FISH for the PEOPLE

A Special Publication for the Promotion of Sustainable Fisheries for Food Security in the ASEAN Region

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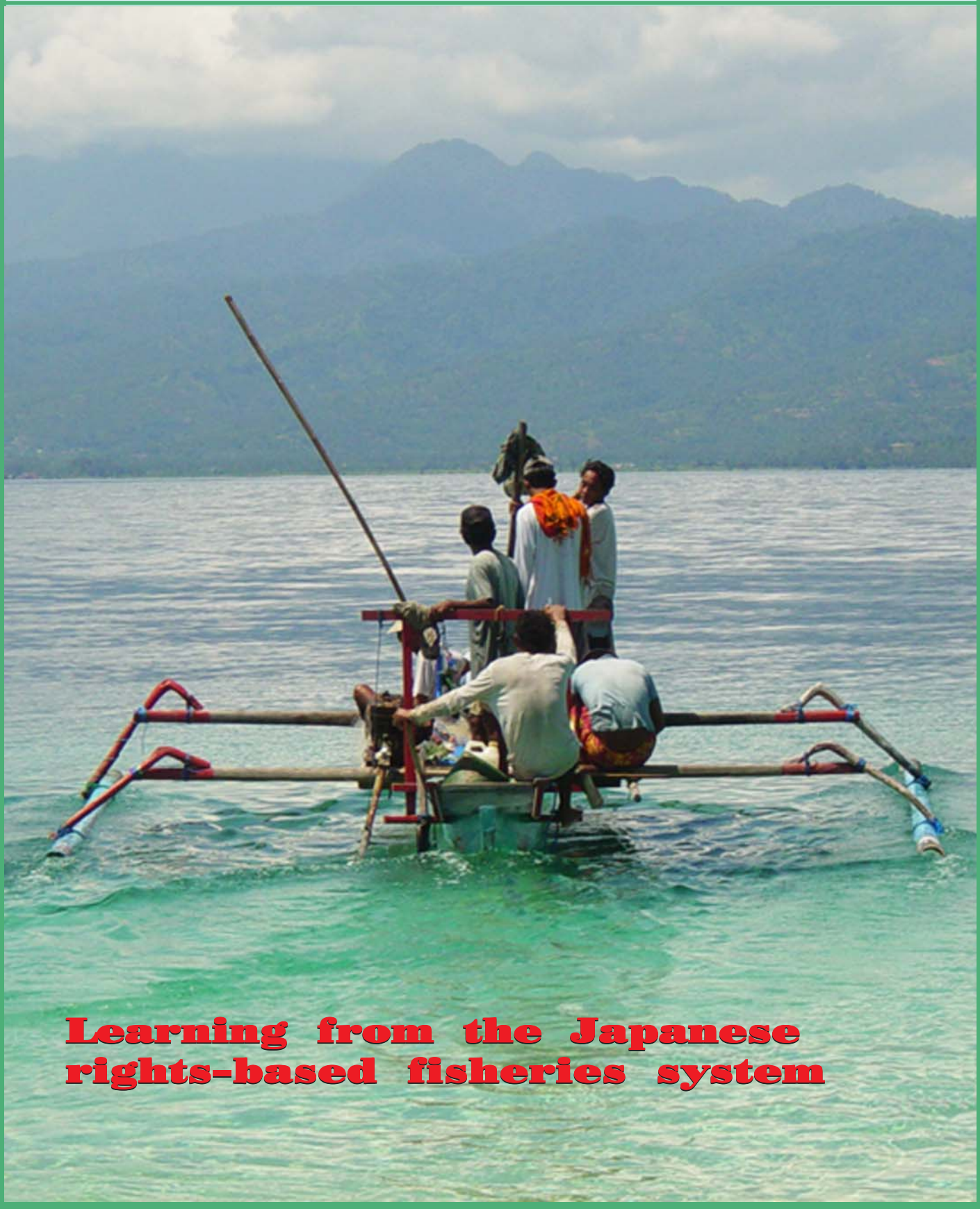

Learning from the Japanese rights-based fisheries system

Southeast Asian Fisheries Development Center

EDITORIAL

Are deaths and devastation unavoidable consequences of tsunamis and typhoons? The 2004 Indian Ocean tsunami left more than 250,000 dead and millions more homeless in a dozen countries mainly in Southeast and South Asia. But the Indonesian island of Simeuleu located some 50 kilometres from the earthquake epicentre lost only a few villagers because their vast mangrove area dissipated the power of the waves and their past experience foretold of the impending disaster. In 1999, an area of mangroves also spared Nasi Island in Kendrapara district in Orissa, India, while elsewhere in the eastern coastal state a super-cyclone killed more than 10,000 people and damaged 3 million houses. Coral reefs encircling the Maldives played a similar protective role; less than a hundred deaths were reported from the December 2004 disaster.

Mangrove-beach forests and coral reefs are natural barriers that diminish the tremendous energy from waves generated by centennial tsunamis and annual typhoons – Nature's protection against Nature's fury. But puny, man-made structures like settlements, tourist resorts and shrimp/fish farms along the coastline are no match for the rampaging waters. We therefore need to restore our degraded mangroves and coral reefs and preserve the few healthy areas that remain. Such coastal rehabilitation will require a paradigm shift in how we view our shorelines, away from the romantic but vulnerable tropical paradise with coconut trees swaying in the breeze to the multi-species forests of pristine coastlines. Nature meant for the coconut palm to be only one among many beach forest species; we should take heed.

Most maritime countries have laws that require buffer zones/mangrove greenbelts and easement or setback or free zones of up to 300-500 meters from the high tide line. It is time to enforce these laws, for only a solid wall of trees can slow down a moving wall of water. Government agencies together with universities and research institutions can provide environmentally sound technologies for rehabilitation. Efforts should focus upon natural recruitment of the mangrove colonizers *Avicennia marina* and *Sonneratia alba* by restoring tidal hydrology or water flow. Only when seedling recruitment fails should planting be considered using the same seaward species *A. marina* and *S. alba*, not monocultures of the more sheltered *Rhizophora* species, so favoured by many rehabilitation projects. Neither should mangroves be planted on seagrass beds and mudflats that are unique habitats in themselves.

