negative effect on the visitation to Bolinao. A two-stage demand curve estimation was used. The trip demand curve was estimated by regressing the number of visits on the cost of travel and other socio-economic factors influencing visitation rate. Results from the stage-one demand curve estimation allowed the generation of total number of visits given a simulated price for visiting the site. The aggregate demand curve was then estimated by regressing the total number of visits on the price. The consumer surplus estimated from the survey yields an average of PhP 10,463 (US\$223) per person, this translates to a total of PhP 61 millions (US\$1.3 millions) based on the rough estimate of at least 5,845 visitors to the reefs in the peak season (March to May) of 2000. The CVM survey elicited very low willingness-to-pay (WTP) values for the conservation of coral reefs at Bolinao, particularly by domestic tourists as compared to foreign tourists. Low WTP values from domestic tourists as compared to foreign tourists suggest that environment preservation may not be an immediate priority for local travelers under the prevailing socio-economic and institutional settings in developing countries. Despite its inability to determine the sustainable level of tourism and recreational use of coral reefs, the TCM, as demonstrated in this paper, can certainly provide an estimate of the fees that can be applied for recreational use of coral reefs.

Ayyat, M.S., F.S. Abbas and G.O. El-Gaggar. 2003. **Effect of dietary protein level and vitamin C supplementation on performance of Nile tilapia (*Oreochromis niloticus*)**. Veterinary Medicine Journal, Giza 51(3): 287-298.

Abstract: Effects of varying dietary protein and vitamin C levels on several nutritional parameters were calculated for young *Oreochromis niloticus*. Live body weight of the Nile tilapia (*O. niloticus*) increased significantly ($P < 0.001$) with increasing dietary protein level or vitamin C supplement in the fish diet. Average daily weight gain increased 37.31% in fish fed the high protein diet (31.1% crude protein) compared to those fed the normal protein diet (25.4%). Also, average daily weight gain increased 5.41% and 14.86%, respectively, in fish fed diets supplemented with 50 and 100 mg vitamin C/kg diet compared to those fed diets without this supplement. Increasing dietary protein levels improved the feed conversion. Feed conversion improved by 18.85% in a fish group fed with high protein diet when compared with those fed the normal protein diet. Feed conversion improved by 1.37% and 7.88%, respectively, in fish groups fed diets supplemented with 50 and 100 mg vitamin C when compared with those fed a diet without the vitamin C supplement. Serum total protein, albumin, creatinine and AST significantly ($P < 0.01$) increased with dietary protein level, while ALT was insignificantly affected. Also, the vitamin C supplement in fish diets significantly increased the concentrations of serum total protein, albumin and AST, while the concentration of ALT was insignificantly decreased. Fish body composition was not significantly affected by dietary vitamin C supplementation. The interaction between dietary protein level and vitamin C supplementation did not show any significant differences in body weight, daily gain, daily feed intake, feed conversion, blood components or body composition.

Bene, C. 2003. **When fishery rhymes with poverty: a first step beyond the old paradigm on poverty in small-scale fisheries**. World Development 31(6): 949-975.

Abstract: In this paper, we first look retrospectively at the perceptions embraced by academics, international agencies and practitioners of the relationship between fisheries and poverty in

developing countries and we try to identify the underlying paradigms which have structured these perceptions. The review reveals how the debate has focused on the economic (low income) and biological (overexploitation) aspects of the problem. We then revisit these perceptions in the light of the recent conclusions drawn from other sectors and in particular from the new “consensus” on poverty proposed by the international community. Incorporation of the recent research on poverty helps to show how socio-institutional mechanisms governing people’s access to fisheries resources – rather than the resources themselves – play such a critical role in vulnerability to poverty. Finally, a typology identifying four different categories of intra-sectoral exclusion mechanisms is developed and illustrated through empirical studies derived from African and Asian fisheries.

Clarke, P.J., T. Komatsu, J.D. Bell, F. Lasi, C.P. Oengpepa and J. Leqata. 2003. **Combined culture of *Trochus niloticus* and giant clams (*Tridacnidae*): benefits for restocking and farming.** *Aquaculture* 215: 123-144.

Abstract: The potential benefits of using giant clam farming systems to rear trochus for restocking were investigated in the Solomon Islands. Trochus with a mean size of 5.61 mm \pm 0.06 SE maximum basal diameter (MBD) reared in concrete tanks used to produce juvenile giant clams, attained a mean size of 28.28 mm MBD \pm 0.25 SE after 22 weeks and grew approximately twice as fast as trochus raised in fibre-glass tanks fitted with poly-carbonate plates. Trochus from the concrete tanks were then transferred to the small (0.36 m²) sea cages used to grow-out *Tridacna derasa* for the marine aquarium trade. Mortality in the sea cages was negligible and the trochus grew from a mean size of 30.52 mm MBD \pm 0.04 to 46.33 mm \pm 0.39 SE in 18 weeks. Stocking density and husbandry (to remove algae and sediment) had a significant effect on the growth of trochus in sea cages: animals stocked at a density of five individuals per cage grew significantly faster than those stocked at 10 per cage and growth was significantly greater in cages where the larger species of algae were removed regularly. Trochus did not appear to have any deleterious effects on the growth and survival of *T. derasa*. On the contrary, there was some evidence that growth and survival of the

giant clams were improved at the highest stocking density of trochus. Trochus grazed on a range of filamentous and turf algae within the sea cages but were ineffective at removing larger species of algae compared to husbandry procedures. Trochus harvested from sea cages were released at seven coral reef flat sites, with two levels of shelter. Mean survival at all sites after 4 weeks was at least 76% \pm 4.6% SE and was not affected significantly by the amount of shelter. There were no apparent morphological weaknesses, or behavioural deficits in the cultured trochus compared to wild individuals. In fact, the shells of cultured animals were significantly heavier than those of wild trochus. Rearing trochus in combination with giant clams produces individuals that are fit for survival in the wild at reduced cost, and paves the way for giant clam farmers to restock trochus by releasing them on reefs under their customary marine tenure, or in marine protected areas.

