FOCUS ON: FOOD SECURITY FOR COASTAL COMMUNITIES

INTERCOAST NETWORK

INTERNATIONAL NEWSLETTER OF COASTAL MANAGEMENT

Coastal Resources Center, University of Rhode Island
Narragansett, Rhode Island USA • #38 • Winter 2001

Highlights

8 Enforcing Coastal Management

12 Capacity in Living Marine Resources

26 Sharks: Their Role in Human/Marine Interactions

28 Miskito Lobster Fishery

Theme Advisor: Lamarr B. Trott

Food Security and Fisheries

By Lamarr B. Trott

Why is food security an issue for fishery resources? Simply put, too many people are harvesting a rapidly diminishing supply of living aquatic resources. This resource is one of our last remaining 'common' properties.

In half a century, we have over-harvested what was felt in 1950 to be an unlimited supply of seafood. The result is that many species that once were abundant food sources, like cod and haddock in the North Atlantic, are now in short supply. As common species were depleted, new areas and species were located by 'in-vogue' exploratory fishing; these species usually suffering the same fate. More efficient gear on an increasing numbers of fishing vessels overcapitalized the industry and over-harvested resources worldwide.

It is interesting that most sea life is concentrated near the coasts, just as most human populations are concentrated near coastal areas or on rivers that lead to them. The trend in human migration, now and through history, is toward coastal areas. One third of the world's human population inhabit coastal areas. Ingress of people, with their multitude of effluents, has had a direct effect on coastal aquatic life. We have dubbed this 'pollution,' the cause being industrial, agricultural, and urban runoffs and discharges. Further consequence have been due to hunting and gathering (e.g., fishing) and natural phenomena (e.g., El Niño/La Niña).

The population explosion, with many nations doubling their population in only a quarter century, along with this migration toward the coasts, exacerbates an already critical scenario. Hence, sustainability of fishery resources is directly related to human population pressures. Management of coasts with their special physical and biotic attributes became one of the major challenges by the end of this last century. Unfortunately, what has often happened is insufficient coordination between efforts to develop the coastal zone and efforts by the harvesting sector to manage the fisheries—we are our own worst enemy.

The complex physical characteristics of coasts (bays, estuaries, and continental shelf) provide a home to 80 percent of living marine species, at some stage of their life cycle. Offshore adult populations

(continued page 2)

Food Security in the Coastal Zone: Anthropologic Considerations

By Lisa Colburn

When the term 'food security' is mentioned what do you think it means? For many of us it may depend on the economic level we consider. National food security may be very different from the ability of individuals to secure food. This article is intended to provide a broad contextual framework for understanding food security. To do this, an anthropological perspective will be placed in the context of coastal communities. For this framework, each level of consideration may usefully be understood as dependent on the level that precedes it. That is, successful national-level food security may, for example, be viewed as dependent on international-level considerations, while individual-level food security may be dependent on household-level considerations (Figure 1, page 30).

According to the United Nations' Food and Agricultural Organization (FAO), "food security exists when all people at all times have physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life." Because average

(continued page 30)

INTERCOAST NETWORK
INTERNATIONAL NEWSLETTER OF COASTAL MANAGEMENT

Editor: Stephen B. Olsen
Editor: Noëlle F. Lewis
Designer: Matt Castigliego

InterCoast is an international newsletter of coastal management, published three times each year by the Coastal Resources Management Project of the University of Rhode Island's Coastal Resources Center (CRC) and the U.S. Agency for International Development (USAID). Funding to publish *InterCoast* is provided by USAID's Global Environment Center and the National Institute for Coastal and Marine Mangement, The Netherlands.

InterCoast's objective is to facilitate information exchange on coastal management. Readers are invited to contact Noëlle F. Lewis with contributions, questions and comments.

InterCoast
Noëlle F. Lewis
Coastal Resources Center
University of Rhode Island
Narragansett, Rhode Island
02882 USA
Tel: 401-874-6870
Fax: 401-789-4670
E-mail: noelle@gso.uri.edu
Website: www.crc.uri.edu

InterCoast's policy is to limit submissions to a short essay or summary on a given topic. The editor routinely edits submissions heavily and removes references. Such changes are commonly made without further consultation with the author.

COASTAL RESOURCES CENTER
University of Rhode Island
USAID

Trott
(continued from page 1)
may not be directly affected by human coastal activity; however, these coastal activities can be disastrous to the larval and juvenile populations. Coastal degradation reduces larval/juvenile survival and offshore harvesting reduces the breeding adults. The results are obvious.

World Fisheries

In 1997, the total world fish harvest was estimated to be 122 million metric tons; in 1998 it had decreased 4 percent. Capture fisheries (the harvest and utilization of natural stocks) accounted for 85 percent of the harvest. At the end of the 20th century, United Nations' Food and Agriculture Organization (FAO) estimated that 70 percent of the world's fishery resources were either fully or overexploited.

Over 50 percent of the world harvest comes from waters of developing countries, and over half of that is caught by artisanal fishers. These fishers are in competition for an ever-decreasing supply of fish.

Factory trawlers became common in the 1960s and 70s, severely depleting stocks in the most productive areas. This led coastal nations to establish exclusive economic zones (EEZ), giving jurisdiction over waters 200 miles from their coasts. The U.S. declared its EEZ with the passage of the Magnuson Fisheries Conservation and Management Act in 1976. Nevertheless in 1996, 20 years later, the Sustainable Fisheries Act was passed recognizing that our fisheries resources had not been sustained and were rapidly declining.

The real issue is what level is actually sustainable. If the overexploitation of natural fish stocks, environmental degradation and the destruction of oceanic, coastal, and freshwater habitats which is currently underway in many parts of the world is not curtailed, the yield from natural stocks will continue to be reduced, and in some areas even eliminated. In the U.S., rebuilding stocks is now the charge, with management forced toward a precautionary approach, thus limiting harvests to levels lower than desired by industry.

Fishery products are the world's most important source of animal protein, particularly important to the poorer segments of coastal society. Fish contribute more animal protein for human consumption than beef and poultry combined. For many people in developing countries, fish provide more than 40 percent of their basic needs for animal protein, and often is the cheapest or only affordable source of this vital nutrient. Of the over 25,000 species of fish, only a few species are harvested for direct human consumption. More than 15 percent of the world harvest is used for other purposes (e.g., meal and oil). In U.S. waters, the U.S. National Marine Fisheries Service's publication *Our Living Oceans* lists only 904 species involved in the 41 fishery management plans that regulate U.S. marine fisheries. This is insufficient information for management for over 60 percent of these species.

Role of Aquaculture

Aquaculture (the controlled culture of freshwater and marine organisms) has been a significant method of producing fish for over a thousand years. Aquaculture now accounts for nearly 20 percent of the total world harvest. But, until recently, aquaculture has depended largely on trial and error, and the basic parameters for production are poorly understood. Carp and a few salmonid species dominate fish culture worldwide, and penaeid shrimp dominate invertebrate cul-

ture. Only a handful of marine fish species are successfully cultured, with significant advances in ornamental species. Much of marine culture is actually in brackish water, with shrimp and milkfish being good examples.

Annual world aquaculture production doubled from 10 to 20 million metric tons in just over a decade (some of this is an artifact of better reporting from China).

Due to the rapidly increasing human population, worldwide demand for fish continues to exceed demand. Assuming that production from natural stocks remains static, any increase will have to be from aquaculture.

The price of fishery products continues to rise, with some being truly excessive. A recent report from Tokyo tells of a single bluefin tuna selling for US$173,000. In Jamaica, tilapia (a group of freshwater fish native to Africa) are marketed as "Caribbean red snapper," demonstrating marketing techniques for capitalizing on the short supply of a popular, high market-value native species. In contrast, in countries like Eritrea where most fishery products remain in the country, the market cost of all species, whether lobster, tuna, or lizardfish is the same (US$0.50 per pound in 1996).

Fish farm yield is increasing due to research in bioengineering (genetics), nutrition, disease control, and reproductive physiology. However, in some countries, these increasing yields have had major effects on coastal ecosystems, causing pollution and altering physical surroundings. Shrimp farming is a major culprit, as seen in Ecuador and Taiwan. In Ecuador, vast acreage of mangroves (a primary wild shrimp nursery) has been destroyed. In southern Taiwan, milkfish ponds were converted for shrimp farming affecting the surrounding ecosystems, i.e., to make brackish conditions necessary for shrimp farming, freshwater is extracted from the water table to dilute seawater in the milkfish ponds. In both cases, and in most other locations where shrimp farming has been practiced, the immense profits initially gained by shrimp farming suddenly turn to losses due to disease. However, today, with increased attention to disease prevention, shrimp production is again on the rise.

The Food Chain

Marine ecosystems are extremely complex. Habitats vary widely and are influenced by many factors (e.g., climate, ocean currents, and water column and substrate characteristics). Marine creatures have evolved to protect themselves from predators. Understanding predator-prey interactions is indeed understanding the food chain, an area greatly studied. Species location and concentration also drive the food chain. Upwelling off western Africa and the eastern Pacific provides nutrients for algal production, which in turn attracts small fish (sardines or anchovies), then larger pelagic fish (mackerel and tuna), and ultimately the apex of the chain (e.g., tuna and sharks). As we fish out larger fish, we are fishing more and more down the food chain to lower trophic levels.

Possible Solutions

Efforts to protect the marine habitat have increased in the last decade. Restrictions on coastal development activities have been in place in the U.S. for several decades, but this is not generally true in developing countries. Protection of mangroves and coral reefs is recent, occurring only after their importance was recognized, and it became clear that a significant percentage is being lost.

One cause of over-fishing is better technology and a better understanding of marine processes. An obvious solution is to restrict harvests (e.g., number of fishing vessels) and to close areas where reproduction occurs, or that are required for larval survival. Reserves and marine protected areas (MPAs) have been established to do this. These zones limit fishing to specific areas, thus removing the element of time or season from management decisions.

However, use of MPAs as a fisheries management tool is somewhat new. A Presidential Executive Order to coordinate U.S. national MPAs was just signed to coordinate work on state MPAs. However, for some states such as California that already have 100+ marine reserves, this is nothing new. Several developing countries are also using MPAs to improve their fisheries stocks.

One effort of resource protection that has been very successful is the protection of turtle nesting beaches. In most cases, this has successfully limited egg harvesting by coastal communities. An example is in Central America where there are large concentrations of nesting turtles, on some beaches hundreds to even thousands of nesting turtles arrive, e.g., La Fleur on the Pacific coast of Nicaragua. In contrast, where this strategy is not being used, green turtles are harvested for meat on the Miskito (Caribbean) coast of Nicaragua. Recent estimates indicate 14,000 large adult turtles are harvested per year. This practice is unlikely to be sustainable.

Socioeconomic Factors

The economies of all nations are somewhat dependent on fish, shellfish, and aquatic plant life. This is especially true for those countries still developing their economic potential.

Living aquatic resources, especially fish, are essential to income

(continued page 34)

The Contribution of Indonesia's Coastal Resources to National Food Security

By Ian M. Dutton and Dietrich G. Bengen

Indonesian's refer to their country as *tanah air kita* (our land and water). This simple expression evokes both a strong sense of association with the sea and an implied recognition of the importance of viewing both land and water in an integrated fashion. These interdependencies are further substantiated by the extensive socioeconomic and biophysical linkages within this 17,000 islands of the archipelago.

More than 65 percent of Indonesia's 220 million citizens live within 60 kms (35 miles) of the coastline. Eight of Indonesia's 10 largest cities and most provincial capital cities are located on the coast. The largest, Jakarta, has long played a dominant role in the national economy because of its maritime trade focus. More than 23 percent of the country's total GDP is generated by marine industries and these also provide formal employment for more than 16 million of Indonesia's workforce.

Despite the obvious significance of these resources to the national economy and to the well being of resource dependent industries and communities, there has, to date, been little systematic effort to (a) document the importance of coastal resources to national food security or (b) protect the resilience of those resources and thus ensure their sustained production. This overview describes aspects of the significance of coastal resources, reports on the results of a recent national attitudinal survey of public perception of coastal resources and outlines some of the steps being taken to promote food security in coastal regions.

Significance of Coastal Resources to Food Security

Perhaps the most important single measure of the importance of coastal resources to the health, welfare, and food security of Indonesia is the (1997) Food and Agriculture Organization statistic on sources of animal protein supply. Some 53 percent of Indonesia's total animal protein supply comes from fish, ranking only just behind South Korean and Sri Lanka and ahead of Bangladesh, Japan and other Asian nations). This is well above the reported global average of 16.5 percent and much greater than developed nations such as the US (6.8 percent) and Australia (6.5 percent).

This single measure belies, however, the significance of coastal resources in periods of greatest importance such as economic recession. No data are available on informal employment in the marine sector, or the relative significance of subsistence industries, but a 1994 World Wildlife Fund study estimated that some 80 percent of coastal residents engage at some time in marine resource-dependent activities such as fishing or gleaning. This observation and the importance of multiple sources of household incomes (e.g., from agriculture, commerce, and fisheries) have been well documented in various recent studies of coastal communities in North Sulawesi, Lampung, and East Kalimantan. In those studies, it has been noted that access to coastal resources has become even more important to rural and urban households in the last three years of the Asian economic crisis due to the need to substitute often expensive imported foodstuffs with locally available produce. Because of the crisis, there has also been a substantial urban-rural migration as city workers returned to their family villages to obtain food and employment in sectors such as fisheries and agriculture that are less affected by regional and global economic forces. This has in turn placed further pressure on local resources and intensified conflicts between subsistence and commercial uses.

One of the consequences of the intensification of competition for coastal resources and of the higher export prices for key fisheries and aquaculture products has been an increase in destructive fishing practices and inappropriate aquaculture development. Many coastal communities are thus caught in a cycle of resource use that favors commercial over subsistence uses, depletes resource stocks at unsustainable rates and ultimately diminishes the capacity of the ecosystem to supply future stocks. This cycle is also a root cause of much conflict between communities and between communities and commercial interests competing for access to ever decreasing resource stocks. Throughout much of western and central Indonesia, many fisheries that communities previously relied upon for both income and subsistence are now commercially extinct. It is feared that as decentralization takes effect in early 2001, rates of unregulated exploitation will increase, further disadvantaging coastal communities who traditionally have had little voice in coastal resource management.

What do Indonesians Think About All This?

A recent national attitudinal survey of 1,600 Indonesians (in three provinces and in the greater Jakarta area) commissioned by the United

States Agency for International Development (USAID)-National Development Planning Board (BAPPENAS) coastal resources management project, Proyek Pesisir, demonstrated the overwhelming concern that Indonesians have for coastal ecosystems and species of importance to them. Eighty-three percent of respondents believe that marine resources are very important to them and their future. Of the top 10 issues affecting them, 'pollution of the sea' ranked as sixth most important after living costs, household income, education costs, unemployment, and security and above economic crisis, rubbish, bad roads, and crime.

Despite a generally low level of factual knowledge (e.g., most Indonesians think that Indonesia has less than 500 islands, and only 19 percent can name the Minister for Marine Affairs), there is clear evidence of informed concern for resources of importance to them. For example, respondents identified some 17 key threats. The top five were blast fishing, catching fish with cyanide, catching fish with a trawl, oil pollution, and throwing waste into the sea. Of equal note is respondents understand the connection between sound management of coastal resources and the supply of food products from those systems. For example, there was strong support for measures such as the return of captured juvenile fish, closed seasons for fishing to allow stock recovery and for protection of coral reefs and mangroves.

Some Initial Steps to Protect Food Security

The establishment in 1999 of a new Ministry of Marine Affairs and Fisheries to coordinate conservation and development of Indonesia's vast coast and marine resources is a major step in developing an integrated approach to coastal and marine resource management. Prior to 1999, fisheries management was subordinate to agricultural management, and there was no single national body concerned with marine resources. The new ministry is now working with other levels of government and with nongovernment interests to actively develop a comprehensive policy framework to better balance commercial and subsistence uses of marine resources and protect the food and ecological security of local communities.