Small-scale fishermen in Indonesia (courtesy of Arif Satria)

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Tourist resorts and shrimp farms that bring substantial, short-term benefits but pay long-term costs should not be rebuilt in the same ecologically high-risk locations. More difficult to relocate are poor fishing communities pushed to the margins of the sea as for so long they have known no other home. Governments must provide these fisherfolk with secure housing sites close enough to the coastal greenbelt to ensure both their safety and access to fishing boats and fishing grounds. These initiatives are part of a wider integrated coastal zone management (ICZM) framework that coordinates the often conflicting needs of fisheries, aquaculture, forestry and tourism to ensure the sustainable use of coastal resources and conservation of critical habitats. ICZM success stories generally involve community participation, validating the role of local villagers as *de facto* managers of coastal resources, in cooperation with local government.

The value of coastal protection (and other ecological services like erosion and flood control, nutrient recycling, fish/shellfish nurseries, and wildlife habitats) provided by mangrove-beach forests is incalculable, as the horrific Indian Ocean scenario has shown. Mangroves and their associated ecosystems also yield important goods from fisheries (seaweeds, fish, crabs, prawns, and molluscs mainly for food) and forests (firewood, timber, dyes, fibres, honey, beverages and medicines). To these vital roles may be added a historical aspect — the premier Philippine city of Manila, or *Maynila*, owes its name to the mangrove species *Scyphiphora hydrophyllacea* locally called *nilad*, which grew profusely along Manila Bay in olden times. Many Southeast Asian coastal towns and villages are named after mangroves and their associates, reflecting the wide distribution and diversity of these plants in the past.

We humans cannot control the occurrence of typhoons and tsunamis, but we can mitigate the damage and devastation they cause. Let us start by rehabilitating coral reefs and planting greenbelts of mangroves in the intertidal zone and beach forests above the high tide level, aside from installing early tsunami warning systems. Such warning systems will surely save lives but not livelihoods and property. For our own survival, we must learn to coexist with mangroves at the water's edge and coral reefs beyond.

J.H. Primavera

Note: This is a revised version of an article published in The Philippine Star, 8 January 2005.

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FISH *for the* PEOPLE is a special publication produced by the Southeast Asian Fisheries Development Center (SEAFDEC) every four months as part of the ASEAN-SEAFDEC Special 5-year Program to promote sustainable fisheries for food security in the ASEAN region.

Learning from the Japanese Rights-based Fisheries System:
Managing our Small-scale Fisheries

by Yasuhisa Kato

Introduction

Following several enquiries from policy makers in the ASEAN Member Countries, interested in the fishery management system developed in Japan which is often reported as successful, a simplified Japanese rights-based fisheries system was discussed at the Regional Technical Consultation (RTC), "Toward Right-Based Management for Small Coastal Fisheries", Bangkok 23rd-26th Nov. 2004. The presented system had been slightly modified as to be easily understood and only present features relevant to the Southeast Asian region, considering the distinctiveness of the region and the coastal small scale fisheries in comparison with Japan. The purpose of such a discussion was not to introduce the Japanese system in Southeast Asia, but to use it as a basis to facilitate further reflection in seeking possible future regional directions on the subject.

It is obvious that the direct introduction to the region of a system developed in Japan that has evolved through a long time process, and based upon the specific culture, politics and history of Japan, is not possible. Putting all small-scale fisheries under a management system is still a relatively new concept in the region and, when existing, it is not likely to be applied. Such a system must be developed based upon diverse national policies, politics, culture and other specificities of the different ASEAN-SEAFDEC Member Countries. Considering that the introduction of fisheries management systems will imply some serious redistribution of wealth along the coast, the required process will need a careful consideration and a cautious approach is very necessary to avoid pitfalls.

"So far, there is little success in finding a working system that can be used as a basis for policy consideration and action, although many countries in the region have experience with their own approaches, and are learning from them."

Meanwhile, the policy makers of the respective ASEAN countries are struggling to find a way to proceed toward sustainable fisheries development and management for the small-scale sector that dominates regional fisheries. So far, there is little success in finding a working system that can be used as a basis for policy consideration and action, although many countries in the region have experience with their own approaches, and are learning from them. It is under these circumstances that there was a widespread request for learning from the Japanese system, which is regularly reported as successful, at least in comparison to others.

Why develop an appropriate national management system for coastal small-scale fisheries?

One may ask that fundamental question and deem that the issue of small- scale fisheries management can be treated in a more relaxed manner with no immediate agenda, since the sub-sector is characterized with pervasive poverty and having its own distinctive socio-economic values. Fisheries management through government involvement is mostly, if not always, considered with strong negative connotations, most stakeholders generally having a short-term perspective on fishing. If such interventions are so harsh, it is often accepted that they should not be applied to the people having such a small-sized livelihood, livelihoods that barely ensure the simplest subsistence level.

"Fisheries management through government involvement is mostly, if not always, considered with strong negative connotations, most stakeholders generally having a short-term perspective on fishing."

It indeed looks like generosity toward an impoverished part of the society, but in the long term, such public attitudes and the accompanying government neglect of the sub-sector will result in the collapse of most coastal fisheries. Considering the declining trends of fisheries resources in coastal waters throughout the region, a lack of an appropriate management system and support will actually drive the small scale fishers into an even more miserable situation. Inaction in managing small-scale coastal fisheries now is at the antipode of generosity as it will result in the destruction of livelihoods of the very people we are willing and trying to support.

It should be noted and more often recognized that systematic and properly provided management interventions would actually have many positive effects on small-scale fishermen's livelihoods, and not only on a long-term basis.

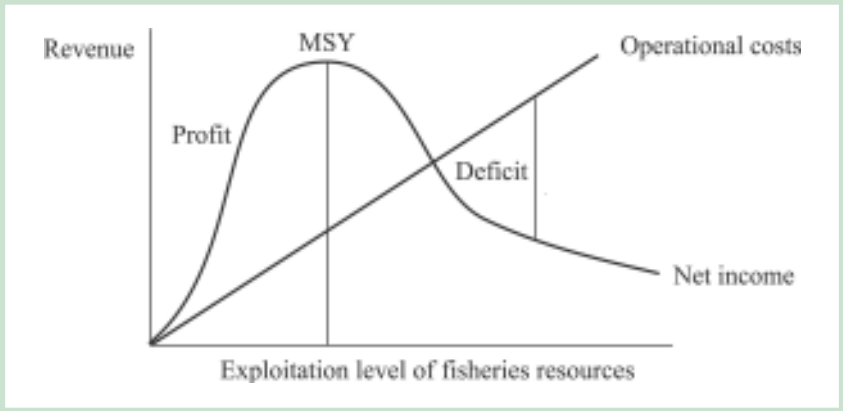
"Inaction in managing small-scale coastal fisheries now is at the antipode of generosity as it will result in the destruction of livelihoods of the very people we are willing and trying to support."