Dance, S.K., I. Lane and J.D. Bell. 2003. **Variation in short-term survival of cultured sandfish (*Holothuria scabra*) released in mangrove-seagrass and coral reef flat habitats in Solomon Islands.** *Aquaculture* 220: 495-505.

Abstract: Juvenile cultured sandfish (*Holothuria scabra*) with a mean size of 35.6 mm \pm 11.4 S.D. were released on soft substrata near mangrove-seagrass and lagoonal coral reef flat habitats in the Western Province of the Solomon Islands. Mean survival of *H. scabra* at the mangrove-seagrass sites was 95-100% 1 h after release and approximately 70% 3 days later. At the coral reef flat sites, however, mean survival was as low as 37.5% 1 h after release and total mortality occurred in two of the three releases within 48 h. Mortality of the juvenile *H. scabra* was due mainly to predation by fish in the families Balistidae, Labridae, Lethrinidae and Nemipteridae. Survival of juvenile *H. scabra* was improved significantly by releasing them within a cage of 8 mm mesh. This procedure resulted in 100% survival of juveniles in the coral reef flat habitat during the course of the experiment. Our data indicate that mangrove-seagrass areas should be suitable habitats for release of cultured juvenile sandfish in restocking and stock enhancement programs. Release of sandfish at night, to coincide with the time they emerge during their natural diel burrowing cycle, and the short-term use of protective cages,

should be investigated to improve survival of individuals released in mangrove-seagrass habitats.

Demanou, J. and R.E. Brummett. 2003. **Heavy metal and fecal bacterial contamination of urban lakes in Yaoundé, Cameroon.** African Journal of Aquatic Science 28(1): 49-56.

Abstract: Concentrations of faecal bacteria and heavy metals (Cr, Cd, Hg, Pb and Zn) were measured in fish, mud and water from two urban lakes in Yaoundé, Cameroon. The mean densities of faecal coliforms (FC) and faecal streptococci (FS) in water were $6\ 160 \pm 8\ 493$ CFU 100ml^{-1} and 387 ± 320 CFU 100ml^{-1} , respectively, in Lac Central, and $8\ 376 \pm 1\ 604$ CFU 100ml^{-1} and $1\ 198 \pm 997$ CFU 100ml^{-1} , respectively, in Lac Melen. Mean intestinal coliform bacterial density ranged from $2.3 \times 10^5 \pm 7.3 \times 10^5$ faecal streptococci CFU 100g^{-1} in *Oreochromis niloticus* from Lac Melen to $3.6 \times 10^7 \pm 7.0 \times 10^7$ faecal coliform CFU 100g^{-1} in *Hemichromis fasciatus* from Lac Central. Predatory fishes (*H. fasciatus*, *Clarias gariepinus*) had higher concentrations of both types of coliform bacteria than omnivorous species (*Heterotis niloticus*, *O. niloticus*). The ratios of FC/FS in Lac Central and Lac Melen were 15.9 and 7.0, respectively indicating a human source for the contamination. All the heavy metals for which we screened were isolated from lake sediments; however, in water and fish, only lead and zinc were detected. In Lac Central, zinc concentration ranged from $39.51 \mu\text{g l}^{-1}$ to $81.51 \mu\text{g l}^{-1}$ with a mean of $57.31 \mu\text{g l}^{-1}$. In Lac Melen, zinc concentration ranged from $41.21 \mu\text{g l}^{-1}$ to $90.21 \mu\text{g l}^{-1}$ with a mean of $65.71 \mu\text{g l}^{-1}$. Lead concentration in Lac Central ranged from $15.11 \mu\text{g l}^{-1}$ to $18.21 \mu\text{g l}^{-1}$ with a mean of $17.41 \mu\text{g l}^{-1}$. In Lac Melen, lead concentration ranged from $17.01 \mu\text{g l}^{-1}$ to $23.01 \mu\text{g l}^{-1}$ with a mean of $20.11 \mu\text{g l}^{-1}$. Heavy metal concentrations in fish tissue were below recommended limits. The piscivorous *H. fasciatus* accumulated the most metal and, among tissues, most of this was in the liver. There were otherwise no significant differences among species ($P < 0.05$). There were no significant differences ($P < 0.05$) between small and large fish in terms of heavy metal accumulation and none of the metals surveyed showed signs of accumulating in the food chain.

Dey, M.M., M.A. Rab, F.J. Paraguas, S. Piumsombun, R. Bhatta, M.F. Alam, S. Koeshendrayana and M. Ahmed. 2003. **Status and economics of freshwater fish farming in Asia.** Aquaculture Economics and Management. (*Forthcoming*).