In some locations this will be achieved by better coordination of government, commercial, and community interests in coastal areas. For example, the government of Lampung province has recently approved a coastal strategic plan that establishes shared vision and coordinated process for coastal development.

In some cases, this will be achieved by supporting community-led initiatives to improve ecosystem quality and protect or enhance production. For example, in the villages of North Sulawesi, community-based marine sanctuary programs are now actively supported by local governments as a means of promoting economic resilience and sustainable fisheries production.

In other cases, an active program of ecosystem rehabilitation is being pursued. In October 2000, the ministry supported the installation of artificial reefs in the Thousand Islands area offshore from Jakarta as a tool for promoting enhanced fish production for the benefit of local communities. At a much larger scale, the Coral Reef Management Project (COREMAP) is testing development of large-scale programs of improved coral reef management and supporting those initiatives with a high profile public awareness campaign.

Conclusion

It is somewhat ironic that while much of Indonesia's development focus for the past 30 years was primarily on agriculture, the pursuit of intensified land clearing and agricultural work contributed to the rapid degradation of Indonesia's most highly productive marine ecosystems. Various recent studies have demonstrated conclusively both the vast extent of ecological devastation that has occurred because of largely unregulated or inappropriate coastal development and the massive social costs borne by present and future generations as a result of ecosystem damage.

At the same time, the rapid expansion of commercial fishing activities, particularly fisheries involving destructive and inappropriate practices, now threatens the ability of Indonesia's seas to sustain previously unchallenged marine food security. Dealing with these threats requires a comprehensive program of action focusing on governance measures and requiring an ecosystem level perspective. It may even require such politically radical measures such as food substitution if action can not be taken quickly enough to deal with the decreasing quantity of fish stocks or the rapidly deteriorating quality of the ecosystems that nurture those stocks.

For further information, contact Ian Dutton, Proyek Pesisir (Indonesia Coastal Resources Management Program), E-mail: crmp@cbn.net.id or Dietrich Bengenk, Bogor Agricultural University (IPB), Kampus IPB, Darmaga, Bogor 16680 Indonesia. Tel: 62251 626380. E-mail: dieter@indo.net.id

Actions Needed to Achieve Food Security in the Philippines

By Catherine A. Courtney, Evelyn Deguit, and Rebecca Pestaño-Smith

The food security programs of national governments rarely consider coastal resources in the inventory of stable, sustainable, and predictable food supply. This is surprising considering the importance of nearshore fisheries in supplying the highest quality and most efficiently produced dietary protein in the world, especially in an archipelagic country like the Philippines where the coastline extends 18,000 km and 60 percent of the population lives in the coastal zone. This neglect is alarming given that international research organizations and experts confirm the global supply of fish is dwindling, and in some cases, collapsing under the heavy pressure of increased demand.

Food security has been recently defined in the Philippines under the 1997 Agriculture and Fisheries Modernization Act 8435 as a: "Policy objective, plan and strategy of meeting the food requirements of the present and future generations of Filipinos in substantial quantity, safety and nutritional quality that meets desirable dietary requirements, ensuring the availability and affordability of food to all, either through local production or importation, or both, based on the country's existing and potential resource endowment and related production advantages, and consistent with the overall national development objectives and policies. However, sufficiency in rice and white corn should be pursued."

In order to achieve this policy objective for the Philippines, the sustainable supply of nearshore fisheries resources must be considered in the food security equation.

Coastal Communities' Dependence on Seafood

The importance of nearshore fisheries to food security in the Philippines is well documented. Fish caught in nearshore or municipal waters (extending to a distance of 15 km from the shoreline) provide approximately 50 percent of the animal protein. In fact, the Philippines' staple food is mainly composed of fish and rice. In rural coastal communities, nearshore fisheries may supply 80 percent of the dietary protein. The extensive shallow seas have historically been rich with coastal resources (fish and shellfish) and their habitats (coral reefs, seagrass beds, and mangroves). Currently, these resources are severely degraded throughout the country. The Philippines is facing the beginning of a crisis in food security from the sea.

In 2000, the Coastal Resource Management Project (CRMP) of the Philippine Department of Environment and Natural Resources, funded by the United States Agency for International Development, conducted a nationwide quantitative survey to benchmark the current fishers knowledge, attitudes and, practices, as well as provide inputs on priority coastal issues and concerns. A total of 700 fishers from 16 provinces were interviewed for the study. The study affirms the heavy dependence of fish and fishing as a primary source of daily food and livelihood for Filipinos, wherein:

- Eighty-nine percent used their own catch from the sea as the largest portion of food
- Eighty-two percent feed their families daily from their fish catch
- Sixty percent claim 75 to 100 percent of their total income comes from fishing

Out of the three most urgent personal concerns, 74 percent of the respondents identified having enough to eat everyday as their top concern.

The majority of respondents cited all major indicators of overfishing as becoming worse over the last three years wherein:

- Seventy percent cited increased time to catch a kilo of fish
- Seventy-four percent cited a decrease in the number of fish caught
- Sixty-eight percent cited smaller fish being caught
- Seventy-four percent cited a decrease in the quality of fish caught

Only eight to 16 percent cited improved fish catch, quantity, and quality over the last three years, while the remaining respondents cited no change.

The Decline in Fisheries-Derived Food

The most common strategy promoted by governments to increase food production and economic benefits from the sea is to increase fishing effort by providing fishing gear, boats, and other incentives to increase the number of fishers and efficiency of exploitation. Production-oriented programs to increase fishing effort without instituting adequate management measures are largely to blame for the current decline in fisheries production in the Philippines. As an example, in 2000, as part of Fish Conservation Week in the Philippines, the national government distributed hundreds of bottom-setting gill nets to small-scale fishers. Commercial fishing licenses continue to be issued to operators who illegally fish in municipal

waters, thus contributing to the decline of nearshore fisheries that supply the daily food to small-scale fishers. Other factors contributing to the decline of fisheries-derived food in the Philippines include:

- Lack of regulatory mechanisms to limit access to nearshore fisheries
- Lack of enforcement of fisheries laws
- Lack of regulation of commercial fisheries
- Continued increases in municipal and commercial fishing effort from population growth and migration to coastal areas
- Slow economic development in coastal areas providing few alternatives to fishers
- Conversion of coastal habitats such as mangroves to fish ponds and reclamation areas
- Economic development of local government inconsistent with principles of sustainable development
- Slow development of an integrated coastal management program at the local and national levels

Together these issues have acted (and continue) to damage coastal resources and decrease fisheries production potential throughout the Philippines. A new paradigm must be embraced to achieve food security from the sea.

Three Critical Results Needed to Achieve Food Security

Coastal resource management (CRM) addresses two key elements of the food security and poverty alleviation equation: ensuring a sustainable food supply from the sea and increasing the earning power of coastal poor to purchase food. The goal of CRM is to manage all the coastal resources in a sustainable manner allowing the greatest benefit to accrue to the largest number of people for the longest possible time. CRM accomplishes this goal through a participatory process of planning, implementing, and monitoring sustainable uses of coastal resources through collective action and sound decisionmaking. Local government units, in particular 832 coastal municipalities and 57 coastal cities, have been given the primary mandate under the 1991 Local Government Code to manage coastal resources and municipal waters. In order to achieve a sustainable food supply from municipal waters, local government units must deliver coastal resource management as a basic service to achieve three critical results:

Critical Result 1: Fishing effort reduced to sustainable levels

Overfishing inside and, to a lesser extent, outside municipal waters is the primary cause of the serious decline in fisheries in the Philippines. Strategic interventions to reduce fishing effort include:

- Strictly regulate municipal fishing through licensing, minimum size restrictions, seasonal closures, and other measures to reduce open access
- Strictly regulate and reduce commercial fishing by the number of licenses issued, not issuing licenses to repeat violators, clearly identifying areas where commercial fishing is allowed, and enforcing all terms of the commercial fishing license
- Identify sustainable economic alternatives for coastal communities
- Ban all fish aggregating devices, artificial reefs and other types of fishing gear which when used improperly in municipal waters result in overexploitation of fisheries resources
- Implement family planning programs
- Provide technical skills, training and educational opportunities to fishers and their children

Critical Result 2: Illegal and destructive fishing practices stopped

Illegal fishing in municipal waters has resulted in relatively small economic gains to a few individuals and large economic losses to the majority of coastal stakeholders. Strategic interventions to stop illegal fishing in municipal waters include:

- Allocate funds from municipal and city government for coastal law enforcement activities including training, seaborne assets, legal assistance, and financial support for community-based coastal watch groups
- Train and equip local police in the enforcement of fishery and other laws designed to protect the coastal environment
- Pass local legislation to prohibit destructive fishing practices

Critical Result 3: Critical coastal habitats protected and managed

The quality of critical coastal habitats, in particular coral reef, seagrass, and mangrove habitat, must be maintained and improved for sustainable coastal resource use

- Establish marine sanctuaries to rehabilitate habitats and increase fisheries production
- Develop community-based forest management agreements for sustainable mangrove resource use
- Revert abandoned fishponds to mangrove areas and stop illegal conversion of mangrove forests to reclamation areas and fishponds
- Monitor and regulate all shoreline development, thus minimizing environmental impacts of activities such as reclamation, tourism, port and harbor development, and pollution on coastal habitats

Local Government Leadership in CRM

The primary mandate for managing municipal waters in the

(continued page 17)

Enforcing Coastal Management Regulations to Enhance Food Security in the Philippines

By Tom G. Bayer and J.A. Atchue, III

The concept of food security initially focused on access to grain resources. The concept subsequently has been enlarged to account for access to all types of food.

What is Food Security?

Food security means that all people at all times have access to enough food for an active, healthy life. At a minimum, food security includes the ready availability of nutritionally adequate and safe foods, and the assured ability to acquire acceptable foods in socially acceptable ways. For example, without resorting to use of emergency food supplies. Food security also includes the need to create social and economic conditions that empower individuals to gain access to food. This can be done by earning the income to purchase food, participating in community food security activities, and where practical, by actually producing food. Effective and efficient use of food, including gleaning and food recovery, is also an essential component of food security today.

In the Philippines, limited resources and lack of access to food are the prime factors leading to food insecurity. Chief among the factors determining food secuity is low incomes. Families with very low incomes often must balance paying for housing, medicine, schooling, and other expenses with paying for food. Another factor is lack of access to food because of low stocks. In many cases, Philippine coastal inhabitants living in rural and remote locations face high unemployment and high poverty rates. They often must also cope with low levels of food stocks. Both of these situations decrease food security. Enforcement of coastal management regulations is one way of helping poor Filipinos maintain adequate food security.

The Role of Coastal Resources in Food Security

Fish and other aquatic resources provide about 25 percent of animal protein in Asia, and approximately 50 percent in the Philippines. In rural communities, fish caught in municipal waters can supply up to 80 percent of the animal protein.

The Philippines historically has been rich in coastal resources. Unfortunately, these resources are now in rapid decline due, in part, to severe human encroachment caused by a rapidly increasing population. This has lead to increasing needs for food which have been answered, in one way or another, by increased fishing pressure along the coast. Also, there was an explosion in the construction of aquaculture ponds in mangrove forests from the late 1960s until the early 1980s.

Most of the increase in effort has occurred in nearshore areas. For example, mangrove forest cover has declined from 450,000 hectars (ha) in the early 1900s to only about 150,000 ha today, due in part to extensive (and often illegal) fishpond development. Many studies have assigned mangrove forests a crucial role in the coastal zone. Of the estimated 27,000 sq. kms of coral reefs in the Philippines, it is estimated that less than five percent is in excellent condition, while over 70 percent is classified as poor to fair condition. This degradation in reef quality is a direct result of numerous illegal activities including dynamite fishing, cyanide fishing, and *muro ami* fishing (when fish are scared into a waiting net by a wall of young boys diving down and making a lot of noise). This decrease in mangrove and coral reef areas spells trouble for the future, considering that a healthy coral reef can produce as much as 20 metric tons of fish per square kms per year. This could provide 50 kg of fish per year to 400 people. On the other hand, one square km of reef in poor condition can produce no more than five metric tons of fish per year.

These and other changes seem to be linked with real and significant changes in the amount of fish caught by municipal fishers. The total catch for municipal fishers has been steadily decreasing since the early 1990s. In addition, the catch per individual fisher has significantly decreased since the 1970s. At that time, approximately 20 kg per fisher per day was reported, while by 1998 the catch had dropped to less than two kg.

Another serious problem is the unequal distribution of the catch between commercial and small-scale fisheries. While commercial fisheries catch about 85 percent of the fish, small-scale fisheries provide work for about 80 percent of all Philippine fishers. This causes severe problems among these two groups. Although the government has banned trawling, push netting, and shellfish racking within a distance of three km from the shore to protect the fishing grounds of the small-scale fishers, enforcement of such measures is inadequate. As a result, the income of the small-scale fishers is below the national average. The coastal resources are heavily exploited and do not produce enough fish to guarantee a living for small-scale fishers.

These decreases in total volume of catch and the individual catch per unit effort are significant food security issues. Lower overall catch means that access to food is decreased, since there is less food in the marketplace. Lower catch per unit effort means that the fisher has either less direct access to food since he may choose to sell his catch, or keep his catch for personal use. In any event, it is clear that the use (and management) of coastal resources plays a crucial role in food security.

Without having a proper management system along the coast, small-scale fishers may need to use more effective and destructive fishing gear for their survival. Such action will eventually destroy the coastal resources—including juveniles of commercially valuable species—and lead to further marginalization of their economic situation now and for future generations.

Coastal Management for Food Security

The government has managed its coastal resources in some form since the 1960s. In the 1990s, the government came to understand that it must put more effort into management. One result was the introduction of local government unit (LGU) responsibilities in coastal zone management as part of the government's (so far successful) experiment in devolution in the early 1990s. Another was the 1998 passage of the new Fisheries Code. This combination of laws, regulations, executive orders, and fisheries administrative orders have all combined into what is now the infrastructure of coastal zone management in the country.

It follows that one of the most important missions for coastal managers in the Philippines is to provide effective enforcement of coastal management regulations at the municipal level. These efforts must of course align with national resource use policies. Coastal management efforts will only succeed when a high level of compliance is achieved with well-developed management measures at all levels. This requires the integration of four concepts:

- Resource users and managers must have a strong working knowledge of coastal management requirements
- Resource users must generally accept that compliance is necessary and in the best interest of all stakeholders to preserve the long-term economic viability of the resources
- Individual resource users perceive a high risk of detection of illegal activity and subsequent apprehension
- Individual violators, when detected, can expect certain prosecution appropriate to the violation

Until the last few years, at least in the municipal fishing community, these concepts often were not acknowledged.

Aquaculture in the Philippines (photo by Lamarr Trott)

The Need for Coastal Law Enforcement

In 1998, the Fisheries Code (Republic Act 8550) was passed into law. The Fisheries Code introduced the concept of coastal law enforcement for the benefit of the coastal resources and the communities that they support. The Philippine National Police-Maritime Group (PNP-MARIG) and the Philippine Coast Guard (PCG) and other law enforcement agencies are instructed under the Fisheries Code to take the lead in the enforcement of environmental laws in collaboration and coordination with community-based Fisheries and Aquatic Resource Management Councils (FARMCs). The code also instructs members of the FARMCs to undergo training and be deputized as fish wardens and natural resources officers. The appropriate government units are further instructed to issue deputization papers to the FARMC members and officers.

Food security and poverty alleviation in coastal areas will be achieved only if coastal and fisheries resources are managed sustainably through effective coastal law enforcement. The three major areas that must be addressed through Monitoring Control and Surveillance (MCS) are illegal and destructive fishing practices, excessive fishing effort, and encroachment into environmentally sensitive areas. Fisheries managers are finally recognizing that fisheries cannot be managed effectively without the cooperation of fishers and the related groups.