The diagrams on the next page show the exploitation pattern of the fisheries resources both for industrial and small-scale fisheries.

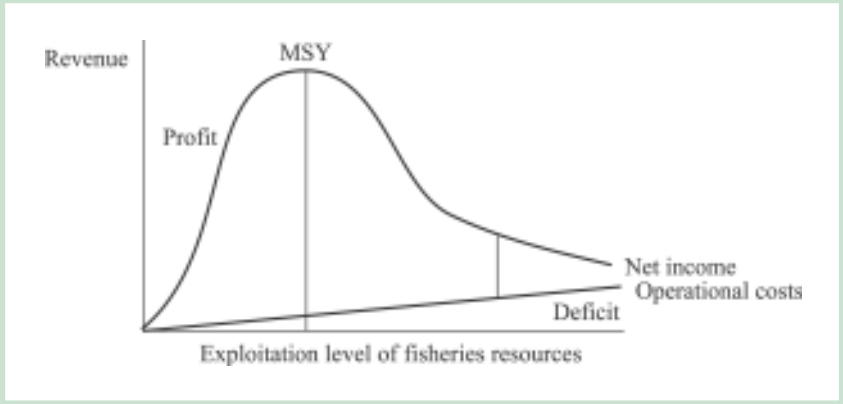
In industry fisheries, the end of profitability, once MSY has been exceeded, can be the main factor to stop or regulate their operation, as long as no subsidies are involved. On the other hand, the second figure clearly shows that small-scale fisheries have no such intrinsic regulator against overexploitation; they will continue to operate beyond the MSY with a diminishing but still positive income from fishing, because of their much reduced operational cost, unless offered possibilities of alternative livelihoods. In this context, small-scale operations can have far more serious effects on coastal resources as they will continue to operate in already depleted fisheries and reduce these to much lower and dangerous levels than industry fisheries will or could.

As inshore waters are generally identified as spawning and nursery areas for many commercial fisheries species, the deterioration of the resource base in these critical areas by an unregulated small-scale sector will eventually result in the deterioration of most fisheries resources. In this connection, it can only be stressed that an appropriate fisheries management program in inshore water for small-scale fisheries must be considered as a priority issue for the region.

There are many reasons for the governments in the region to develop an appropriate fisheries management



Exploitation pattern of the fisheries resources for industrial (above) and small-scale fisheries (below)



system for their small-scale fisheries sub-sector, including the following:

1) Improving the livelihood of the small-scale fishers in the long run
2) Addressing the current over-capacity situation in coastal waters
3) Resolving socio-economic and management problems including resource conflicts (which can only be resolved through an appropriate co-management system that must be developed in the coastal communities)

"Small-scale fisheries have no intrinsic regulator against overexploitation; they will continue to operate beyond the MSY with a diminishing but still positive income from fishing, because of to their much reduced operational cost..."

Once the importance and urgency to manage small-scale fisheries has been understood and recognized, learning from an existing successful system would be a constructive first step for consideration.

Learning from the Japanese Co-management System

It is in this regard that a simplified (and modified) Japanese coastal fisheries management system was presented in the RTC in Bangkok last November. Since the Japanese system has a history of development and modifications behind its long existence, and which are rather irrelevant for fisheries management in other countries, the current paper tries to simplify to its most essential features the system that is presented, pointing out the prominent issues for policy consideration in the region.

As the Japanese system (fishing right fisheries) is operating under the concept of an "open-access regime", one of the important issues is to identify and apply appropriate and transparent regulations that any user-to-be must agree to and respect to be allowed to fish. An open-access system to common resources is

generally customary in Japan, thus any modification of the regime, either by limiting or regulating the access to the fisheries resources, would require a wide consensus not only from the fisheries sector, but also from the citizenry. The Japanese system has been developed without modifying the regime itself, which would have been hard to achieve in the short term, if at all.

"Once the importance and urgency to manage small-scale fisheries has been understood and recognized, learning from an existing successful system would be a constructive first step for consideration."

Issues mentioned in the paper may cover a wider scope than just the establishment of a rights-based management system for small-scale coastal fisheries; it will include issues related to policy, legal framework and appropriate supporting activities that should be undertaken under a co-management system.

The Japanese system has functioned over the last 60 years, effectively managing more than 200,000 coastal fishers operating through in widely diversified manners in various ecosystems. The system is a unified policy promoting a single co-management system, *not* the application of manifold methodologies promoting fishing rights.

"In it is in this regard that a simplified (and modified) Japanese coastal fisheries management system was presented in the RTC in Bangkok last November."

What kind of fishing-right is given to the fishers under the existing co-management system?

The fishing right has been given exclusively to the Fisheries Cooperative Association (also known as the Fisheries Co-op, see Box next page). Fisheries Cooperatives are, in principle, established at the community level, and so no individual fisher has the personal right to fish. Such arrangements effectively prohibit encroachment by local entrepreneurs, who otherwise could acquire multiple fishing-rights through the transaction of individual rights (although a system based on individual but non-transferable fishing rights could also effectively prevent such abuse).

Although the fishing right is characterized as having access to and use right for the fisheries resources in the coastal designated areas, the legitimate stakeholders (the Fisheries Coop and its Members) shall also bear the

responsibility to appropriately manage the fisheries activities in these areas in a sustainable manner.

During the establishment of the system of designated areas and Fisheries Co-ops, the exclusive fishing right was given to the Fisheries Co-op and its Members; however other fishers who historically had used the fishing ground in the newly designated areas could reserve a secondary access right which could be later possibly be converted into full membership. The actual provision of such secondary fishing right to these fishers was decided through mutual consultation with the concerned Fisheries Co-ops and in accordance with the regulations laid down by the responsible government agency. Fishers who received such a secondary access right were also obliged to follow the rules of fisheries set by the concerned Fisheries Co-op in its by-laws.

"The fishing right has been given exclusively to the Fisheries Cooperative Association, which are, in principle, established at the community level, and so no individual fisher has the personal right to fish."

The fishing rights cannot be, in principle, transferable between Fisheries Co-ops unless the concerned Fisheries Co-ops and the government agencies responsible for the co-management mechanism agree by consensus.

The fishing-right has been considered as a use right for 1) members to exploit specific fisheries resources with appropriate fishing gear, or 2) defined water surface areas for aquaculture activities in the designated area. However, the right is not to be used as a kind of property right over coastal water areas. Hence, such a right cannot be used as collateral or other similar transaction that a property right can normally benefit.