Abstract: This paper discusses the status of freshwater aquaculture, productivity, and the cost effectiveness of alternative technologies in the major fish producing countries in Asia such as Bangladesh, India, Indonesia, the Philippines, Thailand, Vietnam and China. The analysis is based on field survey data collected by the WorldFish Center and its partner research institutes and supplemented by secondary information. The paper adopts descriptive techniques to compare performances of each technology across the countries in terms of productivity, cost effectiveness and profitability. Results suggest that freshwater fish farming is, in general, profitable in Asia. Although the return from monoculture of carnivorous species such as prawn, snake head and walking catfish is higher, it appears too capital intensive to be suitable for adoption by the resource poor farmers. Both polyculture and monoculture of omnivorous and herbivorous species like carp and tilapia are likely to be more suitable for adoption by the poor farmers in Asia. Polyculture with semi-intensive method appears especially desirable for further expansion and intensification of aquaculture in the region. The paper also performs econometric analysis to study the determinants of fish production under polyculture and input demand for the same. The results of the production function emphasize that excessive use of farm-based feed cannot increase productivity after a certain level of application as the law of diminishing marginal productivity sets in. Input use is largely determined by the income and ownership status of the farmer. This implies that there should be some kind of institutional arrangements so that poor farmers have access to ponds and institutional credit.

Morrisey, D.J., R.G. Cole, J.D. Bell, I. Lane and G.B. Read.
Low abundances and diversities of benthic faunas of shallow, coastal sediments in the Solomon Islands and their implications for assessing environmental impact of logging.
Pacific Conservation Biology 9: 215-227.

Abstract: The diversity and abundance of benthic organisms were examined in relation to logging impacts in Western Province, Solomon Islands. Organisms occupying sediments offshore from the mouths of streams arising from logged and unlogged catchment areas were sampled from two sites at three depths during a single survey. Overall abundances of organisms were low, and patterns varied between areas. At Kolombangara, ANOVA showed that numbers of molluscs and crustaceans were higher at mouths of rivers with unlogged catchments than with logged catchments, but numbers of individuals, taxa, and polychaetes differed among river mouths within treatments. At Vangunu, numbers of taxa varied inconsistently among depths in the different logging treatments, whereas numbers of individuals were greater at river mouths of unlogged than logged catchments. Multivariate analyses (MOS, ANOSIM) showed differences among river mouths within treatments but not among treatments. In general, there were indications of logging impacts but the effects were not consistent across taxa. Because of this inconsistency, the low abundance and diversity of animals, and the relatively high cost of processing samples, benthic macrofaunal variables were not considered to be cost-effective measurement variables for longer term monitoring of the effects of run-off from logging operations on inshore marine habitats at these study sites.

Nielsen, J.R., P. Degnbol, K.K. Viswanathan, M. Ahmed, M. Hara and N.M.R. Abdullah. 2003. **Fisheries Co-Management - An Institutional Innovation? Lessons from South East Asia and southern Africa.** *Marine Policy* 28(2): 151-160.

Abstract: During the last decade the co-management concept has gained increasing acceptance as a potential way forward to improve fisheries management performance. It has, however, at the same time become increasingly evident that the co-management concept is not clearly defined and means very different things to different people. In this article we attempt to document experiences from a recent study on fisheries co-management that has researched case studies of various implementations of co-management arrangements in coastal and freshwater fisheries in South East Asia and southern Africa, to present a more comprehensive understanding of co-

management and to summarise both the positive outcomes and the problems experienced in actual implementation.

Ramofafia, C., M. Byrne and S.C. Battaglene. 2003.

Development of three commercial sea cucumbers, *Holothuria scabra*, *H. fuscogilva* and *Actinopyga mauritiana*: larval structure and growth. Marine and Freshwater Research 54: 657-667.

Abstract: Development of the tropical sea cucumbers *Holothuria scabra*, *H. fuscogilva* and *Actinopyga mauritiana* was investigated. *Holothuria scabra* developed through the feeding auricularia, the non-feeding doliolaria and the pentactula larval stages in 14-17 days at 26-28°C. *Holothuria fuscogilva* and *A. mauritiana* were reared to the auricularia and doliolaria stages respectively. The auricularia stage was reached by 40-70 h and the larvae developed lateral processes and a prominent ciliated band. Transformation to the doliolaria stage took 10-12 h and occurred on days 9-12 in *H. scabra* and days 12-22 in *A. mauritiana*. During this transition the ciliated band fragmented into ciliary rings, the location of which coincided with the lateral processes in the auriculariae. In *H. scabra*, metamorphosis to pentactulae (13-15 days) was marked by development of five primary tentacles and a ventroposterior podium. This podium was used to attach to the substratum. Newly settled pentactulae of *H. scabra* used their tentacles to test, adhere and move across the substratum. Development of a second podium marked the development of juveniles (14-17 days). Hyaline spheres were conspicuous in late auriculariae of *H. scabra* and may be an indicator of larval competence. They disappeared in the doliolaria stage, which suggests that they may function as nutritive reserves to sustain *H. scabra* through the non-feeding perimetamorphic period. Absence of these spheres in *H. fuscogilva* and their poor growth in *A. mauritiana* suggests the feeding protocol used may not be sufficient to support complete development in these species. Determination of food and culture conditions that promote hyaline sphere formation and control bacteria may be essential for successful culture of *H. fuscogilva* and *A. mauritiana*.

Ratner, B. 2003. **The politics of regional governance in the Mekong River Basin.** Global Change, Peace & Security (formerly Pacifica Review), 15(1) p. xx.

Abstract: The opportunities for the six states that share the Mekong River to benefit directly from its joint management are more limited and the risks to the livelihoods of downstream communities from development schemes more important than the historic rhetoric of Mekong development has implied. Changes in the broader political and economic context have sidelined the Mekong River Commission, the one institution charged with regional cooperation to manage the river. Improved regional governance in the decades to come depends upon efforts by many actors to raise the incentives for intergovernmental cooperation, expand civil society engagement, and strengthen mechanisms for cross-border accountability.