Government agencies charged with enforcement typically lack sufficient personnel, equipment, and financial resources to mount extensive patrols of the 18,000 km

(continued page 21)

Profitability and Cost Structure of Marine Capture Fisheries

By Uwe Tietze

Special efforts are presently being made to implement the United Nations Food and Agriculture Organization's (FAO) Code of Conduct for Responsible Fisheries. These include measures to reduce and adjust the capacity of fishing fleets and to diversify fishing effort away from overexploited resources to ones less exploited. Environmental and natural resource issues can only be addressed successfully if the social and economic concerns of those whose livelihood, employment, and income depend on fishing are taken into consideration. In an effort to help collect background information on the fishing industries' economic situation, the Fisheries Department of FAO is presently carrying out a global study on the economic and financial viability of marine capture fisheries.

The study commenced in 1995 in close cooperation with fisheries research institutions and national fisheries administrations in selected countries in Asia, Africa, Latin America, and Europe. The methodology for studying and analyzing data on costs and earnings of fishing units follows the one used in the 1993 study by the Dutch Department of Fisheries of the Agricultural Economics Research Institute in The Hague. A first round of national level sample surveys and case studies was completed by 1997 in 13 selected countries in these regions. These countries accounted for 49 percent of the marine capture fisheries production in their regions in 1995 and for 41 percent of the global marine production. A comparative analysis of the findings of the national level studies has been published as FAO Fisheries Technical Paper 377. The study is presently being updated and expanded.

Global Trend

The findings of the study suggest that, in spite of heavily and sometimes overexploited fisheries resources, marine capture fisheries is still an economically and financially viable undertaking. In most cases, it generates sufficient revenue to cover the cost of depreciation and the opportunity cost of capital, thus generating sufficient funds for reinvestment. Marine capture fisheries are also an important source of food and income and generates employment and foreign exchange earnings, which is particularly important for developing countries.

It is interesting to note that those few categories of fishing units which incurred operational losses at the time of the study are located at the extreme ends of the scale of fishing operations, (i.e., in the very small-scale as well as in the very large-scale sector of the industry) and include both artisanal gillnetters and large industrial deep sea trawlers. In the former case, overexploitation of inshore fisheries resources and competition from more efficient fish capture technologies, such as purse seiners and coastal trawlers, seem to be responsible for the negative financial performance. In the latter case, excess capture capacity and related excessive costs of operation and investment (limited fishing grounds and fisheries resources) seem to be the important factors.

Trawlers and Small-Scale Fishing Vessels

The economic and financial performance and efficiency of different types of fisheries is compared below with the help of two indicators. For the assessment of the economic performance of a fishing vessel, the ratio between net cash flow and total earnings is used. This ratio is a general indicator of economic profitability/viability of economic enterprises as it shows the amount of total earnings that needs to be earned by a certain type of fishing vessel in order to generate a given amount of net profit. The financial performance is assessed with the help of the rate of return on investment. The ratio shows how much money needs to be invested in an economic enterprise in order to generate a certain net profit.

Regarding productivity and financial performance of trawl fisheries, noticeable differences can be observed between developed and developing countries. While productivity measured as value of production per crew member was found to be generally higher in the developed countries, the rate of return on investment was found to be generally higher in the developing countries.

Of the countries studied, productivity was found to be highest in France, followed by Argentina, Peru, Germany, and Spain. The highest rate of return on investment, however, was found in the Republic of Korea (37 percent), followed by Peru (34 percent), India (24 percent), Ghana (22 percent), and China (15 percent). The higher degree of productivity in the developed countries studied can probably be attributed to a higher degree of mechanization and sophistication of equipment for fish detection, capture, and on-board handling. Their lower cost of operation in relation to gross earnings as discussed above, and their lower cost of investment/higher depreciation because of the use of older fishing vessels, explains the higher profitability of trawl fisheries in the developing countries studied.

As costs of labor increase in developing countries in the course of overall economic development and as old fishing vessels are being replaced with newly built ones, it can be expected that the difference in profitability of fishing operations as compared to developing countries might gradually disappear.

In the case of small-scale fishing vessels, the differences between productivity on the one hand, and financial performance on the other are even much more pronounced. Of the countries studied, productivity is highest, by far, on handliners and gill-netters in France. This is due to extremely small crew sizes and a relatively high degree of mechanization and catch efficiency. However, the rates of return on investment (15 percent for the handliner and only 1 percent for the gill-netter) are much lower than those of most of the small-scale fishing units studied in developing countries.

The financial performance of the small-scale fishing units studied in developing countries is better because of lower costs of investments and lower costs of operations. An outstanding example is the smallest and most traditional of the small-scale fishing vessels included in the study, an Indian sailing log raft trammel-netter locally called *kattumaram* or *teppa*. This fishing craft has an annual rate of return on investment of as high as 388 percent because of extremely low costs of investment and operation and of a selective fishing method that targets high value species.

Differences in the Cost Structure

The cost structure of trawl fisheries again differs significantly between developing and developed countries. The differences seem to be mainly related to differences in the compensation of labor which depend on the overall level of economic development.

As could be expected, the cost of labor (costs include wages and other labor charges such as insurance, employer's contributions to pensions funds, etc.) is the most important cost component in the more developed countries studied, (Spain, France, Germany, Argentina, and Spain). It accounts for 40 to 60 percent of the total cost of operation. The second most important cost component is running costs (costs include fuel, lubricants, cost of selling fish, harbor dues, cost of ice, food and supplies for the crew, etc.) closely followed by vessel costs (costs include vessel and gear repair, maintenance expenses, vessel insurance, etc.).

In the developing countries studied (Peru, Senegal, India, Malaysia, and China), labor costs only account for somewhere between 17 to 40 percent of the total cost of operation of trawlers, while running costs and vessel costs account for the major share. As countries develop, and the level of compensation increases, the above differences in the cost structure can be expected to disappear.

When looking at the cost structure of trawl fisheries in absolute terms and in relation to gross earnings, it is interesting to note that the cost of production per unit of gross earnings is significantly higher for the trawler fleets in developed countries (Germany, France, Spain, and Argentina) than for trawler fleets in developing countries, i.e., Peru, China, India, and Malaysia. The cost of producing one US$ worth of gross earnings varies between US$0.91 and US$0.78 in the developed countries studied, while the corresponding range for developing countries lies between US$0.74 and US$0.68.

The cost structure of small-scale fishing vessels shows some interesting differences as compared to industrial trawl fisheries. In France, as a developed country, labor costs remain the most important cost component, as it already was the case in industrial trawl fisheries. Running costs, however, now become the least important cost component, while vessel costs emerge as the second most important cost component. In most developing countries, labor costs now emerge as the most important cost component of some of the small-scale fishing units studied. This is related to a system of compensation where the proceeds from the sale of fish are shared among the crew members. In cases were crew are paid on a fixed wage basis, running costs remain the singly most important cost factor.

The cost of production of the small-scale fishing vessels studied in relation to their gross earnings shows some distinct differences as compared to the cost of production of trawlers. First of all, it is relatively lower. The cost of producing one US$ worth of gross earnings ranges for most of the small-scale fishing vessels between US$0.56 (Ghanaian gill-netter) and US$0.78 (French gill-netter).

Sustainability and Economic Viability

The general positive economic performance of marine capture fisheries is being achieved in an environment where fisheries resources are fully exploited and in many cases overexploited. How long will it last? The fishing industry, both small scale and large scale as well as the general public, have a vital interest in safeguarding and sustaining the beneficial economic and nutritional role of fisheries. With a view to ensure sustainability and viability, there is an urgent need to strengthen and put in place efficient measures to limit fishing effort and to rehabilitate coastal areas and aquatic resources. In

(continued page 23)

Capacity, Capacity Utilization, and Excess Capacity in Living Marine Resources

By John M. Ward and Theo Brainerd

Capacity, when applied to living marine resources is not a well understood term.

Capacity—What is it?

In the fisheries management literature, capacity is often confused with overcapitalization, a related but different concept. Given the recent national and international interest in measuring fishing capacity and determining if excess capacity exists, this confusion over terminology only exacerbates an already complex problem for fishery managers. At issue is the idea that excess capacity causes overfishing. This seems a logical conclusion since without excessive amounts of labor and capital invested in the fishery, fish stocks would not be over-harvested, leading to excessive exploitation. It is also assumed by some authors that it is the existence of subsidies to fisheries by governments that has led to this overcapitalization of some fisheries and has created excess capacity in these fisheries. Excess capacity is a symptom of a management institution called the open-access fishery. This management institution can take many forms and names, but each is characterized by the absence of property rights for 'fish in the sea.' Since no one owns these fish, competitive markets that allocate resources (capital, labor, and fish stocks) cannot operate efficiently. That is, they misallocate resources, causing fishers to over-invest in capital leading to overcapitalization in a fishery and decreases in the fish stock causing overfishing (excess capacity). Without access rights, attempts to reduce or eliminate excess capacity in open-access managed fisheries will likely be unsuccessful. Changing the management institutions for fisheries from one characterized by a lack of property rights to one in which clearly defined and enforceable property rights exist for fish is the most plausible way for fisheries managers to correct both the overfishing and excess capacity problems that presently plague domestic and international fisheries.

International Capacity Efforts

The Food and Agricultural Organization of the United Nations (FAO) and the U.S. National Marine Fisheries Service (NMFS), among other organizations, have taken the first steps in understanding and managing capacity. This process began with the Environmental Agenda for the 21st Century (Agenda 21), which resulted from the 1992 United Nations Conference on Environment and Development United Nations' Rio Summit in Rio de Janeiro. It included a call for governments to cooperate in addressing crises in global fisheries. As a result of a series of negotiations beginning in 1993, three international agreements were completed, i.e., the FAO Code of Conduct for Responsible Fisheries, the FAO Agreement on Compliance, and the United Nations Agreement on Highly Migratory and Straddling Fish Stocks. The FAO Code of Conduct recommends that "states should prevent overfishing and excess fishing capacity and should implement management measures to ensure that fishing effort is commensurate with the productive capacity of the fishery resources and their sustainable utilization" and "where excess fishing capacity exists, mechanisms should be established to reduce capacity to levels commensurate with the sustainable use of fisheries resources so as to ensure that fishers operate under economic conditions that promote responsible fisheries. Such mechanisms should include monitoring the capacity of fishing fleets."

With this increased interest in global fisheries, the U.S. Department of State and the National Oceanic and Atmospheric Administration (NOAA) tabled a proposal at the 1997 Committee on Fisheries meeting that led to three international plans of action (IPOA) concerning sharks, sea birds, and fishing fleet capacity. The fishing capacity IPOA directs FAO member nations to assess their domestic fishing capacity through a series of voluntary individual and collective national plans. The most significant elements of the capacity IPOA are voluntary commitments to assess levels of capacity in the domestic fisheries of each FAO member and to develop national capacity management plans. To facilitate these actions, FAO organized a technical working group meeting in La Jolla, California, USA, in April 1998 that developed definitions of fishing capacity. A technical consultation held in Mexico City, Mexico, in November 1999 continued this analytical work and reviewed case studies prepared by experts from a number of developed and developing FAO member nations. Most significantly, specific ways to measure fishing capacity that NMFS experts presented were endorsed by the Mexico City consultation as standards that FAO should disseminate globally.

U.S. Capacity Efforts

Domestic concerns with fishing capacity also exist as can be seen in

the 1996 reauthorization of the U.S. Magnuson-Stevens Act, or the Sustainable Fisheries Act (SFA). Although it placed a moratorium on the use of individual transferable quota management programs, the SFA has provided the agency with expanded authority for implementing fishing capacity reduction programs," to obtain the maximum sustained reduction in fishing capacity at the least cost and in a minimum period of time." The reauthorization also mandated a study completed in the summer of 1999 on the role of the U.S. federal government in subsidizing the expansion and contraction of fishing capacity, and otherwise influencing the aggregate level of capital investment in fisheries. The SFA is also the primary factor behind the inclusion of capacity management as a formal NOAA planning objective. Under the Build Sustainable Fisheries element of the NOAA Fisheries Strategic Plan, the goal is to achieve 20 percent fewer overcapitalized fisheries by the year 2005. This planning element gives NOAA, for the first time, a quantitative capacity management target and a time frame.

In addition, the recommendations of the National Research Council (1999) report calls for a reduction in excess fishing capacity and states that "…managers and policymakers should focus on developing or encouraging socioeconomic and other management measures that discourage excess capacity and that reward conservative and efficient use of marine resources and their ecosystems." This report also notes that "…there is a need for better information about capacity, including fleet size, types of ships and gear, ownership, and status of operation."

Increased International Commitment

The NMFS and FAO are not alone in pursuing the issue of domestic and international levels of fishing fleet capacity. The Organization for Economic Cooperation and Development is conducting a study of the impacts of financial transfers on the transition to responsible fisheries, and the role they play in augmenting fish harvesting capacity. The World Bank is working with Argentina to develop a fishing capacity reduction program. The UN Commission for Sustainable Development resolved in 1997 that nations should cooperate in analyses to identify and assess the positive and negative environmental roles of fishing fleet subsidies in fisheries. The White House and United States Trade Representative proposed a fisheries sectoral initiative for the next World Trade Organization multilateral trade round that will address all major trade issues, including subsidies to fishing firms (as opposed to a focus on tariff reductions). This explicitly sought to deal with both the trade and conservation implications of trade liberalization in the fisheries sector including their impact on fleet size and capacity.

NOAA's Fisheries Capacity Program

As a result of these international agreements and plans of action to monitor and assess fishing capacity and the NOAA Fisheries Strategic Plan overcapitalization objective, NMFS has undertaken a program to qualitatively and quantitatively assess domestic fishing capacity in each of its federally managed fisheries. The first step in this program was to establish definitions and measures of capacity. A National Task Force report developed economic and technical definitions of capacity in terms of the level of output that could be produced by a firm. In general terms, fishing capacity is the ability of a vessel or fleet of vessels to catch fish. The second step in this program was to develop measures of capacity levels in domestic federally managed fisheries. While estimates concerning capacity levels in global fisheries exist, estimates of capacity levels in U.S. fisheries are lacking. Both qualitative and quantitative estimates can be created that comply with the short-run definitions of capacity that have been developed by NMFS. The qualitative assessment of domestic capacity categorizes each of the federally managed fisheries into excess, none, or unknown fishing capacity level categories. The quantitative capacity measures needed to comply with international agreements, to effectively conserve and manage our fisheries, to promote the competitiveness of the U.S. fishing industry, and to aid in the development of sustainable fisheries and fishing communities, can be employed as a metrics that NMFS can determine if U.S. capacity reduction objectives are being achieved through our management regulations.

The qualitative capacity report that is presently nearing completion indicates that most US fisheries can be characterized as having some level of excess capacity. It concludes that over half of the federally managed fisheries assessed exhibited qualitative indications of excess capacity (e.g., overfishing existed, managing as an open-access fishery, harvesting exceeds the total allowable catch, a declining fishing season length, declining catch per unit effort, and the existence of latent effort). The federally managed fisheries without excess capacity are the two individual transferable quota fisheries on the East Coast of the U.S., and fisheries that are not fully utilized, such as several low-value pelagic species fisheries and various small-scale and largely part-time and subsistence fisheries in the western Pacific. The quantitative report that

(continued page 29)

Tourism: Paradise and Paradox

By Kathryn Tanner

Traditional fishing villages on Madagascar's southwestern coast already face food security problems. This coastal population is marine dependent and is therefore limited by weather. These food security problems occur during the rainy season between November and March when weather conditions are unreliable and cyclones are a constant threat to being able to access food. This coastal population lacks good, year-round, overland access to regional markets which means they often lack access to fruits, vegetables, and staples such as cassava, rice, corn, and potatoes. However, the food security issue could be exacerbated by the influx of over 1,000 tourists between June and December.