However, compensation scheme is designed and applied if such a use right is violated by external factors, like pollution, that affect the normal usage of the right.

How the designated area has been delimited as a basis for the fishing right?

At the inception of the system, all coastal inshore areas where fisheries/aquaculture has been conducted

Box: What are Fisheries Cooperative Associations (Fisheries Co-ops)?

Under the co-management system developed in Japan, the day to day implementation of the fisheries management and enforcement activities are delegated to the Fisheries Co-op under national legal and policy frameworks. A Fisheries Co-op can be defined in both national and provincial legal frameworks as non-profit organizations with respect to their functions, roles and institutional set-up.

An exclusive fishing right in designated areas will be given to the individual members of the Fisheries Co-op. Only the members of the Fisheries Coop can conduct fishing and aquaculture activities in the area.

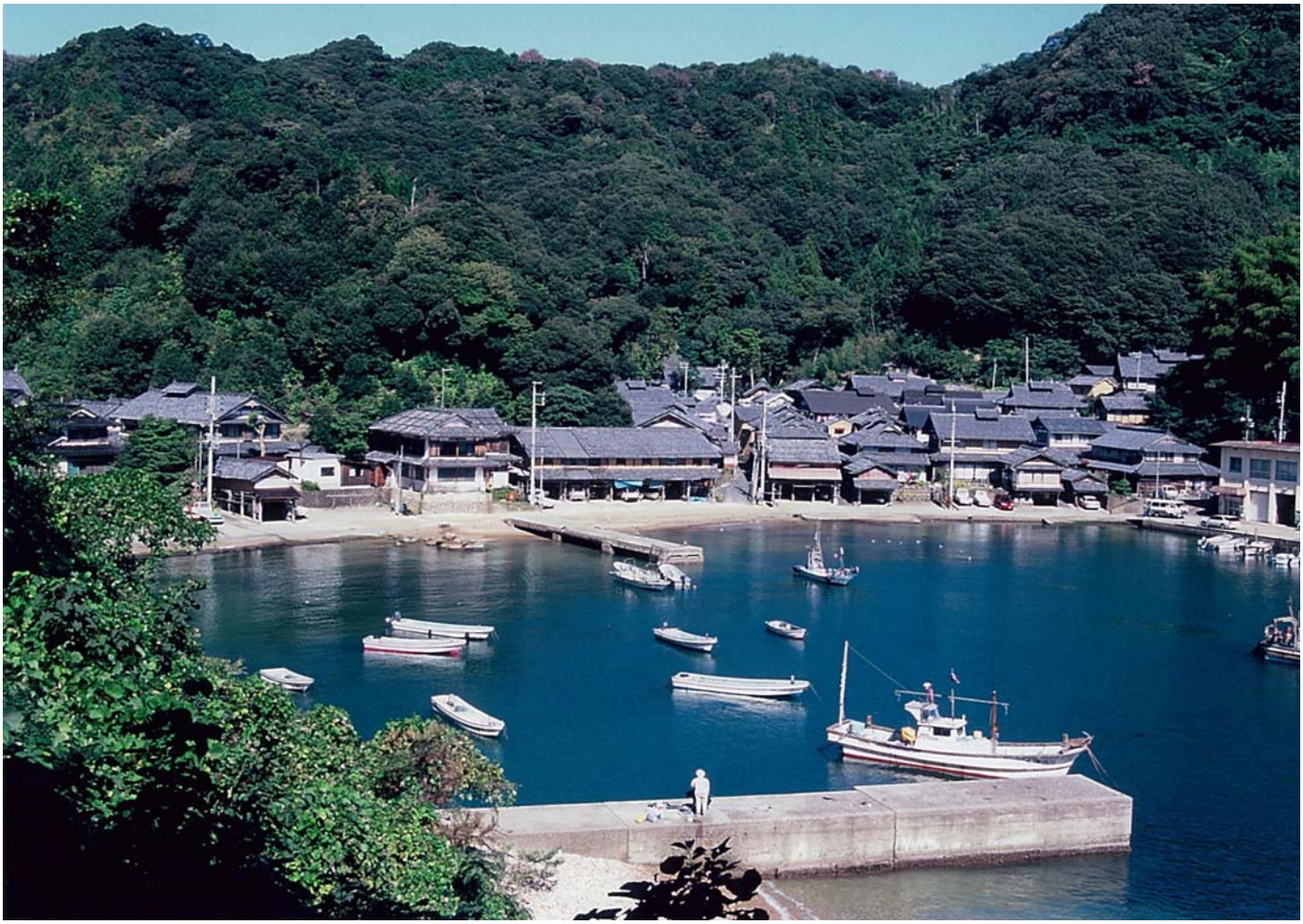
The structure and function of a Fisheries Co-op is as follows:

The Location: One Fisheries Co-op for one designated area (one Co-op/one community)

Council: The Council is legally developed as the decision making body of the respective Fisheries Co-op, which is composed of the representatives of the members, the representatives of the provincial and central government unit. The Council Meeting is periodically organized to adopt rules for the management and other economic activities, including the formulation/ revision of the by –laws of the Fisheries Co-op.

Below are some of the frequent issues discussed and agreed by the Council:

1) Use of various types of fishing gear in regulated manner.
2) Fishing seasons, including a closed season, and closed area(s) for particular species.
3) Development program for fisheries, including proposals for government assistance (like demonstrations of appropriate fishing practices, resource enhancement programs, or the construction of required infrastructures).
4) Exit and new entry of Members (see below).
5) Settlement of local conflicts among members and appropriate penalties for violators of the rules.
6) Supervision of the institution's economic activities and financial management. The Coop must be self-resilient.



A typical fishing community in rural Japan, Nariu, Kyoto (courtesy of the Fisheries Agency of Japan)

were divided by Prefectural boundaries (the Prefecture is a Japanese administrative unit at the level of the Province in countries like Indonesia or Thailand) as Prefectural waters. The width of the areas from the shoreline going off-shore was decided by taking into account factors like the existing usage pattern of the water by coastal small-scale fisheries and the range that could be managed effectively by the Co-op (in most cases, it was delimited at no more than 3 miles from the shoreline).

"The fishing rights cannot be, in principle, transferable between Fisheries Co-ops unless agreed by consensus."

The designated fishing areas managed by each Fisheries Co-op under the co-management system were then allocated within the Prefectural waters where they are located. Generally, the designation of the delimited area of each Fisheries Co-op was a question of determining a proper length along the coast line, while staying consistent with the boundary of the Prefectural water. That length was mostly determined while keeping the two following factors in mind.