Rezk, M.A., R.O. Smitherman, J.C. Williams, A. Nichols, H. Kucuktas and R.A. Dunham. 2003. **Response to three generations of selection for increased body weight in channel catfish, *Ictalurus punctatus*, grown in earthen ponds.** Aquaculture 228(1-4): 69-79.

Abstract: Selection response for body weight at marketable size was measured for channel catfish, *Ictalurus punctatus*, grown in earthen ponds at 7 500 fish/ha. Three generations of mass selection for increased body weight in Kansas and Marion strains of channel catfish increased body weight from 453 to 583 g or 29%, and from 530 to 642 g or 21%, respectively, with cumulative realized heritabilities of 0.17 ± 0.016 and 0.19 ± 0.012 , respectively. Realized heritabilities for the third generation alone were 0.16 ± 0.016 and 0.23 ± 0.015 for Kansas and Marion strains, respectively. The results indicate that body weight can be significantly increased via mass selection in channel catfish, which should result in increased production and profitability in the catfish farming industry.

Squires, D., I.H. Omar, Y. Jeon, J. Kirkley, K.K. Viswanathan and I. Susilowati. 2003. **Excess capacity and sustainable**

development in Java Sea fisheries. Environment and Development Economics 8: 105-127.

Abstract: Excess capacity and overfishing are problems in the open-access, common-pool fisheries of the Java Sea. Data development analysis is used to estimate excess fishing capacity and the number of vessels to decommission in three Java Sea fisheries of Indonesia: the purse seine, mini purse seine, and longline. First- and second-best policy measures are discussed to reduce the excess capacity and give sustainable management and development. The importance of incentive design, asymmetric information, and the regulator's principal-agent problem are emphasized in license limitation programs.

Thompson, P., P. Sultana and N. Islam. 2003. **Lessons from community based management of floodplain fisheries in Bangladesh.** Journal of Environmental Management 69(3): 307-321.

Abstract: Inland (floodplain) fisheries remain the most important contributor to fish production in Bangladesh. They have in the past been administered to generate government revenue without due concern for sustainability or equity. Community Based Fisheries Management (CBFM) is a possible solution and was tested in 19 waterbodies (rivers and beels) during 1996–2000. The outcomes so far are assessed with respect to social, institutional, and physical context, and the interactions that arose in establishing CBFM. The lessons drawn are that: it was essential that communities obtained rights over the fisheries, strong facilitation was necessary, taking up visible resource management actions greatly helped, success was more likely in homogeneous communities, external threats were a strong limiting factor, clear boundaries and small fisheries were not so critical, and new institutions could be built with as much ease (or difficulty) as modifying existing ones. Effective well-defined partnerships of NGOs and government were not easy to establish but were sufficiently beneficial that in several locations new community institutions for fisheries management were established. This is a slow process, the sustainability of local management institutions is not yet established, although they continued during an interim period without

funding, further phased support is planned to strengthen these organizations and to generate evidence of impacts and momentum to influence wider fisheries policy in and beyond Bangladesh.

Tomich, T.P., K. Chomitz, H. Francisco, A.N. Izac, D. Murdiyarsa, B.D. Ratner, D.E. Thomas and M. van Noordwijk. **Policy analysis and environmental problems at different scales: asking the right questions.** Agriculture, Ecosystems and Environment. (*In Press*).

Abstract: In this volume, we seek a common understanding of three environmental problems linked to land use change in Southeast Asia: smoke pollution, degradation of biodiversity functions, and degradation of watershed functions. The objectives of this special issue are to identify usable data and methods for quantifying the impact of land use change on these environmental problems, to identify gaps in either data or methods and, where gaps exist, to set priorities for filling them. That assessment will be done in greater detail in the concluding chapter (Tomich et al., this issue). In this paper, we begin the process by raising policy analysts' basic questions for each environmental problem in turn and making a preliminary assessment of where each of these three problems lies in the 'environmental issue cycle'.

Williams, M.J., P.S. Choo, et al. 2003. **Chapter 2: Ecosystems and their services.** *In* Ecosystems and Human Well-being: A framework for assessment. Millennium Ecosystem Assessment. p. 49-70. Island Press, Washington, USA. (*Location: GF50 E26*)

Abstract: An ecosystem is a dynamic complex of plant, animal, and microorganism communities and the nonliving environment interacting as a functional unit. Humans are an integral part of ecosystems. A well-defined ecosystem has strong interactions among its components and weak interactions across its boundaries. A useful ecosystem boundary is the place where a number of discontinuities coincide, for instance in the distribution of organisms, soil types, drainage basins, or depth in a water body. At a larger scale, regional and even globally distributed ecosystems can be evaluated based

on a commonality of basic structural units.

Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth.

Biodiversity is the variability among living organisms. It includes diversity within and among species and diversity within and among ecosystems. Biodiversity is the source of many ecosystem goods, such as food and genetic resources, and changes in biodiversity can influence the supply of ecosystem services. People seek many services from ecosystems and thus perceive the condition of an ecosystem in relation to its ability to provide the desired services. The ability of ecosystems to deliver services can be assessed by a variety of qualitative and quantitative methods. An assessment of the condition of ecosystems, the provision of services and their relation to human well-being requires an integrated approach. This enables a decision process to determine which service or set of services is valued most highly and how to develop approaches to maintain services by managing the system sustainably.