The role of tourism in the issue of food security in this region is a complicated one. The white sandy beaches and clear blue water attract tourists to this exceptional environment. Tourists are an incentive for the conservation of this paradise, but they also increase the demand on limited marine resources due to their own dietary needs. The contradiction is that tourism may simultaneously be a solution and a major contributor to a food security problem in the coastal zone of southwestern Madagascar. This essay will examine whether the existing food security problem is exacerbated by the needs of tourists.

A study completed in March 2000 highlighted the positive and negative impacts of tourism in this region. Tourism has been reported to positively impact the local economy, environment, and education. The presence of tourists exposes villagers to foreign cultures and languages, and improves access to medical treatment. The integration of tourism into villages may result in marine research, wastewater treatment, and increased respect for the environment. Tourism positively impacts the local economy by creating employment opportunities for cooks, maids, chauffeurs, and boat drivers, among others. Tourism also generates new jobs in other fields such as masonry, carpentry, and gardening, which also support the tourism industry. Unfortunately, tourism also leads to negative impacts on the local culture and environment. The damage tourism has on the traditional culture by the introduction and practice of sex tourism, the adoption of foreign customs by villagers, and the breaking of local taboos and customs by tourists is often not considered. Tourism can lead to the destruction of Madagascar's flora and fauna by capture and illegal trade of endangered, endemic species. It can also cause deforestation of mangroves for beach access, coral mining for construction materials, and an increase in sewage and waste.

The village of Anakao, Madagascar, is a tourist destination on the Mozambique Channel for adventure-minded Europeans. Drawn by the reputation of world-class SCUBA diving and the increasing availability of hotel accommodation, the number of tourists visiting the nearby port town of Tuléar nearly doubled between 1994 and 1998. The village of Anakao, which is accessible by boat from Tuléar, has also experienced an increase in tourism. Between June 1999 and November 2000, the village increased its occupancy rate from 37 per night to 167, a 400 percent increase. This has led to the villagers identifying tourism as the primary reason for conservation of marine resources, including coral islands and the barrier reef.

The village lies 2.6 miles from the first community-based marine protected area (MPA) in Madagascar. This MPA is funded exclusively by a per capita tourist tax. Villagers want tourists to come to the village, not only because they pay tourist taxes that benefit the community collectively, but also because they spend money in the village which can benefit individuals directly. Tourists buy local shells and small wooden sailboats, eat in local restaurants and buy merchandise in local stores. With economic interests in mind, villagers are willing to take part in conservation in order to attract more tourists. Although conservation may attract more tourists and tourist revenues, some village leaders and tour operators are beginning to recognize the real benefit of conservation is the management of marine resources in hopes of assuring their future sustainability.

Although tourism brings the benefit of inspiring conservation, the tourists themselves add environmental and social pressures to the community. These pressures are intensifying at an alarming rate due to the rapid increase of tourism. With a year-round population of 4,000, not only does the additional mouths to feed add pressure to the natural resources, but the amount of marine resources they consume is disproportionate to the amount villagers consume. In the summer of 1999, the diets of tourists were studied in comparison to the diets of villagers. It was found that tourists consume 13 times the amount of marine resources on a daily basis than villagers. In June through August 1999, the amount of seafood sold to tourist resorts represented 10 percent of the locally harvested fish, 100 percent of the lobsters, 4 percent of the squid, and 2 percent of the octopus. In addition, villagers also sell fish and shellfish to fish buyers who

export to foreign markets. This means that villagers decide on a daily basis what portion of the catch to keep for household consumption versus exporting as a cash commodity.

In addition to environmental pressures, tourists add social pressures to the community that influence food security. Tourism has introduced foreigners, and therefore foreign goods and priorities, to this community. Tourists wear nice clothes, listen to audio players, drink Coca-Cola, and eat prepackaged food. Villagers desire these goods, and with the revenue they earn from fish sales, villagers are presented with a choice of whether to buy food or desired goods. The result is often the villagers substitute cheaper and less nutritious food into their diets, and sell the more expensive and nutritious foods for money to buy these unnecessary, but desired goods. Thus, villages are making dietary sacrifices to obtain these desirable goods by using money originally spent on high-quality sources of protein. In addition, those villagers who do wish to use their fish-sale revenues towards alternate sources of protein might find it difficult due to the unavailability of these resources during certain times of the year. The fishing village of Anakao does not cultivate food nor raise animals, so they rely on import of non-marine products from inland villages. Although some food is transported overland, the bulk of imported food comes from the Onilahy River by boat. During the rainy season from November to March, cyclones can make this water transport impossible.

Due to the multiple factors contributing to the food security problem in this region, there is a clear need for management of these marine resources. A community-based conservation association, Association for the Protection and Development of Nosy Ve (FIMIMANO), has been established in order to manage the marine protected area. FIMIMANO represents collective efforts of Madagascar's National Environmental Office, village representatives, and hotel owners. FIMIMANO's primary objective is to manage the current and future marine resources in the region. In response to the impact of tourism on coastal food security, two courses of action should be pursued by FIMIMANO in order to sustain the positive role of tourism while controlling the adverse effects.

The first course of action should be to determine a carrying capacity for tourists. Without a plan for managing the number of tourists in the village, there is potential for explosive growth of tourist numbers, as seen by the growth during the past 15 months. With a per capita consumption rate for tourists that is 13 times greater than of villagers, even a small increase in the number of tourists can have a significant impact on a community with access to finite food resources. The local government and FIMIMANO should control the growth of tourism by capping the number of tourists allowed to stay and eat in the village on a given day. The second course of action should be to charge a meal tax for tourists in order to reflect the disparity in marine resource consumption. The revenues acquired by the administration of this tax should be used to proactively promote food security within the community. The meal tax revenues should be used to implement an aquaculture project in the village. Aquaculture projects have been pursued in nearby villages with similar physical environments and socioeconomic situations. An aquaculture project would help ease the problem of food security by creating a reliable food source.

Effective management of tourism must be considered in order to maximize the positive impacts of tourism while minimizing the negative impacts. Although the paradox of tourism exists, through effective management tourism can function almost exclusively as an aid to food security for coastal populations. Tourism development can have a paradoxical effect on food security in the coastal zone, by both imposing a potentially unsustainable demand on local resources and acting as a force for conservation. It is possible, however, for tourism to play a positive social role in local economies if the government, the tourism industry and local peoples begin to be explicit about the numbers of tourists that can be accommodated based on local resources.

For further information, contact Katie Tanner, Fulbrighter, PAO-Tana, U.S. Department of State, 2040 Antananarivo Place, Washington, DC 20521-2040 USA. (after 9/01) 36 Church Street, Noank, Connecticut 06340 USA. Tel: 860 536 2327. E-mail: tanner_katie@hotmail.com

Fish, People, Land and Food Security

By Magnus Torell

The relation between rural/coastal people, the availability of land—inland as well as coastal—and the relative importance of fish and other (wild) aquatic resources for food security and livelihood is important to acknowledge. People in rural areas that lack or only poses limited land are often among the poorer groups of the society. Lack of arable land is one of the factors that contribute to coastal households being among the poorer strata of the population in various countries. The non-availability of land has also been a reason for people to settle along coasts, rivers, and lakes, where the open access to marine, aquatic, and coastal resources have been providing for a large number of people to sustain their livelihood. Also in many countries it is estimated that those living on coastal fisheries (i.e., small-scale fishing households) have significantly lower incomes than the average population.

The notion of being 'poor in all but fish' was first applied to describe the Cambodian fisheries. The context is actually a very good way of capturing the importance of fish and other aquatic products (frogs, snails, crabs, etc.) for poor rural/coastal households. If fish is taken or disappears from people that have no real access to other resources, they will become really poor in all aspects. The group includes landless people, those with relatively small (and unproductive) landholdings, those living on (infertile) coastal land, etc.

For example, Southeast Asia is an area that is very rich in both marine and freshwater resources (using paddy rice as an aquatic or wetland product). Subsequently, the area is well populated and especially so in the fertile—and fish rich—flood plains and deltas of the Mekong River, the Red River, andChao Phraya River, among others. The United Nations reports that population, perhaps with the exception of Singapore and Thailand, is rapidly growing, and in some cases very rapidly, by global standards (Cambodia, Laos, and the Philippines). The growth in population has also meant that people occupy more marginal and infertile land within the flood plains, along coasts, and in mountain areas.

Seen in another context, based on World Bank indexes, some of the world's poorest countries are located in this area. Laos, Cambodia, Myanmar, and Vietnam are among the poorest countries based on a gross domestic product per capita. According to these World Bank indexes, many people are living below the poverty line.

It is important to note that, concerning nutrition (and health), these countries are in a much better position than what their poverty index would indicate. The expected number or percentage of people being considered undernourished is much less than those being rated as being under the poverty line. This relative well-being is to a large extent linked to the access to aquatic resources. It has been said that the nutritional value of wetland products is equivalent or even higher than that of other foods. Also suggested is that if it were not for the abundance of these aquatic animals, Cambodia) might not be able to survive at all on poor rice lands. Note that according to the definition of the Ramsar Convention, coastal waters down to six meters depth at low tide are considered wetlands.

It is again important to state that rural poverty is linked to the access or ownership to productive land and water to cultivate that land and to keep animals on that land. As suggested above—those living on coastal fisheries have lower incomes than the average population—Vietnam could provide one example. In the coastal districts of Quang Binh Province there is a marked difference between urban and coastal households:

- Urban households: 414,000 Dong for the rich and 91,000 Dong for the poor (average income per person per month)
- Rural households: 277,000 Dong for the rich and 65,000 Dong for the poor (average income per person per month)

Continuing the example from Southeast Asia—in a theoretical situation without too much pressure on the aquatic resources (marine and freshwater) and where there are not too many competing uses of resources and space (i.e., regulation of flood plains, coastal developments, etc.)—there should also be an abundance of fish, frogs, snails, crabs, etc. to sustain a fairly large amount of people with small or no land holdings. But there is over-fishing, and there is destructive fishing, pollution, and environmental degradation reducing the coastal stocks. This leaves a coastal fishing household with limited resources for their subsistence and livelihood. Subsequently, they will become poorer. The situation is especially difficult in marginal or isolated areas where presently few alternatives for supplementary employment exist.

In connection with the development of a master plan for fisheries in Vietnam, the critical situation was highlighted together with the urgent need to take some action.

Even though there is little scientific evidence, there is no doubt that most coastal resources are

either fully or overexploited. Also, there is no doubt that the continued expansion in coastal fisheries needs to be stopped if a massive social and socieconomic disaster is to be avoided. The expansion and over-fishing of coastal resources are driven by a complex interaction between several social and socioeconomic factors (e.g., low income levels of coastal populations, poverty, population growth, and low levels of labor mobility), coupled with the open access issue.

In inland aquatic systems, regulation of floodplains, irrigation and intensification of agriculture, flood protection schemes, regulation of rivers, drainage of swamps and other ways of limiting the easy or free access to water-bodies, reduces the availability of fish and other living aquatic resources. It also reduces the accessibility to water bodies (as well as wetlands in a wider context) which implies further hardship for those with limited or no land. They will again become poorer, together with a significant decrease in food security.

Lakes, rivers, swamps, mangroves, and coastal waters are mostly considered public lands, and resources therein common property if not under specific regulations. It is also important to stress that the knowledge is lacking and the statistics on the production level of coastal and inland fisheries (including frog, snails, rice field fishing, etc.) are unreliable, if existing, at all. Where numbers are stated those are in general underestimations of the real production levels.

The general situation is critical, and changes in land use (coastal and inland) tends to be neglecting the needs of the poor, especially with regards to the importance of fish and other aquatic resources for food security and to sustain their livelihood. The importance of these aquatic resources and the seriousness of present trends is frequently stated, yet little has changed.

For further information, contact Magnus Torell, Regional Advisor to Sida, Policy Research and Impact Assessment Programme (PRIAP), ICLARM. E-mail: m.torell@cgiar.org

Courtney, Deguit, and Pestaño-Smith

(continued from page 7)

Philippines lies with local government, municipalities, cities, and provinces who must serve as action centers for results. Local government units cannot, however, accomplish the job alone and must receive technical assistance and support from national government agencies and other organizations to implement sound management.

- Leadership from coastal municipalities and communities is needed to implement coastal resource management programs that will rehabilitate degraded coastal resources and stop illegal activities that adversely affect the state of coastal resources in order to improve food production and increase economic benefits. Initially, some actions to achieve the three critical results may be unpopular. Local leaders must promote coastal resource management measures as providing the greatest benefits to the most people. Sound policy guidelines and laws related to coastal management backed by financial investment at the local level signify leadership and political will to implement CRM programs.
- Partnerships with private sector, financial institutions, and foreign donors can facilitate sustainable economic development activities in coastal areas. These sectors must align their resources and support to reinforce the critical results needed to achieve food security from the sea.
- Multisectoral implementation groups formed at the provincial level can provide a mechanism to consolidate resources and technical capacity available from national government agencies, academic institutions, and nongovernmental organizations in support of local CRM programs

Through leadership, partnerships, and multisectoral collaboration, the three critical coastal resource management results—reducing fishing effort, stopping illegal fishing, and protecting critical coastal habitats—will achieve positive and measurable impact on food security today and into the future. While local government units, being closest to the day-to-day problems, will have the unique insight and incentive to implement sound practices, they also represent the last safety net. Without leadership and action on the part of local government and communities, the coastal resource base that supports economic development in coastal areas will ultimately collapse under the pressure of overpopulation and overexploitation.

For further information, contact Catherine A. Courtney, Coastal Resource Management Project of the Philippine, 5th Floor, CIFC Towers, J. Lunacor. J.L. Briones Sts. Cebu City, Cebu, Philippines. Tel: 6332 232 1821. Fax: 6332 232 1825. E-mail: courtney@mozcom.com. Website: www.oneocean.org

Integrating Women's Subsistence Fishing into Pacific Fisheries and Conservation Programs

By Elizabeth Matthews

Fishing is generally thought of as what fishers do—catch fish. A sentiment among some Pacific Island fisheries departments is that "women don't fish, they just collect shells." The extent or affect of that shell collecting is often minimized or overlooked completely. This has helped to isolate women's concerns from mainstream fisheries programs. For instance, the Secretariat of the Pacific Community (SPC) began a Women in Fisheries program within its coastal fisheries section. Although women's needs and collection activities are increasingly acknowledged and studied, they are usually the focus of a separate and special office, not integrated into the fisheries development program as a whole. In addition, regional organizations and governments rarely integrate the impacts and needs of these collection activities into broader fisheries conservation and management programs.

Many women in the Pacific Islands ensure a daily supply of fresh seafood for their families by gathering invertebrates from nearshore areas. This aspect of the traditional food production pattern has remained prominent even as imported and processed foodstuffs have gained wide local acceptance. Various fresh and saltwater mollusks, crustaceans, sea cucumbers, urchins, and prawns are eaten on a daily basis throughout the region. These invertebrate species are collected from the reef flats at low tide, or from mangroves, rivers, and streams in both rural and urban areas. Often the invertebrates are collected in rural locations, transported, and then sold in urban areas where adults are more likely to work in offices than in traditional gardens and lagoons.

Although lifestyles have changed, the taste for traditional foods remains. Some invertebrates are exported, most notably trochus, dried and smoked sea cucumbers, and in some areas both live and dead corals. After centuries of continued exploitation, some invertebrate species are showing localized signs of depletion. Stocks that could once support daily harvest are feeling the effects of overexploitation and pollution. The combination of overexploitation from a growing population and from increasing commercial enterprises, habitat degradation (especially mangrove destruction, erosion due to land-based construction and development, destructive fishing, collecting practices, and pollution), and the lack of conservation programs for invertebrate species have contributed to this decline.