1) The boundaries of individual designated areas should be in line with the historical community boundaries (not specifically with a fishery perspective).

2) The boundaries of individual designated areas should also accommodate traditional fishing areas and fishing grounds' use pattern by each fishing community.

To ensure efficient implementation of the established management measures, effective enforcement mechanisms and supporting economic activities (guaranteeing the Co-op's financial sustainability), the designated area for the Fisheries Co-op was, in general, designed to accommodate 200-500 fishermen's households.

General views on co-management

Very often government agencies responsible for fisheries management are much smaller than those of the farming sector, although they have a greater burden as they are responsible for the common fisheries resources. Very often, the structure and capacity of the fisheries agencies, both at central and local levels, are also too small to ensure that the required fisheries management tasks are effectively carried-out. In most cases, local government agencies are just not equipped well enough to provide the required services for fisheries management, usually because of technical and financial limitations. The logical option isto share these management responsibilities with appropriate "private" institutions.

"In most cases, local government agencies are just not equipped well enough to provide the required services for fisheries management, usually because of technical and financial limitations."

In Japan, the delegation of selected fisheries management authorities to the local institution, including day to day management of the Co-op and its Members and limited fisheries management and informal enforcement actions, resulted in a successful system. This co-management mechanism was nonetheless realised under the close supervision and within the framework set by the relevant government agencies.

Meanwhile, most of the ASEAN Member Countries are considering adopting a co-management system through the decentralization of some management responsibility to local government authorities, not to the "private" sector mobilizing fishers groups like the Fisheries Co-op developed in Japan. Thus, the option developed in Japan, if adopted in the region, will require a drastic policy adjustment, which must take into account the existing system. However, considering the institutional weakness of the local government agencies in most ASEAN Member Countries, such options can be worth exploring as a basis for policy formulation.

In Japan, fisheries management responsibilities have been demarcated at a different level as presented below.

At central level

The Central Government agency provides the national Co-management framework. Appropriate policy is established at the national level together with various guidelines for their implementation at the Prefectural and local levels. Terms of References for identified parties with respect to fisheries management and other required services are also clarified. The appropriate legal provisions, including the delegation of fisheries management authority to each party, are clarified. The central government provides appropriate services to the system through close monitoring of how the management activities delegated to the lower levels are carried-out. The required services include coordination with other sectors, and technical/financial assistance as required, including various subsidies.

Operation of coas
(courte

stal trap net fishery, Hisaka Island, Nagasaki
y of the Fisheries Agency of Japan)

At Prefectural level

The Prefectural government agency provides the regional framework (adaptation of the co-management system with appropriate focus given to the provincial specificities). It also coordinates and monitors the practical usage of its coastal waters (e.g. assessing the suitability of the designated areas for individual fishing communities in their administratively responsible area). Every 10 years, the designated areas in each Prefecture will be reviewed based upon this assessment. The Prefectural government also coordinates management actions with its Fisheries Co-ops, including appropriate interventions to solve any management conflicts among these. Finally, it monitors fisheries management activities undertaken by the Co-ops and periodically reports to the central government for their further coordination and suggestions for improvement.

At community level

Fisheries Co-ops, in principle, were established at each community level to empower fishermen with day to day fisheries management, and to allow them some scope for local, although informal, enforcement actions under the national framework and Prefectural regulations. With technical assistance from the Central and Prefectural government units, the Fisheries Coops have developed appropriate by-law that serve as guidelines for their management and the economic activities in their designated area.

Who is eligible to be a Member of the Fisheries Co-op?

Clear criteria for determining who is eligible to become a Member of the Fisheries Co-op, and a transparent mechanism to select the Members based upon these criteria, must be assured under an open access regime.

"The Fisheries Co-op functions as a key player within the established co-management system."

At the establishment of the system, the selection mechanism of the Members of the Fisheries Co-op follows these criteria:

1) The applicants should depend on fisheries as a professional livelihood for a majority of the year
2) The applicant must live in the community
3) The applicant has appropriate assets/ technology to conduct responsible fisheries in regard to the Co-op's fishing rules.
4) The applicants are deemed willing to comply with the rules and regulation set by the Institution.

The Fisheries Co-op functions as a key player within the established co-management system. An appropriate numbers of the Fisheries Co-op staff have been locally recruited (with wages paid by the Co-op) to conduct the administrative and financial activities, provide the required services and to assist the Members to fulfil their responsibilities toward the Fisheries Co-op.

In practice and with time, a self-regulating mechanism may start to limit the numbers of members in the Fisheries Co-op. As the given fisheries resources covered by the fishing right are limited, or even deteriorating if subject to over-pressure, the Co-operative itself tends to limit the numbers of its Members to obtain a larger share of the given resources, and endure its sustainable exploitation. With appropriate supervision of the relevant government agencies, such a self- regulating mechanism might be a very important factor to alleviate the present over capacity situation if a similar system is adopted in the region.

How the economic sustainability of the Fisheries Co-operative is secured?

In the ASEAN region, many attempts have been made to create local institutions carrying some management responsibilities, but most have failed when it came to ensure their financial sustainability once donors/ support withdraws. There are many factors related to such failures, including conflict between established institutions and the prevailing mechanism. A lack of a mechanism to make the newly created local institution financial sustainable is nonetheless one of the major constraints in achieving successful co-management in Southeast Asia. As continuous financial support by the Government agency through a program or through subsidies is unlikely to be feasible in the long term, a self-sufficient system must be developed through institutional building exercises if any co-management is to be promoted at all.

The Japanese system has a legally supported mechanism to accommodate economic activities as an important function of the fisheries Co-op in addition to its management responsibility.

The Fisheries Co-op conducts the following two main economic activities, carried-out by its recruited staff, which ultimately ensures its financial sustainability:

1) To conduct public auctions for the sale of the Members' catch, which with appropriate government and legal support, will help the Member to obtain stronger bargaining power for their sales to the market sector.

2) To bulk purchase the required goods (fishing gear, engines and other equipment and basic consumable items for the use of Members.) The bulk purchase can economize the cost compared with individual purchases.

"In the ASEAN region, many attempts have been made to create local institutions carrying some management responsibilities, but most have failed when it came to ensure their financial sustainability once donors/support withdraws."

Based upon a nationally standardised agreement from the Councils that the Co-ops must sustain themselves through their Members' activity, a commission is taken from the sales of fish through auction, and/or from the mark up of equipment bulk purchase.