Non-Refereed

Ahmed, M. and C.K. Chong. 2003. **An overview of problems and issues of coral reef management.** *In* Ahmed, M., C.K. Chong and H. Cesar (eds). Economic Valuation and Policy Priorities for Sustainable Management of Coral Reefs. WorldFish Center Conference Proceedings 70: 2-11. (*Location: SH207 CP6 #70*)

Abstract: This paper considers issues and problems of coral reef management for coastal communities. In particular, it looks at the links between coral reef management and livelihood dependence, poverty and the vulnerability of coastal communities. It also focuses on the risks and impacts of various scales of threat to coral reefs, and how these could affect the livelihoods of coastal communities.

The management of coral reefs can be influenced by valuation studies that reflect various forms of perceived and realized benefits from coral reefs. The paper describes how various methods to value and determine policy for coral reef management are used, with reference to a number of papers in this volume. Institutional issues of devolution and decentralized policy-making are considered with respect to the empowerment of economically poor coastal communities. In particular, there is a focus on the legal frameworks that help or hinder local stakeholders access resources and maintain their livelihoods. The paper concludes that research methods that improve people's understanding of coastal livelihoods, and that incorporate associated values should be encouraged. It further concludes that policy instruments and management tools that empower local stakeholders and support the livelihoods base of coastal communities dependent on coral reefs should be promoted.

Barut, N.C., M.D. Santos, L.L. Mijares, R. Subade, N.B. Armada and L.R. Garces. 2003. **Philippine coastal fisheries situation.** *In* G. Silvestre, L. Garces, I. Stobutzki, C. Luna, M. Ahmed, R.A.V. Santos, L. Lachica-Aliño, P. Munro, V. Christensen and D. Pauly (eds). Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries. WorldFish Center Conference Proceedings 67: 885-914. (*Location: SH207 CP6 #67*)

Abstract: The fisheries sector in the Philippines provides a significant contribution to the national economy in terms of income, foreign exchange and employment. In 2000, total fish production was estimated at 2.94 million tonnes, 84% of which was derived from marine capture fisheries. The export of fish and related fishery products amounted to about US\$400 million in the same year. Between 1984 and 1997 the fisheries sector contributed between 3.8% to 5.0% of the national GDP and 18.4% to 20.6% of the agricultural GDP in the same period. The fisheries sector also provided employment to about 1 million people in 1997.

This paper reviews the Philippine coastal fisheries situation in terms of the status of the marine/coastal environment, resource potential, socioeconomic aspects of the fisheries and management measures to sustain the fishery. It also presents the problems, opportunities and recommendations for sustainable exploitation of coastal fish stocks based on a multi-sectoral workshop under the "Sustainable Management of Coastal Fish Stocks in Asia" Project in September 2000.

We highlighted the following areas that should be addressed in attaining improved fisheries management in the context of the Philippines: (1) maintaining integrity of coastal stocks and habitats; (2) maintaining the integrity of shared stocks; (3) maximizing economic benefits from utilization of resources; (4) promotion of equity in sharing benefits from the utilization of the resources; (5) minimizing conflicts among resource users; and (6) minimizing poverty among small scale fishers.

Bene, C. and A.E. Neiland. 2003. **Valuing Africa's inland fisheries: overview of current methodologies with an emphasis on livelihood analysis.** NAGA: WorldFish Center Quarterly 26(3): 18-21.

Abstract: While Africa's inland fisheries are widely recognized to be of great importance to local people, accurate and up to-date information on their value is sparse and its absence is a serious constraint to the formulation of effective fisheries policies and management practices. As a contribution to current efforts to address this constraint, this paper reviews the different methods that are potentially applicable to the valuation of inland fisheries and discusses their respective rationales

and limitations within a multi-sectoral, multi-user context. The livelihood analysis approach is given special emphasis. The complementarity of this recently developed approach with the other, more conventional, environmental economics methods is illustrated.

Cesar, H. and C.K. Chong. 2004. **Economic valuation and socioeconomics of coral reefs: methodological issues and three case studies.** *In* Ahmed, M., C.K. Chong and H. Cesar (eds). Economic Valuation and Policy Priorities for Sustainable Management of Coral Reefs. WorldFish Center Conference Proceedings 70: 14-40. (*Location: SH207 CP6 #70*)

Abstract: In most tropical countries, coral reef ecosystems provide coastal populations with a number of goods and services. However, a variety of anthropogenic practices threatens reef health and therefore jeopardize the benefits flowing from these goods and services. These threats range from local pollution, sedimentation, destructive fishing practices and coral mining, to global issues such as coral bleaching.

By 'getting some of the numbers on the table', economic valuation can help shed light on the importance of the goods and services and show the costs of inaction in the face of threats. Creating markets for sustainable resource use can highlight the value of these goods and services to local populations.

This paper gives an overview of economic valuation (total economic value, cost benefit analysis) and the techniques supporting it (contingent valuation, travel cost, effect on production, etc.) as they are applied to coral reef ecosystems.

The paper also highlights some of the socio-economic issues of reef degradation and conservation and shows the importance of economic issues involved in stakeholder analysis. Stakeholder analysis helps to show who gains and who loses from threats to the coral reef and from conservation measures. Together with economic valuation, it thereby helps to determine what drives unsustainable practices and how such practices can best be mediated given the local social situation.

Three case study examples are explored. The first examines the total economic value of a specific area, namely Jamaica, and the costs and benefits of this area when coastal management is

introduced. The second demonstrates cost benefit and stakeholder analysis of a threat to coral reefs. The third estimates the economic costs of climate change (coral bleaching, erosion, etc.).

The paper concludes with an up-to-date summary of economic valuation studies on coral reefs.