Women's Activities and Impacts

Women generally engage in reef gleaning by walking along the reef flats at low tide, collecting invertebrates, small fish, and seaweeds. They engage in other activities as well. In Fiji, women collect freshwater mussels from rivers, small crabs, shells, sea cucumbers, and urchins from reef flats, and mud lobsters and crabs from mangroves. In Palau, women collect clams from mangrove areas as well as mollusks, sea cucumbers, crabs, and urchins from reef flats. In Kosrae, women use gillnets to catch a variety of fishes from shallow reef flats. A quarter of Kosrae's fish catch is caught by women in this way. Women also collect mangrove crabs, octopus, eels, anemones, seaweeds and numerous kinds of mollusks. Little quantitative data is available on the extent of these activities. However, in 1993 it was estimated that women in Vavau, Tonga, collected about 230 tons/year from the reef flats. This includes shellfish, mangrove crabs, jellyfish, sea cucumbers, and algae (especially sea grapes, *Caulerpa* sp.). At one time these were purely subsistence activities; today, however, most women sell at least part of their catches in markets.

Occasionally women resort to destructive methods in order to collect some species. They break coral heads, overturn rocks, and walk on delicate corals in their search for food species. In Tonga, for example, reef gleaners often use knives, iron poles, or hammers to smash corals in order to find shells. They also leave coral encrusted rocks overturned after their visits to the reef flats, which can cause the death of the exposed organisms. Women in some areas continue to use traditional methods that utilize poisons obtained from plants and sea cucumbers to stun fish, possibly affecting other species as well. In Fiji, women may collect freshwater prawns by pouring bleach, pesticides, or fertilizers into streams and rivers. Although many of these practices have not been officially documented in the region, fisheries and conservation department personnel have acknowledged them as one of the serious threats facing the reef environment.

Environmental Degradation

Environmental degradation of inshore areas is an increasing concern as many countries in the region contend with growing populations and increasing urbanization and industrialization, under the difficult island conditions of limited

resources and space. The major environmental problems affecting coastal areas in the region include land-based sources of pollution, deforestation leading to erosion and sedimentation, mangrove and other habitat destruction, unplanned and rapid coastal development, and destructive fishing methods. These are compounded by rapid urbanization, a growing population, and the low priority given to environmental concerns in many places in the region.

Invertebrate species, because they often live close to land on the lagoon or shore bottom, can be very susceptible to land-based pollutants. They can accumulate bacteria or diseased organisms from human wastes, pesticides, or heavy metals making them dangerous for human consumption. The invertebrates can also be killed outright by contaminants, suffocated by sedimentation, or eliminated due to loss of appropriate habitat.

Integrating Women's Needs into Fisheries Management

Fisheries departments throughout the Pacific region are concerned with downturns in nearshore fish stocks, due to overfishing and habitat loss. One of the most common solutions is to encourage the use of offshore resources. Men receive gear, training, and advice on how to move their fishing activities offshore to take the strain off the heavily utilized inshore coastal resources. Women, however, receive little or none of the benefits of these programs due to oversight or isolation from mainstream fisheries programs. In fact, even as men are moving into deeper waters to protect the inshore lagoon resources, women continue to collect small fish and invertebrates from the shallow waters. Many nearshore invertebrate species are showing signs of decline.

In order to more fully protect invertebrate species and women's collection activities, a more holistic and integrative view of fisheries management should be taken. A management strategy should:

- Include invertebrate species in fisheries management programs. Species important for subsistence and small-scale local markets should be included
- Increase priority of environmental protection of inshore areas and their resources in the Pacific islands region
- Decrease the amount of mangrove and other habitat destruction
- Develop local education and outreach programs focusing on wise collection strategies, especially the use of non-destructive methods, the need for environmentally sound local practices at the village level, and the importance of all species to the health of the lagoons and nearshore areas
- Use locally important and depleted species (i.e., sea cucumbers, mollusks, urchins, small crabs, and seaweeds) instead of non-native introduced species in aquaculture and mariculture trials. Small-scale village aquaculture projects could be used to rejuvenate popularly harvested species in local areas and contribute to local participation in stock management and conservation:
- Integrate conservation plans into all future women's fishing and collecting projects. There is going to be an increasing danger of overexploitation of invertebrate species as women's fishing projects become more prevalent in the region.
- Explore non-fisheries-related income generation schemes for women to take additional pressure off local resources.
- Use a holistic view of fisheries management that focuses on ecosystems and habitat rather than individual species. One means of creating holistic conservation and management strategies is through the use of linked marine and terrestrial protected areas as part of a larger management program.

In Palau, women fishing for snapper trapped in pools by low tide

Women and other reef gleaners will continue to collect these inshore invertebrates, whether or not fisheries personnel take notice. They will collect invertebrates from reef flats that may not be able to sustain a continued harvest if the environment is continually assaulted by damaging human activities. Serious efforts should be made to assess the status of these inshore invertebrate stocks and to develop sensible management strategies for their protection

For further information, contact Elizabeth Matthews, Marine Affairs Department, University of Rhode Island, Kingston, Rhode Island 02881 USA. Tel: 401 874-6513. Fax: 401 874-6869. E-mail: emat2715@postoffice.uri.edu

Raft Method of Seaweed Cultivation in Tanzania

By Lugazo Zuberi

Seaweed farming has contributed to Tanzania's coastal economy since the 1940s, with the export of indigenous algal species harvested from the reefs. The first cultivation efforts were made in the late 1980s. The introduction of seed stock of *Eucheuma* spp. from the Philippines led to the large-scale cultivation of seaweed in Tanzania. Seaweed farming became an economic base for coastal residents, and a reliable source of foreign exchange, especially in Zanzibar. Seaweed farming first started in Zanzibar and later spread to the mainland.

Two species are commonly farmed in Tanzania, *Eucheuma cottonii* and *Eucheuma spinosum*. Carrageenen, an emulsion stabilizer in the pharmaceutical industries, is extracted from both. Currently, there are three seaweed companies in Zanzibar: Zanzibar Agro Seaweed Company Ltd. (Zascol), Kingsway International (KI), and Zanzibar East Africa Company (ZANEA). The Tanga region on Tanzania's mainland currently has two companies, Kingsway International and Zanzibar Agrow Seaweed Company Ltd.

The cultivation method commonly used in shallow intertidal areas is the peg and line method. This method uses pieces of seaweed (thallus) tied to a monoline that is attached between two pegs driven into the seafloor. Seaweed is harvested at every low tide (two weeks).

An alternate method for cultivation is the raft method. Here, monolines are attached to a floating bamboo frame. This method allows a larger area of the seafloor to be farmed since it is not restricted to the shallow intertidal areas.

A raft compared to peg and line culture experiment was undertaken at Kijiru and Moa, in the Tanga region of Tanzania, in 1998 and 1999. The objective was to explore the technical, social, and economic feasibility of seaweed farming using the raft method. The experiment assessed growth and survival rates, gender applicability, and cost effectiveness.

Methodology

The experiment ran from July 1998 to January 1999. Two villages (Moa and Kijiru, Tanga) were chosen because of the willingness of the villagers and the local seaweed developer in these villages.

Materials used were bamboo poles, anchor ropes (nylon/sisal), monolines, tie tie, seaweed seedlings and one-litre empty plastic bottles. The experiment included 20 rafts of 3 sq. metres and 20 plots for the peg and line. Each area had the same amount of monolines and seedlings. The initial weight of the seedlings was 100 grams. Thirty seedlings were used for each method. The growth and survival rates after every two weeks were measures.

Results

1. At both sites and for all months, the rafts produced higher yields compared to peg and line
2. Highs and lows of production for both methods followed the same pattern—when one method of production was high, so was the other
3. The mean production of the surviving seeds for the rafts was 116 grams, and for every 100 seeds sown, 73 percent survived. The mean production of the surviving seeds for peg and line was 43 grams, and for every 100 seeds sown, 60 percent survived.

Discussion

Looking at operating costs, a seaweed farmer using rafts will start getting his profits after two harvest; whereas, a seaweed farmer using peg and line will take nine harvests. In addition, given favorable conditions, the raft method of cultivation produces higher yields compared to the peg and line. This is true even thought the operating costs of the raft method are higher than the peg and line.

These varying production rates can be caused by biological and physical influences. Rafts have an advantage because grazing by fish can be minimized, and the system offers a constant level for optimal light intensity allowing higher yields. In addition, the rafts are set at the surface and receive consistent water exchange, and nutrient limitations are reduced. However, peg and line requires less labor, thus more economical and easier to maintain, i.e., amount of cleaning of the plants.

The disadvantage of the peg and line system in this trial is the grazing by herbivore fishes causing lower production. Physical conditions such as salinity and turbidity can also contribute to differences in seaweed production. This study showed that rafts can be considered a viable alternative where the peg and line method is difficult to operate, i.e., in areas where the seafloor is rocky.

It is still unknown whether women, especially those from the mainland, would adopt the peg and line method. In general, women do not leave the shore or use boats. A few women from the Kijiru village are accustomed to crossing the channel to Kirui Island to collect firewood and go to farms, and may be willing to use this method.

Recommendations

1. The yield of the raft method of production is greater than peg and line, although its operating costs are higher. Raft culture involves using a boat, which is also

commonly used by the peg and line farmers to ferry the seaweed from the farms to the beach. Thus, rafts should be encouraged in areas where the seabed is not ideal for peg and line. However, at the moment, a significant problem with the raft method is that the bamboo for construction of the rafts is unavailable.

2. As rafts are not restricted to the intertidal areas, this method can be more easily expanded than the peg and line. Raft areas need to by required to be clearly marked to reduce user conflicts, often seen in other areas.

3. Additional research should be done on the environmental impact of both methods.

4. Herbivores (grazing fish) hinder peg and line production rates. As a way to minimize this, studies should be done to see if the introduction of groupers to these sites reduces grazing activities (as compared to a control site with no groupers).

For further information, contact Lugazo Zuberi, P.O. Box 5415, Tanga, Tanzania. Tel: 255-27-2647156. Fax: 255-27-2647465. E-mail: tangacoast@raha.com

Bayer and Atchue

(continued from page 9)

of Philippine coastline. To address this weakness and to respond to the clamor of civilians for authority to apprehend fishery law violators, the national government has begun to involve coastal community members in defending the security of the coast. Under these conditions, delegation of fisheries management authority to the local fishers and community level (also known as *Bantay Dagat,* or Sea Watch) may be more effective than the management efforts which distant, understaffed and under-funded national government fisheries agencies can provide.

The Role of Coastal Communities

Coastal law enforcement has moved beyond the concept of individual organizations working on their own. Due to the growing threat of illegal activities, and the growing responsibilities of individual municipal local government units (LGUs) to manage their resources, it is becoming increasingly attractive for LGUs and local organizations to work together. This not only saves on manpower in the field; it broadens the available scope of activities that any one coastal law enforcement effort can take. Certain management authority should also be delegated to the fishers. MCS is always a serious problem. It is almost impossible and expensive for government agencies to enforce coastal fisheries involving many small boats and fishers through physical patrolling. If management authority is legally delegated to a group of fishers, as is the case in *Bantay Dagat* operations, then this decentralized MCS will be more effective and less costly.

Local coastal law enforcement teams enforce laws on closed areas and seasons, license requirements, prohibited gear, banned fishery products, and protected species. Depending on the nature of the violation, and whether a national or local law is broken, violators may be fined directly at the time of the violation, or charged in an official court of law. The gear, the fishing vessel, and the catch may be confiscated, and the license of the operator can be revoked depending on the severity of the crime.

There are certain advantages to employing local fishery enforcement teams. Authorizing civilians to go after violators provides them with a significant stake in the management of their resources. This can facilitate empowering the community to make informed decisions and be responsible for their fishery resources. The team may be multi-sectoral, comprised of deputized fish wardens, members of the police force who may be assigned to the municipality, as well as representatives of the PCG, PNP-MARIG and other related agencies. Occasionally, the mayor and some town councilors and municipal officials may even join the patrols. This provides a good opportunity for the community to work together, supporting one another in achieving common goals. This concerted effort becomes even more meaningful in instances when neighboring municipalities undertake joint patrols.

The role of local and national government agencies in coastal law enforcement is to provide effective and professional support that achieves full compliance with coastal zone management regulations and objectives. The public must also become a full partner in providing coastal enforcement services. Enforcement is but one piece of the overall integrated coastal management process. With proper coastal management measures, being effectively enforced both at sea and ashore, coastal resources sustainability—and food security—should occur. The Philippine's emphasis on partnerships between LGUs, the national agencies, and local communities is a significant step towards achieving this.

For further information, contact Tom Bayer, Coastal Resource Center, University of Rhode Island, Narragansett, Rhode Island 02882 USA. Tel: 401 874 6407. Fax: 401 789 4670. E-mail: tgbayer@gso.uri.edu or J.A. Atchue, E-mail: Joeatchue@aol.com

Fishing and the Future of Brazil's Northeastern Reefs

By Beatrice Padovani Ferreira and Mauro Maida

Fishing is one of the oldest of human activities and has been practiced since Palaeolithic times by almost all ethnic groups in the world. Today, technology advances and increasing human population have caused an overall increase in the exploitation rate of natural resources, and fish communities are no exception. Until the first half of the last century, it was mostly freshwater and anadramous fishes that were affected, but the century ended with the collapse of many fisheries in the world. In tropical regions, fishing has retained many of its traditional characteristics, but the population has increased and habitat degradation has led to severe stock depletion. This depletion in the fish stocks has threatened the food security of the coastal communities.

In northeast Brazil, about 18 million people live on the coast in an area marked by coral reefs and mangroves. The ecosystems of this area are among the most intensely used; and, apart from the large cities, the economy of the coastal districts relies on the exploitation of reef resources through fishing and gathering.

During the last decade, fishing villages grew with tourism, and now the population of most coastal districts increases up to five fold during the summer. The recognition that the reefs and associated environments were being threatened raised the concern of the authorities, and in 1997 led to development of a large multiple-use marine protected area (MPA) of Costa dos Corais. The project, Recifes Costeiros, financed by the Inter-American Development Bank and Brazilian institutions, started in 1998 todevelop a management plan for the area.

In 1998, a fisheries assessment was started. This included interviewing fishers, collecting fisheries catch statistics, and making an underwater visual census. Although all the fishing activities fell into the official definition of artisanal, it was clear that they could be subdivided into two distinct types: the commercial fishing and the subsistence fishing. While the commercial fleet operated offshore from motor or sail boats, the subsistence fishing was basically a daily activity restricted to the nearshore, in which fishers operate from sail or row boats or from no boat at all. The commercial fisheries targeted prawns, lobsters, and highly prized finfish, while the subsistency fishery was mainly small individual catches of less valuable fish.

Mother and son fishing in Brazil

Because the subsistency fishery had no specific place for landings, sampling was very difficult and time consuming. Because this fishing resulted in very small individual captures, there were no official registrations or studies concerning this fishing.

The assessment was first conducted in Tamandar, a municipal district of seven thousand inhabitants and 13 km of coast. This area was chosen because of the facilities available, and the artisanal fisheries in the area were intense and representative of the region. Six field agents were hired from the local community to conduct the fishing surveys. They participated in designing the sampling strategy because of their knowledge of the fishing operations. After one year of sampling, it was found that every day an average of 50 fishers operated along the coast using hand lines, nets, spears, cast nets, and other gear. The fishers reached the nearby reefs by sailing, rowing, swimming or just walking the beach during low tide. On average they caught two to three kg of fish, octopus, or lobster per day. Throughout the year, it was estimated that a total of 43 tons was removed from a 14 sq. km area of the reef—a productivity of 3 tons per sq. km per year.

The subsistency fishery had a total productivity much smaller than the commercial fleet. Also, the products were worth much less, but because the costs involved were very low (no fuel, ice or food for trips), and the product was sold directly or consumed by the fishers, the final income generated was larger. Currently, the results indicate the activity is very important, the total capture of this fishing is significant in terms of total biomass captured, many people are involved, and this is a significant source of nourishment for a great part of the population that does not have other source of income.