How are conflicts settled and rules enforced at the community level?

In the case of Japan, the Fisheries Co-op is not formally empowered for the enforcement responsibility. However, internal conflicts and violation of the rules among the Members are settled through an internal mechanism, including the Council. When there are conflicts or no compliance by external people with the rules set by the Co-op, outside existing mechanisms like Prefectural Government or the police, depending on the severity of the offence, will take appropriate action to settle the conflict.

"...a self-sufficient system must be developed through institutional building exercises if any co-management is to be promoted at all."

With the enhanced ownership of the designated areas and privileges of exclusive fishing right to exploit the fisheries resources, the conflicts have nonetheless been minimized. The mutual surveillance system naturally developed among the Members, ensuring that each operates in respect to responsible fisheries principles set in place by their Co-op, further encourages the reduction of conflict.

Conclusion

In looking for suitable management approaches for small-scale coastal fisheries for the ASEAN-SEAFDEC member countries, some features of the Japanese coastal fisheries management system may provide guidance to fisheries policy makers and managers. Most notable among these are the combination of an area-based management approach with community user

rights. Through this approach, access to coastal fisheries resources is effectively regulated and limited to clearly specified user groups. Another important facet of the Japanese system is the creation and establishment of effective, financially viable and functioning management institutions at the local level. In these fisheries Co-operatives, the fishers can actually take part in decision making processes regarding the management of their community's coastal aquatic resources.

Some of the ASEAN-SEAFDEC Member Countries have already established or are developing fisheries management approaches with similar features: In the Philippines, the creation of Fisheries and Aquatic Resource Management Councils at the local level and the designation of municipal waters reserved for municipal fisherfolk, tries to combine an area approach with user-group approaches. Similar efforts are expressed in the system of community fisheries in Cambodia and can be found in the draft of the new Fisheries Law of Thailand.

Among the most important lessons the countries of the region can learn from the Japanese approach to the management of small-scale coastal fisheries is the importance of clearly defining and specifying the roles, functions, responsibilities and authorities of the various institutions and administrative levels.

"In looking for suitable management approaches for small-scale coastal fisheries for the ASEAN-SEAFDEC member countries, some features of the Japanese coastal fisheries management system may provide guidance to fisheries policy makers and managers."

As a direct follow-up of the RTC on Rights-based fisheries management, the SEAFDEC Member Countries could use these basic features of the Japanese coastal fisheries management system as introduced and discussed as a frame against which to assess the current situation of their own coastal fisheries management approaches and systems. By doing so, they may be able to identify areas of concern and strategic action for strengthening and improving their existing fisheries management systems, in the light of the Japanese experience.

About the author

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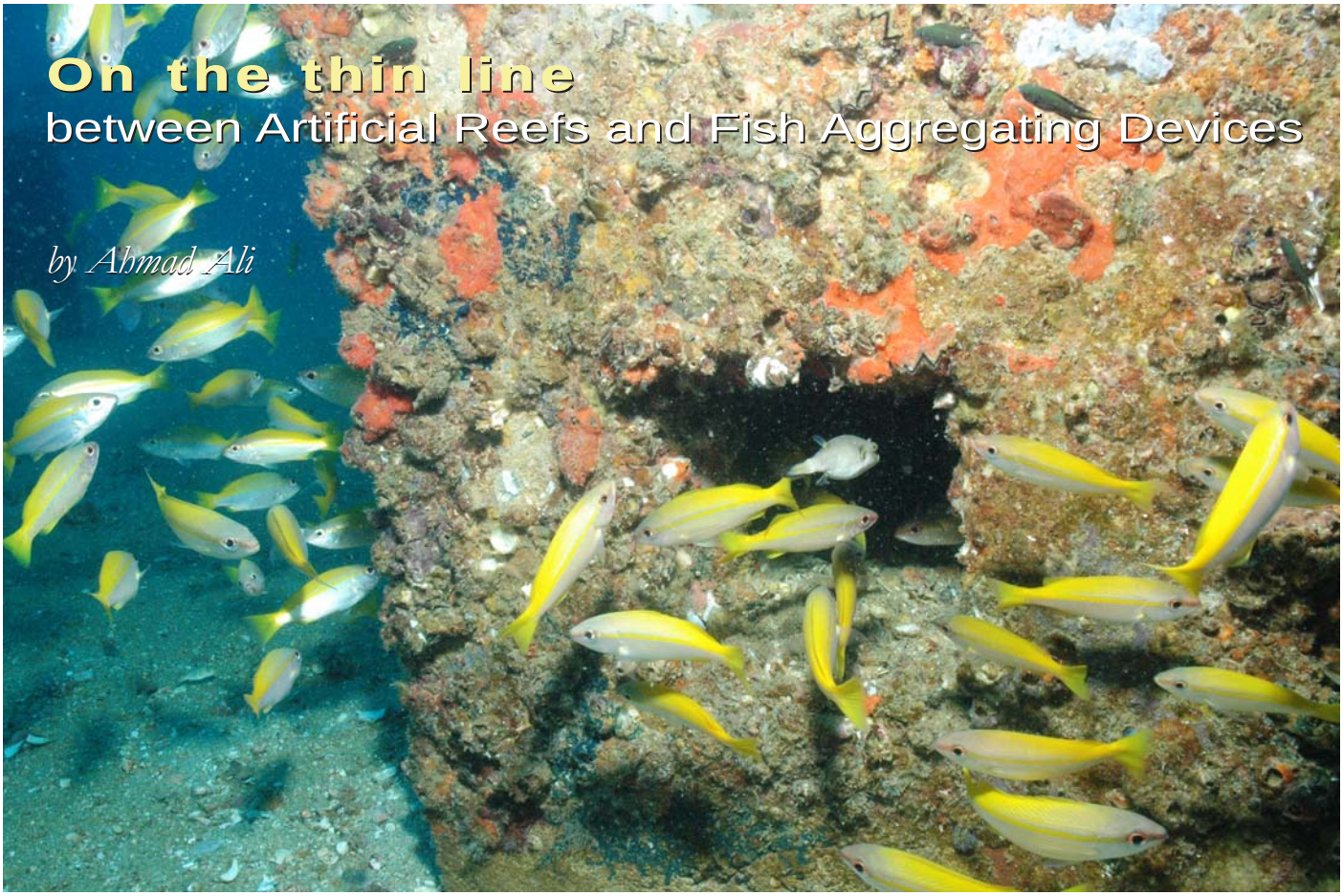


On the thin line
between Artificial Reefs and Fish Aggregating Devices

by Ahmad Ali

Because of the destruction of natural reefs and seagrass beds through coastal development and damaging trawling activities, many feeding, spawning and nursery grounds in the already fragile marine ecosystems have been destroyed. Much effort has been expended in attempts to rebuild these destroyed ecosystems, often following a strategy promoting the development of artificial reefs (ARs). Artisanal fishers and local government have developed various designs of ARs and also fish aggregating devices (FADs) to create fishing grounds close to the fishing villages. These efforts have become widespread for a substantial period in the region; in some areas fishermen have done this for nearly a century. With the actual combination of ARs and FADs, these structures can aggregate many varieties of fish species and attract both pelagic and demersal fish.