Chong, C.K., H. Cesar, M. Ahmed and H. Balasubramanian. 2004. **Future research directions in coral reef management.** *In* Ahmed, M., C.K. Chong and H. Cesar (eds). Economic Valuation and Policy Priorities for Sustainable Management of Coral Reefs. WorldFish Center Conference Proceedings 70: 204-209. (*Location: SH207 CP6 #70*)

Abstract: At the International Consultative Workshop on Economic Valuation and Policy Priorities for Sustainable Management of Coral Reefs, 10-12 December 2001, Penang, Malaysia, participants were divided into three working groups to discuss the future research directions for sustainable management of coral reefs. The groups focused on one of the following three themes: (i) economic valuation; (ii) policy analysis; and (iii) community participation. This paper is based on the outputs resulting from the group discussions.

Choo, P.S. and M.J. Williams. 2003. **Fisheries production in Asia: its role in food security and nutrition.** NAGA: WorldFish Center Quarterly 26(2): 11-16.

Abstract: Predictions of the worsening condition of fisheries stocks worldwide and of aquatic ecosystems in crisis, together with the uncertainty on whether the emphasis given to intensive aquaculture production (which is still heavily reliant on fish meal and fish oil) is sustainable and is able to contribute to net growth in fisheries production, have been vigorously discussed and well documented in recent years. These challenges were recognized by the World Summit on Sustainable Development in 2002. The future of fisheries and their sustainability will have major consequences in Asia, where large populations live in riparian and coastal states and are heavily dependent on fisheries and their products for food and for livelihoods. Asian countries produce almost 50 per cent of the world's total capture

fisheries production and about 90 per cent of the world's aquaculture production. Coastal and riparian states in Asia rely heavily on fish as a source of food, and statistics from FAO indicate that *per caput* consumption of fish from the East and Southeast Asian countries (24.0 kg), and China (24.7 kg) surpassed the global average of 15.8 kg. Some Asian countries are also important seafood exporting countries, with Thailand, China, China-Taiwan, Indonesia and the Republic of Korea ranking among the top ten world exporters of seafood. Fish and other living aquatic animals have often been classified as a good source of protein, vitamins and minerals. In recent years, fish has been acknowledged as a functional food and has important roles in the prevention and management of heart disorders, neurological diseases and mood swings. Important products such as fish leather, squalene, chitosan, eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) are also obtained from fish and fisheries products.

This paper reviews the status and some management issues of fisheries production in Asia, as well as the supply and demand situation. Food security, nutritional roles and opportunities for value addition are also discussed.

Christensen, V., L.R. Garces, G.T. Silvestre and D. Pauly. 2003. **Fisheries impact on the South China Sea Large Marine Ecosystem: A preliminary analysis using spatially-explicit methodology.** *In* G. Silvestre, L. Garces, I. Stobutzki, C. Luna, M. Ahmed, R.A.V. Santos, L. Lachica-Aliño, P. Munro, V. Christensen and D. Pauly (eds). *Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries*. WorldFish Center Conference Proceedings 67: 51-62. (*Location: SH207 CP6 #67*)

Abstract: A multiple regression model is derived, based on biomass estimates in 16 mass-balance food web (Ecopath) models, which explains 68% of the variation in the data at hand, and shows that the abundance of fish with trophic levels of 3.0 or more in the South China Sea area had declined, by 2000, to less than half its value in 1960. This is worrisome, as this generalizes to the entire region; declining trends observed in local areas within the South China Sea. Moreover this estimate is almost surely too conservative, given the method we used. This declining trend is compatible however with

the fishing 'down marine food webs' reported from well studied parts of the South China Sea, notably the Gulf of Thailand, where the mean trophic levels of landings have declined, indicating gradual replacement in the underlying ecosystems of large, long lived, high-trophic level fishes by small, short-lived, low trophic level species often described as 'trashfish'. The only exception to these trends is Brunei, whose offshore oil rigs have led to regulations precluding trawling across much of the shelf thus, in effect, creating a marine reserve. We conclude by pointing out that marine reserves are indeed one approach that will have to be used if the present declining trends are to be reversed, along with a rollback of excessive fishing effort.

Delgado, C.L., N. Wada, M.W. Rosegrant, S. Meijer and M. Ahmed. 2003. **Fish to 2020: Supply and Demand in Changing Global Markets**. International Food Policy Research Institute, Washington, DC.; WorldFish Center, Penang, Malaysia. (*Location: SH207 TR4 #62*)

Abstract: Using a state-of-the art computer model of global supply and demand for food and feed commodities, this book projects the likely changes in the fisheries sector over the next two decades. As prices for most food commodities fall, fish prices are expected to rise, reflecting demand for fish that outpaces the ability of the world to supply it. The model shows that developing countries will consume and produce a much greater share of the world's fish in the future, and trade in fisheries commodities will also increase. The authors show the causes and implications of these and other changes, and argue for specific actions and policies that can improve outcomes for the poor and for the environment.

Dugan, P. **Investing in Africa: the WorldFish Center's African strategy in summary**. Naga: WorldFish Center Quarterly 26(3): 4-8.

Abstract: Across much of Africa, freshwater and coastal fisheries provide an important source of food and livelihood for many millions of people. In addition, the aquaculture potential of the continent has only recently begun to be developed. To help sustain these capture

fisheries, support the emergence of aquaculture and foster the contribution of both to sustainable livelihoods and improved food security, the WorldFish Center is increasing its investment in Africa. The framework for this investment is provided by a new 'Strategy for Africa and West Asia 2002-2006' that identifies priorities for the Center's work in rivers and floodplains, lakes and reservoirs, coastal fisheries, aquaculture, policy research and capacity building. The present article summarizes the issues being addressed by the Center and describes initial research priorities.