Signs of overfishing, however, can be seem even before analyzing

the dynamics of the exploited populations. Reports from older fishers indicate a drastic reduction in the quantity and quality of the catches over the last decade. Most fishers do not want their children to become fishers, as they see no future in the activity. Alternatives such as better-equipped vessels or more sophisticated fishing techniques are successful only if there are additional fishing grounds to be exploited. Incentives through loans for the construction of boats and equipment have failed to pay back, perhaps because there are no alternative grounds left, or because they are not worth the risk to the fishers, as most fishers prefer to keep land in sight and do not want to venture far offshore.

What are the alternatives to fishing? In northeast Brazil, the most sought solutions, or at least the ones most mentioned, are aquaculture, tourism, and better management options. Aquaculture mainly means shrimp farming, a highly profitable business, but generates fewer jobs and can cause significant environmental degradation. Tourism as an option already exists; however, fishing and tourist activities are closely associated, as tourist come to the beach expecting to see fishers and to eat their catches. The limitation is tourism is seasonal. The last, but perhaps the best is undertaking better management of the resources.

The exclusion of fishing from designated marine protection areas (MPAs) first appeared in the tropics. This practice is increasingly used and has been recognized as one of the more efficient strategies for fisheries management. Expectations of MPAs are that, besides allowing fish populations to reach and maintain natural levels, the no fishing zones help to maintain or even increase catches in adjacent areas.

In February 1999, an area of 3 sq. km was closed to all activities in Tamandar, Brazil. A survey comparing this MPA and a similar open fishing area nearby indicated a rapid increase in fish abundance in the MPA. While there were no previous surveys to compare, some clear changes were detected. These included fish behavior and the occurrence of species that had been rarely seen in the preceding years.

Integration of fishing and tourism is a management alternative through zoning that incorporates one or both activities. Recent proposals for tourism development along the coast will lead to even greater changes. With the use of MPAs and other best management practices, loss of the fishing practices and fish abundance, which will in turn affect tourism, may be avoided. The situation is urgent. A strong emphasis must be placed on zoning and other measures to protect this area.

For further information, contact Beatrice Padovani Ferreira or Mauro Maida, Departamento de Oceanografia, Universidade Federal de Pernambuco, Recife - PE -Brasil, CEP 50739-540. Tel: 55 81 6761355. Fax: 55 81 6761437. E-mail: beatrice@free.elogica.com.br

Tietze

(continued from page 11)

order to be successful, these measures need to be designed and implemented in close cooperation with fishers and fishery industry associations.

In order to safeguard the important economic and social role of the small-scale fisheries sector as the provider of employment, income, and food, particularly in rural areas of developing countries, special efforts are needed to protect small-scale fisheries sectors. The findings of the study suggest that the economic performance of this sector has already been negatively effected through overexploitation of coastal fisheries resources and competition by more catch efficient commercial fishing vessels such as purse seiners and trawlers.

For further information, contact Uwe Tietze, Fisheries Industry Office, FAO Fisheries Department, Viale delle Terme di Caracalla 00100, Rome, Italy. Tel: 396 57056451. Fax: 396 57055188. E-mail: Uwe.Tietze@fao.org

Food Security and Fisheries in India

By Eberhard Weber

When India became independent in 1947, the small-scale fishers belonged to the poorest sector of the population. At this time, fish was the cheapest source of protein. More than 50 years later, protein from fisheries products is the most expensive in India, but the fishers are still among the poorest sector of society. They did not benefit when fish became an expensive food item. In addition, as India has become a major exporter of marine products, fishers' livelihood became threatened. Outsiders entered the lucrative market, and for more than 40 years there has been a fierce fight between traditional fishers and fishing companies.

More than one million people work in India's fisheries sector. About 450,000 are active fishers, most of them working on traditional fishing boats, while the rest are fish vendors or working in fish processing plants. The fisheries sector has undergone many changes. The fish landings increased five-fold, and in 1998 India's share in the world's fish landings was about 4.2 percent, being about 2 percent of India's gross national product.

Fish landing near Kerala

The export of fishery products contributed about three to four percent to India's foreign exchange earnings. In the 1970s, India was the world's biggest producer of prawn.It has been overtaken over by China and Indonesia. Almost 90 percent of the export earnings from marine products are from prawns, lobsters, and cuttlefish being exported to Japan and the U.S.

Modernization of India's Fisheries

Since its independence, India's government has put much effort into modernizing the fishing sector. Modernization of the fisheries required a whole package of measures, starting from supplying the fishers with new vessels, constructing harbors and landing and repair facilities, and ensuring fuel for the fishing fleet. Another important change was the modernization of the fish processing and marketing infrastructure.

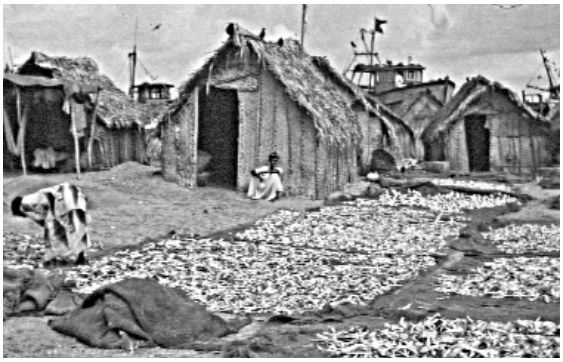
The first major fishery project after India's independence was the Indo-Norwegian Fisheries Project (INP) in Kerala. The objective was to improve food security of the poorer sector of society by strengthening fisheries and fish marketing. The project was to benefit the poor fishers by increasing their productivity, and to benefit Kerala's inland consumers by improved marketing of fresh marine products to the hinterland.

In the early 1960s, the modernization project was facing severe difficulties. Efforts to equip the existing fishing boats with outboard engines failed miserably. Also, fishing vessels that could be operated from beaches, thus not needing harbor facilities (beach-landing craft), were not accepted by the local fishers. This resulted in the development of mechanized fishing vessels that relied on natural harbors found throughout Kerala. The attempt to supply cheaper fish to those inland failed totally. This was because the increasing costs to fish (energy, processing, preserving, and transporting) increased the price of fish and made it unaffordable for many consumers.

In order to catch fish that could be sold at much higher prices in the foreign market (pomfret and tuna instead of sardines and mackerel), additional major changes were made in the industry. World market prices for these high-priced fish and prawns were on the rise during the 1960s and significant effort was given to their catch and export. This new strategy benefited the Indian government by bring in badly needed foreign exchange at a time when India was facing a severe imbalance of payment.

By the end of the 1960s, more than 1,200 trawler boats were operating in Kerala, almost all catching prawn. Already the majority of the boats belonged to large fishing houses. This was the beginning of a new class of entrepreneurs who were interested only in maximizing profits in the shortest time possible, with no consideration to food security of the poorer consumers, the livelihood security of artisanal fishers or the environmental sustainability of the resource.

There are huge differences between this modernized fishing sector and the traditional small-scale fishers. The traditional fishers are highly immobile, both in spatial as well as in occupational terms, and for generations they have depended on the resources they are exploiting for their livelyhood. In addition, they do not have any other place to go or any other work to do. This is very different than the big fishing entrepreneurs; they are mobile and their main interest is to totally exploit the



Fish drying for market in India

resources. The more they exploit the resource, the higher their profit. When the resources are depleted, they can easily shift their attention to fisheries elsewhere or shift to an entirely different activity.

What started as an effort to increase protein supply for local consumers ended up in benefiting big business houses that sold to the international market, and helping India's government by gaining foreign exchange. The problems increased when some of the modern fishing vessels started to fish species caught by artisanal fishers. Sardines, anchovies, and mackerels were considered to be the poor man's fish, but caught in volume by modern vessels were quite profitable when sold to produce chicken feed.

Today the atmosphere in many coastal areas is highly explosive. Violent conflicts occur daily and lives are lost. John Kurien, the vice chair of the Advisory Committee on Fisheries Research in India, noted, "I don't see this as a law and order problem, but a consequence of failing to address development issues. If we don't put a check to this the situation is bound to explode. In Kerala, everybody is tense. The fishers, the administrators, the politicians are tense. But nobody wants to get together and address the issue—it is so highly political."

Fishing practices today use some of the most damaging equipment. The bottom-trawl net is a plow, destroying the seafloor and its habitat. The mash size of the trawl net is small enough that juvenile fish and prawns are caught, thus effecting the species' reproduction ability. In addition, a large percent of the fish caught are not economically important and are discarded as waste. In the Bay of Bengal, this by-catch constitutes as much as 85-95 percent of the catch that could instead be consumed by the poor. For these reasons, many developed countries ban bottom trawling many years ago. Another harmful yet profitable fishing practice is to fish for prawn during the monsoon season when they come close to the shore to breed. Fishing during the monsoon season depletes the juvenile population, thus destroying the future stock.

Today, more than 50 years after modernization started in Kerala, the fishers are among the poorest sector of Kerala's society. More than 80 percent live below the poverty line, meaning they don't even have a balanced and sufficient diet. In 1956 a person lived on about 14.5 kg a year. In 1992 this has dropped to 8.4 kg. In 1953 fish was among the cheapest food items in Kerala. By the mid 1990s, it was the most expensive. In 1956 almost 50 percent of sardines caught were marketed locally. By the late 1990, this figure had fallen to less than 25 percent.

Johan Galtung, a prominent social scientist working on peace and conflict research for over 40 years, summarizes his experience with the Indo-Norwegian Project in Kerala, "My evaluation is that it is a scandal, and not a partial scandal but a total scandal…the INP project failed in four ways: less protein became available to the population, the level of living of the fishers decreased, partly violent conflict between the traditional and modern sectors emerged, and depletion of the raw material, particularly the shrimps, set in. Still, however, the project was a success in the sense of being a major source of foreign currency."

For further information, contact Eberhard Weber, School of Social and Economic Development, Geography Department, University of the South Pacific, Suva, Fiji Islands. Tel: 679-212620. Fax: 679-301487. E-mail: weber_e@usp.ac.fj. Website: http://www.usp.ac.fj/geography

Sharks: Their Role in the Human/Marine Species Interaction

By Vincent Gallucci

Among the fishes, sharks are unique in several different categories. These include their skeletons and sensory organs, their methods of reproduction, and their ecosystem niches, especially their feeding and migratory patterns. In one way or another, each of these categories has some role in the sharks' current biological status, and the likelihood of them being a reasonable candidate to support a sustainable fishery for human communities. For the purposes of this article, 'sharks' is a generic term meaning a group of similar fishes: sharks, rays, and skates.

Shark fishers, top predator

Sharks are fish that are located at the top of the food chain. They are excellent predators, feeding adaptively on other fish, and sometimes smaller sharks of their own and other species. Being at the top of the food chain generally implies fewer numbers of animals and a susceptibility to changes in their food base. These animals are known, as a group, to have extended migratory routes and the ability to follow local environmental changes such as oceanic current changes under El Niño conditions. An implication of their migratory flexibility is that sharks occupy a wide range of oceanic and coastal niches, often at different times of the year or lives. This flexibility accounts for the high species diversity in tropical environments and their extension to niches in polar regions. These observations suggest a group of species with the ability to adapt to ecosystem change and natural selection. Despite their adaptability, the question of how they will react to not being at the top of the food chain, but instead being heavily hunted, remains unanswered. Will the species as a group be able to compensate for the increased harvests by changes in their life histories?

The reproductive patterns employed by sharks are also diverse but, as a group, can be categorized as involving high parental care and low reproductive rate. It is unknown whether shark species will be able to adapt to the decreased density of smaller fish due to increased fishing mortality by humans.

A major reason that sharks are considered a different type of fish is that they do not have bones. Their entire skeleton is constructed from cartilage. Furthermore, the sensory organs of sharks are unbelievably complex and efficient. When these long-range sensory organs are combined with high migratory capability, it suggests that most species will live essentially solitary lives. While sharks are often observed milling around in clusters, this is likely associated with a local feeding source that has become available for a limited time. In terms of their exploitation by humans, their non-schooling behavior protects them from being harvested in large numbers as are tuna. But, their long-range ability to detect food makes them susceptible to chumming and other artificial types of lures.

A combination of the above three categories: migration, reproduction, and sensory sensitivity leads some species to use bays, estuaries, and coastal regions within 10 miles of shore as nursery areas for juveniles. The separation of mature and juvenile animals from each other reduces the juvenile mortality. Though this also raises juvenile mortality from humans who focus on large numbers of juveniles clustered in smaller areas. At the moment, the impacts of the removal of large numbers of pre-reproductive (juvenile) animals will have on the whole population is unknown. From the viewpoint of fisheries in developing countries, the already observed decreases in the number of juveniles available for harvest is a source of concern.

The last category of interest is shark skeletons, skin, and organs, and their growth rate. Two decades ago shark meat was low on the list of desirability in most fish markets, but in the last decade has become desirable. Reasons include decreasing supply to the established shark markets, decreasing abundance of other fish in the primary and sec-

ondary categories, increasing desirability as a delicacy (European, and U.S. markets), and some sharks are valued either for shark fin soup or as an aphrodisiac (primarily in Asian markets). The increase in the number of markets makes the animal one worthy of targeting by fishers everywhere. Another factor is that sharks are extremely slow growers and reach sexual maturity at any age between 12 to 70 years.

Worldwide, and more locally in Central America, food security based on shark captures alone is an unlikely situation in general. Food security based on shark captures as a part of the management of a general marine fishery is an attainable goal, within bounds. Fisheries management is usually partitioned into the parts dealing with human institutions and their policies, and those concerned with stock assessment. The best predictive models of shark populations are quite similar to those used for marine mammal populations. The analogy is a useful one to keep in mind since the biology and ecosystem role of sharks are more closely related to mammals than to most fishes.

Annual worldwide shark, skate, and ray catches reached 800,000 metric tons (about 2 billion pounds) in year 2000. Their captures occur as a result of:

- Being targeted by artisanal fisheries in developing countries
- Being targeted by small, semi-industrial fisheries in both developed and developing countries in coastal environments from tropical to temperate waters
- Being taken as incidental catch in larger, industrialized fisheries where tuna, swordfish, or related species are targeted

While the distinction between targeted-catch and by-catch is often made, there is evidence that many fisheries target sharks during the part of the year when the tuna or swordfish are not available.

Nicaragua and Costa Rica were the two Central American countries that first sustained commercial shark harvests for both export and domestic markets. The pattern spread to other Central American countries as supplies to the traditional domestic fisheries on snappers, croakers, etc., were strained, and as supplies to the export market on shrimp were also strained.

The different countries have different utilization rates of the various shark parts. These parts are categorized as fresh meat, dry meat, salted meat, fresh fin, dry fin, cartilage, liver oil, jaws, and skin. Depending on the category, nearly 100 percent could be for export, while others will be retained for domestic consumption. The point here is that the value of the meat and fin markets probably approaches US$100 million and is growing. From 1987 to 1997, the fin market in Costa Rica alone increased by 236 percent. In Central America, the removal of the income from the shark catches would be sorely felt by the fishers, the owners of the large corporations, and the national treasuries via taxes. It cannot be denied that these human needs must be considered when shark species' conservation needs are considered.

The point of the statistics on catch is not only the big numbers. The point being made is these catches are distributed over ages that range from juvenile, and thus will never become reproductive, and large, old sharks that took decades to become reproductive. In other words, by definition, a sustainable fishery for any species is based upon the premise that the harvested biomass removed is balanced by the biomass added from natural reproduction. While no conclusive statistical evidence exists, it appears that too much of the harvest today comes from the mature segment of the population, thus shrinking the source from which juveniles are added to compensate for the removals (delayed by the 12 to 70 years to become reproductive). Also, the removal from the juvenile stock by artisanal fisheries actually removes some fraction of the juveniles that did result from natural reproduction. Thus, most stock assessment models assume that only 'surplus production' is being harvested, thus allowing an equilibrium or sustainable harvest to develop. However, current and predicted shark harvests appear to be contributing to the likelihood of future stock failures. In agricultural terms, these harvests are analogous to consuming the seeds this year for next year's wheat crop.