"Much effort has been expended in attempts to rebuild destroyed ecosystems, often following a strategy promoting the development of artificial reefs"

Based upon knowledge and experiences accumulated through the years by fishermen and several studies in the coastal waters of Peninsular Malaysia, the researchers of SEAFDEC Marine Fisheries Resources Development and Management Department (MFRDMD) introduced a new design of durable Artificial Reef Fish Aggregating Device (ARFADs) that will provide a more stable and dependably enriched ecosystem for fishers to exploit fisheries resources. This is a new approach that aims both to aggregate multiple fish species and to enhance fisheries resources in coastal areas.

ARFAD: What is it in short?

The Artificial Reef Fish Aggregating Device is a structure made up of a 3.2 tonnes concrete anchor, plastic appendages and floats that will be deployed in appropriate shallow coastal areas. After a few years of deployment, this structure becomes a new habitat that resembles a natural habitat for several demersal fish species and acts as a sanctuary for pelagic fish and other marine creatures. The concrete anchor may also act as a hindrance to illegal trawlers encroaching in the areas

ARFADs, ARs and FADs : what are the differences ?

	Function	Material	Installation Area	Type
ARs	- Enhance resource (flora and fauna) - Aggregate demersal fish - Create fishing ground - Habitat protection	- Concrete/Ferroconcrete - PVC - Tyre - Fiberglass - Metal - Others	Shallow water	Bottom
FADs	- Aggregate pelagic fish - Create fishing ground	- Sticks - Platic stripes - Bundle of brush or fronds - Bamboo - Canvas - Others	Shallow to deep water	Floating Anchored
ARFADs	- Enhance resource (flora and fauna) - Aggregate pelagic and demersal fish - Habitat protection	Concrete for the anchor Plastic stripes for the attractor	Shallow water	Floating and anchored

while the whole structure creates a new fishing spot close to traditional fishing communities for their subsistence or for recreational purposes. The aggregation, enhancement and diversification of pelagic and demersal fish resources resulting from this ARFADs structure could, in many cases, lead to economic gain for the coastal communities, directly from fishing or from ecotourism.

"SEAFDEC introduced a new design of durable Artificial Reef Fish Aggregating Device that will provide a more stable and dependably enriched ecosystem for fishers to exploit fisheries resources."

Unrestricted fishing around an AR or FAD may lead to exploitation of the resources, as the device usually just attracts marine life from surrounding areas, but doesn't produce as much. This is especially true for pelagic species, which are just attracted to these structures. Without proper management, it can enhance some sessile, demersal resources at low trophic levels while catching too many valuable pelagic fish of higher trophic levels. Thus, to guarantee the sustainability of the ARFADs and to ensure that their resource enhancement effects outweigh their contribution to resource harvesting, fishing effort in their vicinity must be strictly regulated. In this context, traditional fishers using selective gear, especially hook and line that are known to be very selective, catching only marketable sized fish should only use ARFADs. This may eventually increase the catch performance of traditional fishers while not causing an unsustainable fishing pressure on the coastal resources.

The ARFADs are also popular sites for recreational anglers and divers because they provide convenient sites with high concentrations of fish and a multitude of other marine organisms, both flora and fauna, similar to natural coral reefs.

Both a FAD and AR

An ARFAD has three components: floats, an attractor, and an anchored mooring. The upper part of the structure, consisting of the floats, appendages and mooring line, is commonly referred to as a fish-aggregating device. Thus, it is used to attract pelagic fish, mostly thanks to the presence of fish attractors, made of plastic strips and attached to the anchor line. The main function of this anchor line, also known as the mooring line and made of polyethylene rope, is to attach the float section to a heavy moulded concrete anchor resting on the bottom of the sea. This anchor acts to hold the FAD in position as well as being an AR important to demersal fishes.

Deploying the ARFADs

To benefit small-scale fishers, the selected sites for the deployment of ARFADs should not be too far away from the fishing village. The criteria considered for the deployment of these ARFADs are based upon the availability of fish for aggregation and the oceanographic and meteorological conditions. In evaluating a particular site, consideration should be given to the bottom topography, wind, wave and current actions and other infrastructures, like a jetty or pontoon, for transferring ARFADs material to the selected site. The ideal location should be in shallow and calm areas (15-30 m) out of important shipping lanes. It is very important to take sediment samples before any deployment of ARFADs because the structure will sink into the seabed if the bottom sediments are not hard or stable enough to support the concrete anchor. As the ARFAD hinders trawling activities, the selected deployment spots should not be into a legal trawling or drift netting area, however, they might be deployed to protect areas where such fishing activities are forbidden.

"Without proper management, [ARs and FADs] can enhance some sessile, demersal resources at low trophic levels while catching too many valuable pelagic fish of higher trophic levels."

As the installation of an ARFAD involves a heavy weight anchor of about 3.2 tonnes, adequate safety procedures must be observed and the deployment should follow an anchor-last method, carried-out during daylight with clear and calm weather conditions. Thus, the upper part of the ARFAD, which contains the polypropylene rope with appendages and floats, is jettisoned first while the anchor that is tied at the other end of rope remains on board. The barge then slowly drifts away to prevent the entanglement of the upper part of the ARFAD, once everything is clear, the anchor is finally released into the sea.