Garces, L.R. and G.T. Silvestre. 2003. **An overview of the Fisheries Resources Information System and Tools (FiRST) version 2001: A database management system for storing and analyzing trawl survey data.** *In* G. Silvestre, L. Garces, I. Stobutzki, C. Luna, M. Ahmed, R.A.V. Santos, L. Lachica-Aliño, P. Munro, V. Christensen, and D. Pauly (eds). Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries. WorldFish Center Conference Proceedings 67: 41-50. (*Location: SH207 CP6 #67*)

Abstract: Demersal trawl surveys have been used for assessments of fisheries potential and monitoring the status of fish stocks in many countries in South and Southeast Asia. This paper presents the development of a database system, the "Fisheries Resource Information System and Tools" (FiRST), from a regional collaborative effort between eight countries and the WorldFish Center. The effort has collated about 21 000 hauls/stations from research trawl surveys across the South and Southeast Asian region.

FiRST (ver. 2001) was designed as a data management system (to organize, store, retrieve and exchange) for extant trawl surveys. In addition, the database system includes an analytical routine to approximate biomasses and generic socio-economic data, as well as catch and effort statistics for coastal fisheries. Analytical modules from other software needed for data analyses have also been made accessible via the database system.

This paper also presents some examples of the utility of retrospective analysis of trawl survey data in establishing resource baselines and improving understanding of the biology and exploitation status of coastal fishery resources. The database system is now an

important regional repository of information for management of coastal fish stocks in developing Asian countries. FiRST is envisioned to provide solid foundations for the formulation of appropriate fisheries management strategies and action plans at the national and regional level.

Garces, L.R., M. Alias, A. Abu Talib, M. Mohammad-Norizam and G.T. Silvestre. 2003. **A trophic model of coastal fisheries ecosystem off the west coast of Sabah and Sarawak, Malaysia.** *In* G. Silvestre, L. Garces, I. Stobutzki, C. Luna, M. Ahmed, R.A.V. Santos, L. Lachica-Aliño, P. Munro, V. Christensen, and D. Pauly (eds). Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries. WorldFish Center Conference Proceedings 67: 333-352. (*Location: SH207 CP6 #67*)

Abstract: A mass-balance steady-state trophic model of the coastal fisheries ecosystem off the west coasts of Sabah and Sarawak, Malaysia (10 - 60 m depth) was constructed using the Ecopath software. The ecosystem models were partitioned into 29 ecological/trophic groups. The input values (e.g. biomasses) for selected groups were obtained from the research (trawl) surveys conducted in the area in 1972. The estimated mean trophic level of the fisheries catch for both models is about 3.3. The biomass values obtained from Ecopath when compared with the estimates of the fishery catch indicate a low level of exploitation of coastal fisheries resources in 1972.

Gardiner, P.R., L.S. Lim and G. John. 2003. **New biotechnology applications in fish.** *In* I. Serageldin and G.J. Persley (eds). Biotechnology and sustainable development: voices of the south and north. p. 113-124. Biotechnology in Agriculture Series No. 26. CABI Publishing, Wallingford, Oxon, UK. (*Location: S494.5 B563S47*)

Abstract: Until recently, relatively little attention has been paid to the molecular biology and other biotechnological applications in fish compared with livestock and plants. Aquaculture is a relatively recent, although fast-growing, industry. Unlike the livestock industry, which is

based on a few species, there are around 25,000 species of fish, and over 170 aquatic species are presently being farmed (103 species of fish, 21 crustacean species, and 43 molluscan species). Efforts in basic and applied research therefore must be spread over a number of key organisms. Gene mapping efforts, for example, are focused on such different organisms as the salmonids (salmon and trout), catfish, tilapia, shrimp and oyster that are important regionally or globally.

This review covers the present and potential applications of biotechnology in three areas:

1. Conservation of aquatic biodiversity and fisheries management.
2. Selected aquaculture and model species.
3. Improvement of fish for aquaculture in developing countries.

Jamu, D.M. and O.A. Ayinla. 2003. **Potential for the development of aquaculture in Africa**. Naga: WorldFish Center Quarterly 26(3): 9-13.

Abstract: Aquaculture production in Africa has remained low despite the huge potential that exists on the continent. In order for this potential to be realized, it is necessary to refocus the direction of aquaculture development. This paper concludes that for further growth to occur it is necessary to: (i) widen the range of production systems; (ii) increase production intensities and efficiencies; (iii) develop management technologies for indigenous species that target local niche markets; (iv) put more emphasis on marketing and processing of high value products; (v) promote policy research on how aquaculture production can respond to changing macroeconomic policies; and (vi) accelerate the disengagement of government from activities that can best be done by the private sector.

Jamu, D.M., K. Chaula and H. Hunga. 2003. **A preliminary study on the feasibility of using fenced brushparks for fish production in Lake Chilwa, Malawi**. Naga: WorldFish Center Quarterly 26(1): 4-8.

Abstract: A study to investigate the feasibility of using fenced brushparks for fish ranching in Lake Chilwa was conducted for five months at the Kachulu Harbor. In a water depth of 1.4 m, enclosures

constructed from bamboo sticks embedded in the sediment and surrounded by a 13 mm seine net were filled with three different substrates (Typha, bamboo, and Sesbania branches) and a no substrate enclosure served as a control. Netting materials contributed 57 per cent towards the total cost (US\$ 0.24-0.30/m²) of brushpark construction. Fish productivity was highest in the Typha, bamboo and control treatments and lowest in the Sesbania treatments. The decomposition of substrates did not affect water quality. The results indicate that enclosed brushparks may be a feasible technology for enhancing fish yields and providing alternative income sources to fishers in small lakes and water bodies.