In summary, the statistics provided for Central American shark fisheries do nothing more than indicate that similar data would be needed for the fishing activities in South America, Southeast Asia, Africa, and many other locations around the globe. The future is dire for both the shark species and the human dependencies that have build up around the associated market places for shark products.

For further information, contact Vincent F. Gallucci, School of Aquatic and Fisheries Sciences, Box 355020, University of Washington, Seattle, Washington 98195 USA. Tel: 206-543-1701. E-mail: vgallucc@u.washington.edu

Miskito Coast Reserve and the Lobster Artisanal Fishery

By Jose A. Robleto

The Miskito coast lowland is almost 1,000 km long and in places is 150 km wide. It is one of the more extensive coastal plains in lower Central America. In general, the entire Caribbean coast of Nicaragua is drained by rivers. The Miskito coast is well east of the Maya region and cuts across a number of tribal and language groups in Honduras and Nicaragua.

After the 16th century, Miskito tribes were composed of a mixture of linguistic groups. The Miskito Nation has survived almost 500 years of attempts by foreign states to seize and annex its territory and resources.

During the 1980s, autonomy increasingly became accepted as a solution to the war between the Sandinistas and the Miskito, Sumo, and Rama nations that make up the collective territory of Yapti Tasba. Miskitos wanted autonomy based on indigenous political and economic self-determination, control of resources, and sea and land territory. On the other hand, the Sandinistas proposed a Nicaraguan constitutional Autonomy Law (approved in September 1987) that contributed to decentralization of some political power and tied resource exploitation decisions to a trilateral agreement between local communities, autonomous governments, and the central government.

Coastal fish market in Senegal (photo by Lamarr Trott)

Despite the fact that the Miskitos won their war against the Sandinistas, they did not view the Autonomy Law as a victory. They felt this has become a barrier to effective indigenous territorial control, due to its contradictions. Though the two governments after the Sandinistas have accepted autonomy as a principle, overall autonomy is seen as a barrier to exploiting much-needed natural resources that would benefit the reconstruction and economic recovery of the non-indigenous west coast.

Natural Heritage

Nicaragua has a very rich natural heritage. A proof is the existence of a very highly productive coastal system located on the Miskito coast (the Northeast Atlantic region). This is due to a wide, shallow continental shelf and a series of coastal lagoons that provide coral, seagrass, and mangrove habitats.

The Miskito Cays are a series of mangrove islands along the broad continental shelf off the northwest coast of Nicaragua. This shallow-water region has extensive seagrass beds, fringing coral reefs, and mud banks dotted with mangroves. This area also is home of the Caribbean spiny lobster.

In 1991 the central government established the Miskito Coast Marine Reserve, a 20 km wide coastal strip from the Honduran border to Wounta, and a 25 km radius circle around the Miskito Cays. The Miskito Coast Marine Reserve was established to protect these systems, while allowing their utilization for limited fishery production.

The communities in the Miskito Coast Marine Reserve are almost entirely dependent upon the harvests of the natural resources found in the reserve, such as green turtle, shrimp, and lobsters. From quick assessments conducted in the past, it has been found that the resources are adequate to support the 38 communities, but because of the nation's economic development, there has been increasing pressure on the existing resources. In addition, pressures are increased by the increasing human population.

Lobster Fishery

The Miskito Cays Marine Reserve is a relatively pristine mangrove/coral reef ecosystem and an ideal habitat for Caribbean spiny lobsters, *Panulirus argus*. Nicaraguan fishers fish for lobsters in the Miskito Cays using both slat traps called *nasas* and divers armed with long, hooked spears. According to the Center for Fishery and Aquatic Research (CIPA), it seems that in the Miskito Cays, lobsters are harvested more through diving than with *nasas*. For many years, fishers from nearby countries have come to fish illegally in this productive group of islands.

Although the lobster fishery exceeds the shrimp fishery in volume (pounds harvested), in terms of economic return, lobsters are still the most important fishery in the Miskito Cays region. Statistics from the National Fishery Administration (ADPESCA) show that in 1999 the artisanal sector harvested 1.5 million pounds of tails (46 percent of the total capture reported for the Caribbean) which represents in economic terms about US$19 million.

Despite these numbers, the Miskito coast region is still poor, undeveloped, and a huge portion of its inhabitants are jobless. The national government benefits from most of the richness produced in the region, and a very small percent of the economic production stays in the region. Unfortunately, because of political interests, the people are not benefiting from their own resources; on the contrary, they are contributing to the nation's extreme poverty.

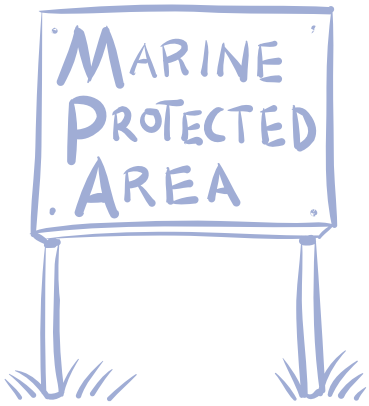
Unfortunately, in the last five years, neither the central nor regional governments have done much to maintain a healthy ecosystems (ocean and lagoon). There has been little thought given to maintaining or increasing the standards of living in the communities on a long-term, sustainable basis. The only way for this to happen is to implement an integrated coastal area management program. The sustainable development concept commonly strives to maintain or restore a balance between the natural and human environments without any agreement on spatial or temporal benchmarks. It is impossible to freeze the biosphere in its present state for future generations or restore equilibrium of the past. Changes in population density and distribution, and national and local economies are adversely contributing to the evolution of the area. As a result, the myth of equilibrium is replaced by variability, uncertainty, precaution, and irreversibility.

What the region needs is to develop a means of management that balances, in time and space, the interactions between economic, ecologic, social, and natural variability, thus allowing the ecosystem and development to exist side by side.

Maintaining an ecosystem includes a plurality of factors between resources and uses. The issue is therefore a matter of coordination between the many possible uses and those who want to use them.

The Miskito Cays Marine Reserve has the potential to be a model of marine fisheries management that achieves this by balancing the demands of environmental protection, resource utilization, and economic prosperity.

For further information, contact Jose A. Robleto, Environmental Consultant & Associated, Thomas More University, Managua, Nicaragua. E-mail: jrobleto@usa.net



Ward and Brainerd
(continued from page 13)
develops short-run capacity estimates has found similar results for those fisheries that have been analyzed using capacity estimation techniques based on data envelopment analysis.

Future Capacity Activities

The process is far from complete. Once estimated, these must be thoroughly reviewed before determinations of what constitutes a level of excess capacity can be made for U.S. fisheries. Excess capacity in open access fisheries is really a long-run phenomenon, and short-run capacity measures may not accurately represent the capacity level for fishery management purposes. In addition, the Fishery Management Councils need to decide upon an appropriate course of action to reduce or eliminate excess capacity levels in federally managed fisheries. While accurate capacity metrics will aid fishery managers in determining if their management actions are successful, they will not in and of themselves provide solutions to the management problem. What is needed is to develop a program that will change our fishery management institutions from one that presently causes fishers to overinvest in capital and labor that depletes our living marine resources to one that encourages fishers to conserve all the resources used in the recreational and commercial harvest of fish.

For further information, contact John M. Ward, NMFS/Office of Science and Technology, HQTR, Route: F/ST1, Bldg: SSMC3, 1315 East-West Highway, Silver Springs, Maryland 20910-3282 USA. Tel: 301 713-2328. Fax: 301 713-4137. E-mail: john.ward@noaa.gov

Colburn
(continued from page 1)
national or regional conditions do not necessarily apply to all people, this article will emphasize the mechanisms through which food security is achieved at the household and individual level (micro-level). However, food security at these most basic and elementary levels still needs to be understood in the larger context of macro-level considerations. These will be considered first.

Macro-level food security tends to arise as a policy consideration in national- and international-level discourse discussed in terms of political economy. The World Food Program of the United Nations, The World Bank, FAO, and the World Health Organization are examples of organizations involved in developing policies and implementing programs. Food security at this level tends to be dependent on, but is not limited to, international (i.e., political alliances, trade relationships, debt ratios) and national (political and economic stability, natural resource base, degree of market to subsistence economy, infrastructure, health) level concerns. How well a country is able to either produce or procure sufficient food to feed its people is of primary consideration. The reasons why some countries are more successful than others at insuring adequate food availability vary widely (political instability such as war, climatic conditions such as flooding and drought, lack of natural resources, insufficient financial resources). In addition to international disparities, in-country regional variations in ecosystems and climate may result in some regions producing a food surplus exported to other regions, while some regions may experience a food production deficit, relying on inter-regional and international imports. Macro-level analysis includes local and community assessment. At the local level in coastal areas, food security may be dependent on the availability of marine (fish, shellfish, mangroves, sea grass, coral reef) and agricultural resources (soil conditions, climate) and the richness and fragility of these resources. For cash-based communities, access to food commodities is also a consideration.

In coastal states, fishing and aquaculture may contribute to food security by increasing locally available food supply. This is particularly important at times when there may be a reduction in the availability or scarcity of other foods. Fish (including vertebrates and invertebrates) as a source of food has the potential to provide a significant portion of animal protein. This is particularly true for small island nations and countries with a significant coastline where often greater than 50 percent of the animal protein consumed is from fish and marine resources. Further, the continuity of local-level food supply is enhanced by capture fisheries and fish culture production. Fish surplus that is cured and stored can bridge significant gaps in food availability between planting and harvest seasons. Fish and other marine resources are a source of income in many poorer communities where they are consumed and traded. Through the trade of fish, both fishers and aquaculturists contribute to their own personal household food security and also to consumer households not involved in trading fish. Implementation of national food security policies at the local level may overlook important cultural behaviors and patterns that affect the food security of individuals.

The micro-level of analysis considers factors that contribute to food security in households and individuals. Here we see most dramatically

Figure 1

Macro and Micro-Level Food Security Considerations

MACR-LEVEL CONSIDERATIONS: **Political Economy**

International
- * Political alliances (inter-country conflict)
- * Trade relationships
  - * Balance of trade
  - * Debt ratio

National
- * Political stability (civil conflict)
- * Economic stability
- * Natural resource base (land and marine)
- * Degree of market vs. subsistence economy
- * Infrastructure (roads and ports)
- * Communications
- * Health
  - * Nutrition
  - * Morbidity and mortality
    - * (AIDS, diarrhea, upper respiratory infection)

Regional
- * Ecosystem differences
  - * Coastal (estuary, mangrove, sandy beaches, coral reefs)
  - * Others (desert, rainforest, plains, mountain)
- * Climatic differences
  - * Rainfall, drought, flooding, temperature

Local
- * Marine resource utilization
  - * Richness and fragility of marine and/or agricultural resources
    - * Fin fish, shell fish, mangroves
- * Reliance on marine resources as part of total and total animal protein
- * Agricultural resource utilization
- * Local government

MICRO-LEVEL CONSIDERATIONS: **Cultural Mechanisms at Work**

Household
- * Household resource base
  - * Food production (subsistence vs. market economy)
    - * Marine, agricultural, animal husbandry, other wage labor
  - * Social networks
    - * Labor resource pool
      - * Family and friends
  - * Knowledge and education
    - *Traditional and formal
- * Household decisions
  - * Male or female headed household
  - * Acquisitions and allocative priorities
    - * Food, health care choices, ceremonies, and child care

Individual
- * Valuation and relative prestige of each household members
  - * Male or female, elderly, children, pregnant or lactating
- * Per person receipt of resource benefits (food)
  - * Personal preferences on the part of the allocator or receiver
- * Beliefs (taboos) that may restrict the consumption of some resources

the impact of cultural mechanisms that can be overlooked in a macro-level analysis. The resource base of a household (food production capability, social networks, and knowledge and education) is highly influential in determining the extent to which a household can successfully produce or procure an adequate food supply to meet the energy needs all members through the exploitation of marine resources, agriculture, animal husbandry, and wage labor. While a simple analysis of the food available to a household is important for evaluating coastal communities, it may not be enough to explain or predict the nutritional outcomes (a measure of the sufficiency of diet) of individuals. There are two additional factors to consider: the interactions between households and the actions of individuals within a household. Further, individuals may themselves respond to food availability differently based on cultural norms and individual preferences regarding food (prestige, taboos, illness, and pregnancy).

Social networks are often an overlooked household resource. Having a group of people outside one's household to rely upon to meet the labor needs of households at peak periods of need (preparation of fish or shrimp for market, or agricultural planting and harvest) may be an important determinant of the ability of some households to meet their food supply needs. Those without ready networks of kin and friends may be at a disadvantage for meeting such needs. The degree of inter-relatedness with other households (i.e., family and friends) may be viewed as an important household resource. People who participate in social networks provide valued labor at peak times and may be the means through which scarce resources can be obtained during deficit periods. Generally, networks are ideally comprised of at least some kin. Those households without kin connections (new immigrants) may be at a distinct disadvantage. Knowledge and education (traditional or formal) are important resources to the others in one's kin network and may be an indicator of the ability of people to maximally obtain what they need during periods of shortfall.

Decisions within a household (often gender specific) as to whom within and outside the household receive a share of the food and other resources available may vary greatly depending on cultural beliefs about the relative importance of expected outcome. Female heads of household tend to be responsible for making decisions regarding food acquisition and preparation, and what foods will be served to whom. Male heads of household tend to make decisions regarding capital purchases. That is, an increase of one kilo of fish may not directly translate to an equivalent level of calories entering the household, as a portion of that kilo may customarily be reserved for some other purpose (shared with someone from their social network). Also, fish may be sold to generate money that will be used to buy processed (often less nutritious) foods.

The allocation of food to individuals within the household may depend on the relative status or prestige of individual household members. Differences in food distribution may be determined by sex (men tend to get the choicest pieces of food), age (the elderly and infants may be served first), and health of household members (pregnant and lactating women) may be given special foods. Cultural practices and beliefs can be influential in guiding food allocation. In many cases, the person who serves food has primary influence on how food is allocated. Simply because a natural resource such as fish or other foods collected from coastal areas may exist, does not guarantee that it will be consumed. Culturally-based dietary taboos for some fish species may prevent them from being used for personal consumption. The same fish may instead be sold in the marketplace to generate cash.

While the person responsible for allocating food may make decisions that discriminate between individuals within a household, household members may have their own discriminatory preferences regarding what foods they can consume. Individual taboos and preferences may vary from those observed by the majority of household members. Such preferences can influence consumption. Some foods that may be available in abundance may be considered taboo, therefore restricting its consumption to only those who do not believe it is taboo.

The individual well being of household members is the product of both macro- and micro-level factors described here. Individual-level food security can be affected by one or more factors at the macro level that are outside the direct control of individuals. Micro-level considerations are dependent on the decisions made by key individuals within households. While it is clear that the political economy influences macro-level food security considerations, the cultural mechanisms that influence micro-level food security considerations must be evaluated to insure the maximum success of programs focused on insuring or improving local-level food security.

For further information, contact Lisa Colburn, Coastal Vision, 215 Eustis Avenue, Newport, Rhode Island, 02840 USA. Tel: 401-849-8118. E-mail: lcolburn@etal.uri.edu or l.colburn@worldnet.att.net

Three Community-Based Marine Protected Areas Successfully Designated in Indonesia

Blongko Marine Sanctuary after Two Years

Community-based marine sanctuaries in the Philippines and South Pacific have proven to be effective in conserving coral reef ecosystems, increasing fish biomass within sanctuaries and increasing fish production in adjacent areas to these permanently closed areas. Efforts have been underway in North Sulawesi since 1997 to adapt this approach to the Indonesian context, *Proyek Pesisir* (Indonesian Coastsl Management Program) has been pioneering the establishment of community-based marine sanctuaries in several villages.

The Blongko marine sanctuary was approved by the community and then formalized through an official village ordinance signed by the head of village and the district head in November 1998. In October 1999, a coastal resources management and marine sanctuary management plan was approved by the village of Blongko. A management program has been formally adopted by the village.

As a result, there have been a number of quality of life changes for the village community. These include improved drinking water supply, sanitation improvements, improved understanding of coastal management issues and their consequences, among others.

In the sanctuary, signboards with the rules of the marine sanctuary have been installed in the village. Marker buoys have been deployed and the community itself is undertaking surveillance and enforcement activities. Several instances occurred where village residents have been punished for violating the sanctuary and where outside

(Continued facing page)

Talise Marine Sanctuary is Inaugurated

Inspired by the success of the Blongko Marine Sanctuary established in 1998, the community of Talise, hand-in-hand with local government, worked to establish their own marine sanctuary. On August 25, 2000 the community, local government, and the Regency of Minahasa inaugurated the Marine Sanctuary.

Assisted by *Proyek Pesisir*, the process of establishing and implementing a community-based marine sanctuary in Talise started in 1997. Many steps were taken in the establishment of the Talise Marine Sanctuary, such as socialization of the community-based marine sanctuary concept in village meetings, cross-visits to Blongko village, public education, and training in coral reef monitoring.

Proyek Pesisir facilitated the process of establishing the marine sanctuary by conducting meetings, coral reef monitoring training, cross visits, public education, seminars on environmental laws and provided the community with a legal consultant to help draft the ordinance.

For further information on marine sactuary development in Indonesia, contact J. Johnnes Tulungen, Field Program Manager, Proyek Pesisir (CRMP), North Sulawesi, Jl. W. Mongisidi 5, Manado 95115 Indonesia. Tel: 62 431 841671. Fax: 62 431 841673. E-mail: crmp@manado.wasantara.net.id or tulungen@manado.wasantara.net.id

Tumbak Marine Sanctuary

On November 15, 2000, Tumbak Marine Sanctuary was formalized through a village ordinance and inaugurated by the local government of North Sulawesi. Using similar processes of establishing community-based marine sanctuaries in Blongko and Talise villages, with the assistance of *Proyek Pesisir*, the community of Tumbak worked together with the local government to establish their own marine sanctuary. Tumbak is the third community-based marine sanctuary established in North Sulawesi.

The process of establishing community-based marine sanctuaries started in 1997, using identification, village profiles and management plan development. Supported by a local ordinance, the management plan, which called for development of marine sanctuaries, was launched in 1999. Marine sanctuary development, as stated in the management plan, was aimed at protecting the marine resources and to provide for the local communities in terms of benefits from fish production and ecotourism. The subsequent steps in the development of the management plan were socialization of the community-based marine sanctuary concept in village meetings, cross-visits to Blongko village, public education, and training in coral monitoring.

After much discussion, the activities prohibited or allowed in the sanctuary were decided. The next challenge for the community is enforcement.

Blongko Marine Sanctuary

(Continued from previous page)

fishers have been prevented from bomb fishing in the sanctuary. Local fishers have reported that they believe fish abundance in and around the sanctuary is increasing.

Preliminary results of a recent study show an increase in coral cover of approximately 20 percent inside the sanctuary since it was established. These preliminary results suggest the community-based marine sanctuary in Blongko is being effectively protected. It tends to confirm community-based marine sanctuaries can be an effective means of coral reef conservation in Indonesia.

Sign showing the location of the Blongko Marine Sanctuary

Western Indian Ocean Region Meets on MPAs

The Coastal Zone Management Centre of the Netherlands and the Institute of Marine Sciences of the University of Dar es Salaam organized a regional meeting of a Reference/Working Group on marine protected areas (MPAs) in the region to coordinate and facilitate implementation of activities geared towards improving the management of MPAs in the region. Regional experts and representatives of regional and international organizations attended the meeting. These included: The World Conservation Union-East Africa Regional Office (IUCN-EARO), Worldwide Fund for Nature (WWF), Secretariat for Eastern African Coastal Area Management (SEACAM), Kenya Wildlife Service (KWS), National Environment Management Council (NEMC) and Western Indian Ocean Marine Science Association (WIOMSA). A representative of the University of Queensland, Australia, also attended.

The meeting resulted in the establishment of the Group of Experts for Marine Protected Areas in Eastern Africa (GEMPA-EA). The broad goal of the GEMPA is to build a constituency for MPAs in the region and to provide a forum for linkages and dialogue between MPA practitioners and experts and between governmental and nongovernmental organizations.

More specifically, GEMPA aims at coordinating and facilitating implementation of activities geared towards improving the management of MPAs in the region. The terms of reference of the group are:

- To provide and promote a coherent regional vision for MPAs within the context of environmentally sustainable development.
- To advocate and build a constituency for MPAs among formal and informal stakeholders including governments, management authorities, the private sector, coastal communities, and NGOs.
- To assist and facilitate linkages and dialogue between potential collaborators with the aim of maximizing synergies at all levels of MPA support and management, including the identification of needs and the coordination of activities such as capacity building and research.
- To provide and facilitate access to technical advice across all levels of MPA planning and management including: the monitoring and review of guidelines and codes of practice; development of methods and criteria for a consistent high level of management quality; and the harmonization of MPA technologies within the region consistent with global thinking.
- To encourage and facilitate the development of a regional network of MPA professionals and provide access to external networks for the sharing of experience, knowledge, and expertise.
- To provide advice on the development and implementation of MPA policies, legislation and institutional arrangements at all appropriate levels based on a sound technical platform.

The GEMPA-EA will be hosted initially by WIOMSA and UNED until WIOMSA or another relevant regional organization has the capacity to host and maintain it.

The GEMPA-EA core membership comprises of prominent experts whose selection is based on their strong regional knowledge and experience in MPA matters as well as a firm commitment for the group's activities.

In addition, organizations with a strong interest and involvement in MPAs will also be requested to nominate their representatives to the group from the roster of experts.

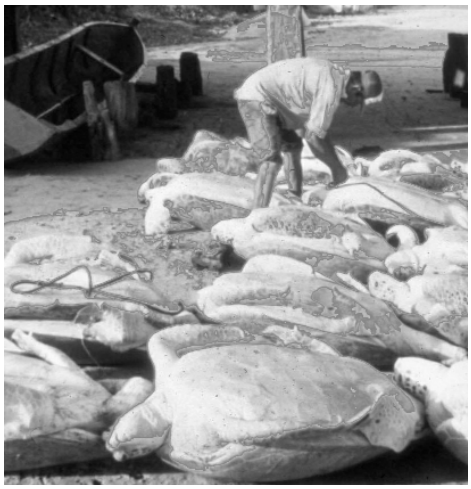
(Excerpted from the WIOMSA Newsbrief, September 2000, Vol. 5 No. 3)

For further information, contact Julius Francis, WIOMSA Secretariat, PO Box 3298, Tanzania. Tel: 255 24 2233852. Fax: 255 24 2233050. E-mail: wiomsa@zims.udsm.ac.tz. Website: www.wiomsa.or.tz

Trott
(continued from page 3)
generation in much of the developing world. A minimum of 15 million people are estimated to engage directly in fishing, and many millions more are employed in associated processing and manufacturing activities. In Southeast Asia and the South Pacific, there are an estimated four million fishers. There are more than a million fish farmers in Indonesia alone. In many countries, fisheries represent more than 25 percent of the employment in the agriculture/food production sector, and in some countries fishers earn significantly more than farmers.

In many countries, destructive fishing practices (dynamite and cyanide fishing) have developed from pressures to feed the family or produce at least limited income.

The economies of many nations are largely dependent on the presence or absence of social conflicts. Though probably not the rule, locations like the southern Red Sea and Caribbean Central America, where long-term wars have occupied the energies of Eritrea and Nicaragua potential, fish populations were able to increase. However, in the case of lobster harvesting in Nicaragua, there is still constant illegal fishing by Honduran fishers, sometimes resulting in armed conflicts.



Green turtle harvest,Caribbean Miskito Coast, Nicaragua (photo by Lamarr Trott)

Development Assistance

A prime culprit for the current state of depleted world fish stocks could actually be the effort to develop the fishery sector. Many assistance efforts by development banks and international donors focused on increasing harvests. It was only five years ago the U.S. Agency for International Development (USAID) changed its approach from increasing harvests to increasing sustainability. It is fair to say that the majority of assistance programs concentrate their efforts on aquaculture, rather than on building vessels and using more efficient gear.

The Future

Worldwide, demand for fish will continue to significantly exceed supply unless there is proper management to ensure sustainable yields from natural stocks. In concert, there must be efforts to reduce/eliminate environmental degradation and habitat destruction, as well as to develop and transfer technology to increase mariculture production. Although this is a worldwide problem, the impact of this deficit will be most seriously felt in developing countries where the loss of food and employment from fisheries-related activities could be catastrophic.

The bottom line is that the earth's population, already at 6 billion, will continue to increase. Pressures on coastal fisheries will continue to increase. Even with efforts to restore traditional fisheries, it is unlikely that wild stocks can increase much above their current level. Mariculture will continue to increase, both in numbers of species and level of harvest, but environmental effects will offset production by effects on natural stocks. It is likely that limited entry through limiting licenses and ownership of sub-tidal coastal areas will increase in developed countries. Land for aquaculture, for both marine and freshwater, will continue to increased, but with competing use demands. Only through development of intensive culture methods, after solving associated disease and feed issues, can higher levels of aquaculture production be expected. Frankly, most developing nations that have traditionally depended on fish and fishing can look forward to experiencing some level of desperation (already seen in the Philippines).

Currently, progress towards food security is likely to be limited to developed nations that have the means to make major investments toward this goal. Hopefully, in time, the techniques developed can be rapidly adapted to developing countries to quicken the pace of achieving sustainability, thus food security.

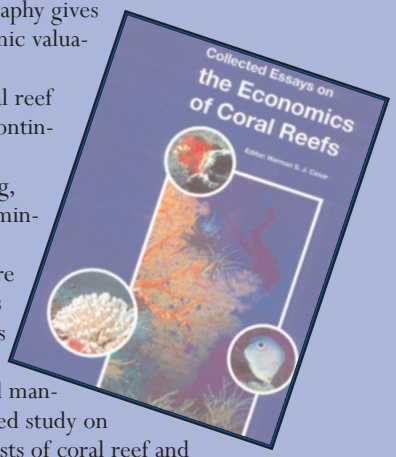
Lamarr B. Trott is the Deputy Director of the Office of Science and Technology of the U. S. National Marine Fisheries Service. He spent 14 years, until fairly recently, as the Senior Fisheries Advisor for the U. S. Agency for International Development. He previously built and directed the Marine Science Laboratory of the Chinese University of Hong Kong. He also operates a small plantation in Fiji, in the South Pacific.

Lamarr B. Trott, National Marine Fisheries Service, HQTR, Route F/ST, Bldg SSMC3, Room 12451, 1315 East-West Highway, Silver Spring, Maryland 20910-3282 USA. Tel: 301 713 2367. Fax: 301 713 1875. E-mail: Lamarr.Trott@noaa.gov

Collected Essays on the Economics of Coral Reefs

Edited by Herman Cesar

This is the first book completely devoted to economic analysis of coral reefs. It gives the state-of-the-art thinking on economic aspects of coral reef management. Through case studies, it gives examples of these aspects in relevant real-life circumstances. Intended for a wide audience, academic jargon is kept to a minimum. The 16 chapters are structured in four parts: methodology, threats, policy and management, and case studies. In addition, a detailed annotated bibliography gives an overview of the main publications on coral reef threats and stakeholder analyses, economic valuation as well as policy/management issues.



Methodology: Chapters 2 and 3 discuss the various functions, services and goods of coral reef ecosystems; the uses and economic valuation of these; and explain recent advances in the contingent valuation method.

Threats: Chapters 4 through 8 discuss El Niño revisited, the economics of cyanide fishing, costs and benefits associated with blast fishing, two case studies on the economics of coral mining, and the economic costs of the recent massive coral bleaching.

Policy and Management: Chapters 9 through 12 summarize the rapidly growing literature on the economic implications of fully-protected marine reserves; introduces the economics of coral reef restoration; describe policy options for combatting cyanide fishing; and discuss economic principles that can be applied to marine parks.

Case studies: Chapters 13 through 17 present a comparative study of socioeconomic and management issues related to coastal resources; present a summary of a large World Bank-funded study on ecological economic decision support modeling; present a case study of the benefits and costs of coral reef and wetland management; and describe the challenges of private-sector management of marine protected areas.

The book has been published through the CORDIO program with financial support from the Swedish International Development Co-operation Agency (Sida). The book brings together the experience gained over the last decade on economic aspects of coral reefs.

For further information on how to order, please contact Herman Cesar. E-mail: herman.cesar@ivm.vu.nl

Marine and Coastal Protected Areas

A Guide for Planners and Managers

By Rodney V. Salm and John R. Clark, with Erkki Siirila

Third Edition

There have been major advances in the last two decades on the challenges of sustainability of marine protected areas (MPAs) through innovative financing mechanisms, partnerships with private sector and non-governmental organizations, and collaborative management between government and coastal communities. These have brought new approaches for MPA establishment and management that are more participatory, involving communities through interaction and collaboration rather than prescription.

This book mainly addresses conservation in tropical coasts and seas. It is meant to compliment modern texts covering policy and design of MPAs by providing approaches and tools for application in field sites. The volume is arranged in three parts. Part I introduces MPAs as an important approach to managing coastal and marine resources. Part II considers principles and mechanisms for planning and managing protected areas in different environments. Part III presents case histories from around the world.

Available from: IUCN Publishing Service Unit, 219c Huntingdon Road, Cambridge CB3 0DL, UK. Tel: 1223 277894. Fax: 1223 277175. E-mail: info@books.iucn.org. Website: www.iucn.org/bookstore/index.html or IUCN Marine Programme, 1630 Connecticut Ave. NW, Washington, DC 20009 USA. Tel: 202 387 4826. Fax: 202 387 4823. E-mail: oceans@iucnus.org

InterCoast's Policy on References. *Upstream/Downstream: The Pacific Salmon's Story* by Syma A. Ebbin (Issue#36, p.13) was printed without the references originally appearing in the article when submitted to *InterCoast*. This reflects *InterCoast's* policy of limiting submissions to a short essay or summary on a given topic. The editor routinely edits submissions heavily and removes references. Such changes are commonly made without further consultation with the author.

InterCoast, Spring 2001, Issue #39

Across-Portfolio Learning for Enhancing Impacts of Integrated Coastal Management

The challenges of integrated coastal management (ICM) that are being addressed around the world are complex. To improve performance, practitioners and the donor community need information on the benefits of alternative frameworks and approaches to ICM. In order to achieve a better understanding about what strategies and practices of ICM planning and implementation are most effective, ICM must understand and address:

- Under investment in self-assessment, monitoring and evaluation
- Cause-and-effect relations of ICM
- Methods for mapping ICM strategies and outcomes
- Ways to measure objectives and intermediate and end outcome goals of ICM
- Ways to network for exchanging information and advancing strategies for donor-funded ICM

In response to these challenges, many projects in ICM have been experimenting with activities that promote learning across project portfolios and have constructed learning programs to harvest experience, capture lessons learned, and assess performance. These efforts recognize that effective practice in a maturing field requires the documentation and analysis of experience in order to better understand what works, what doesn't and why.

The next issue of *InterCoast* invites papers that describe:

- Experience in different approaches to learning
- Learning topics and why they were chosen
- What was learned and the impacts of learning

Articles on other coastal management issues are also welcome

Deadline is April 1, 2001

To contribute to *InterCoast*, please contact:
Noëlle F. Lewis
Coastal Resources Center, University of Rhode Island
Narragansett, Rhode Island 02882 USA
Tel: 401-874-6870
E-mail: noelle@gso.uri.edu

Coastal Resources Center
University of Rhode Island

Articles are 1,000-1,700 words. Photos are strongly encouraged. Articles are edited; please do not include references.

Coastal Resources Center
University of Rhode Island
Narragansett Bay Campus
Narragansett, RI 02882 USA

Address service requested

Printed on recycled paper