Noordeloos, M., J. Oliver, N. Nayan, Y. Yusuf, M. Tan, K. Foo and F. Shahriyah. 2003. **ReefBase: Improved data and incorporation for coral reef management, research and education.** Naga: WorldFish Center Quarterly 26(2) (flyer).

Abstract: ReefBase is a global information system on coral reefs and was developed by the WorldFish Center and the International Coral Reef Action Network (ICRAN). This online database provides quality information on the location, status, threats and management of coral reefs in nearly 100 countries and territories with coral reefs. ReefBase serves as the central database for the Global Coral Reef Monitoring Network (GCRMN) and ICRAN, and continues to provide valuable information services to managers, policy-makers, researchers, conservationists, educators and students around the world.

The first online version of ReefBase was launched on April 19, 2002 (<http://www.reefbase.org>). During its first year the ReefBase website received more than 200 000 visits by over 60 000 individuals from 136 countries. During that time, more than 60 000 publications were downloaded from the ReefBase website.

A major new version of the ReefBase online information system was launched in August 2003. It was designed to provide better access to more information. In this article, we highlight some of the improved contents, layout and functionality that will strengthen ReefBase as the key source of quality information for coral reef professionals.

Silvestre, G.T., L.R. Garces, I. Stobutzki, M. Ahmed, R.A. Valmonte-Santos, C.Z. Luna and W. Zhou. 2003. **South and Southeast Asian coastal fisheries: their status and directions for improved management. Conference synopsis and recommendations.** *In* Silvestre, G.T., L.R. Garces, C. Luna, M. Ahmed, R.A. Valmonte-Santos, L. Lachica-Alino, V. Christensen and D. Pauly (eds). Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries. WorldFish Conference Proceedings 67: 1-40. (*Location: SH207 CP6 #67*)

Abstract: As a step to address the problems of coastal fisheries in Asia, the WorldFish Center joined forces with fisheries agencies from eight developing Asian countries (Bangladesh, India, Indonesia, Malaysia, The Philippines, Sri Lanka, Thailand and Vietnam) and the Asian Development Bank, to implement a project entitled "Sustainable Management of Coastal Fish Stocks in Asia" (also known as the "TrawlBase" project). The project was implemented between 1998 and 2001. The main achievements of this partnership were: (a) development of a database called "Fisheries Resource Information System and Tools" (FIRST), which contains trawl research survey data and socioeconomic information for selected fisheries, and facilitates its analysis; (b) evaluation of the extent of resource decline and over-fishing, both biological and economic, in the region; (c) identification of the measures needed to manage coastal fisheries in the participating countries, resulting in draft strategies and action plans; and (d) strengthening of national capacity in coastal fisheries assessment, planning and management.

The analyses show an alarming decline in coastal fishery resources throughout the region, with biomasses down to 5-30% of levels prior to the expansion of fishing. The relative abundance of the larger, more valuable fish has decreased sharply and that there has been a proportionate increase in smaller, less valuable species. The socio-economic characteristics of the coastal fisheries, including fleet dynamics and cost efficiency has also been documented. These results provide a clear picture of the extent of stock rehabilitation and management required to restore maximum economic value to the fisheries of the region.

The project has contributed to increasing awareness of key issues and opportunities in coastal fisheries management at the national and regional levels and illustrated the benefits of

collaborative efforts in addressing issues of regional concern. It has also highlighted the need and urgency for concerted action at various levels of the institutional hierarchy to successfully resolve fisheries issues. There is a need to foster regional/national collaboration and cooperation among scientists and institutions involved in assessment and management of coastal fisheries. These gains provide the base (and momentum!) for the effective follow-up actions by the countries and international agencies to sustain the benefits derived from coastal fisheries by developing Asian countries.

The directions for follow-up action towards improving the management of coastal fisheries resources presented in this paper were based on the results of a multi-sectoral consultation conducted in the region. The main goal of fisheries management suggested is the sustainable utilization of coastal fishery resources in South and Southeast Asia, defined with environmental, socioeconomic and institutional objectives. Eight interventions to achieve these objectives are presented. These are grouped into interventions for implementation by the national fisheries institutions in the respective countries and regional support activities. We also urge that the countries must commit to continuous, long-term capacity building and institutional strengthening.

Torell, M. and A.M. Salamanca. 2003. **Wetlands management in Vietnam's Mekong Delta: an overview of the pressures and responses.** p. 1-19. *In* M. Torell, A.M. Salamanca and B.D. Ratner (eds). *Wetlands Management in Vietnam: Issues and Perspectives.* WorldFish Center Technical Report 61, 89 p. WorldFish Center, Penang, Malaysia. (*Location: SH207 TR4 #61*)

Abstract: This paper introduces the characteristics of the Delta and outlines the pressures that are impinging on the sustainability of the Delta's wetlands. Although these pressures are non-linear and interacting, three are considered prominent. These pressures stem largely from rice production and the associated large-scale water control infrastructures, shrimp aquaculture, and the inadequacy of the current institutional arrangements. Responses to these pressures are discussed noting the diverse interventions made in the past and the present. Moreover, key points raised by authors in the succeeding chapters in this volume are highlighted and a short description of the WorldFish Center project is provided.