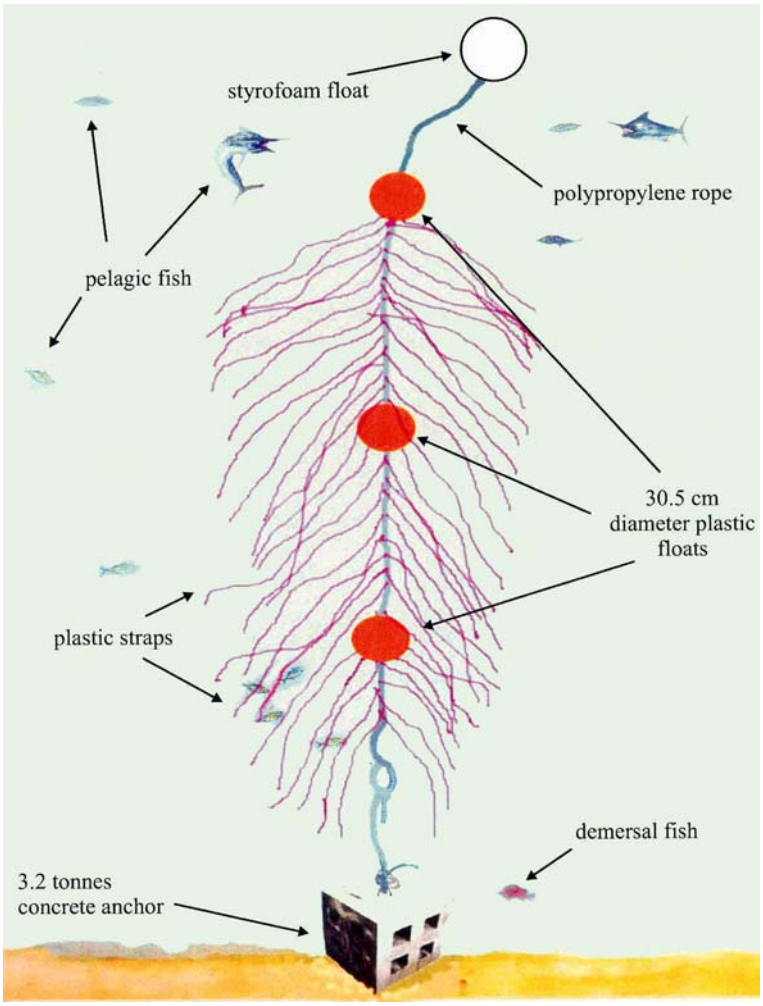
It was found that the function of the ARFADs is more successfully realised when many structures are set up at one site, 25 units are normally deployed in each location. The ARFADs are usually arranged in a square of 5 by 5 units with the distance between each unit of about 10 meters, thus designating an area of 50 by 50 meters or 2,500 m2.

Maintaining and using ARFADs

Users around the ARFADs should always pay attention to the surface floats (made of Styrofoam) because once the floats break loose from the ARFADS, the appendages will fall to the sea floor and become useless. The propellers of passing boats may cut floats on the upper surface of the sea. Any rope not properly attached to a surface float must be fixed to prevent the surface float from drifting. Nonetheless, after 3 to 6 months of deployment, barnacles and other flora and fauna will have covered the appendages and the surface floats will sink under the increasing weight. This needs to be compensated for by placing additional floats, usually made from plastic drums at the upper section of the rope of the ARFAD.

Fishing around ARFADs

Hand lines, squid jigging and trolling are recommended as the only fishing gear allowed to be used around ARFADs. Hand lines are selective gear and the catch can be controlled by using different sized hooks. Fishers can tie the boat to the floats or drift around and use live or dead bait for fishing. Jigging for small pelagic fish using feathers or plastic lures may also be used around ARFADs shortly after their deployment. Live baits are usually used for catching target species like Spanish mackerel (*Scomberomorus* spp.). In trolling, towing live or dead bait at low speed was found more efficient than artificial lures. The fishers of Terengganu use squid jigging around ARFADs, both during the night and daytime to catch squid species like *Loligo* spp., *Sepia* spp. (cuttlefish) and *Sepioteuthis lessoniana* (bogfin reef squid). Other methods including traps and gillnets are strenuously not recommended because they catch more fish than that which would be sustainable and can easily get entangled with the mooring line. Uncollected traps around ARFADs would also cause ghost fishing.



A schematic representation of an Artificial Reef Fish Aggregating Device or ARFAD

"ARFAD structures, especially the concrete anchor, will in the long-term help to enhance the resource base of coastal areas."

In general, the fish caught around the ARFADs are mainly composed of groupers, red snappers, sweetlip, Indian and Spanish mackerel, barracuda, scad, yellow snapper, nemipterids, trevally, starry trigger fish, dolphin fish and shark. The species composition of the catch differs according to the technique employed; for example, with fishers using trolling for Spanish mackerel and dolphin fish, while fishers using hand lines principally get grouper and snapper.

The AR function of ARFADs

ARFAD structures, especially the concrete anchor, will in the long-term help to enhance the resource base of coastal areas. This anchor will develop into a look-alike natural reef and become an important breeding and nursery ground for several fish species.

Recreational fishing and scuba diving

Marine recreational fishing is a well-known outdoor activity that has the potential to be developed into a profitable economic sector in this region. Over the years, there has been a steady increase in the number of people involved in recreational fisheries and it has become one of the most popular open-air recreational activities in this region. Recreational anglers are fully dependent upon the presence of larger size fish to enjoy their activities. Larger predators like marlin, sailfish, grouper, shark, ray, barracuda, red snapper, trevally, dolphin fish, or tuna are normally only present in deeper water. As not all anglers can afford to pursue large game fish offshore, installing ARFADs in coastal waters can aggregate small fish, which will in turn attract larger predator to the

area. To enhance the coastal fishery resources, these durable ARFADs are useful in attracting and enhancing both pelagic and demersal sport fish. Many ARFADs are already popular sites for recreational anglers and divers, creating a potential alternative source of income for the local communities.

Who owns such structures?

All ARFADs in the coastal waters of the east coast of Peninsular Malaysia are set by MFRDMD and the Department of Fisheries Malaysia (DoFM), and they are considered to be the common property of the local communities. Currently, all traditional fishers and recreational anglers can fish freely around those ARFADs provided that they follow local regulations. DoFM considers the ARFADs deployment program as an indirect support to the coastal fishers, which they believe is seriously needed. The introduction of ARFADs allows fishers to obtain a supply of fresh fishes throughout the year including during the northeast monsoon season.

Management issues

Only big fish are targeted by the local fishers and as long as the total fishing effort on the resources is kept at a low level, the effects of those ARFADs are not harmful to the resources. The only potential problem caused by ARFADs is competition between types of gear and fishers. Fishing effort must be distributed wisely between fishers and gears to avoid conflicts.

"...as long as the total fishing effort on the resources is kept at a low level, the effects of those ARFADs are not harmful to the resources."

These durable ARFADs are also a very useful mechanisms to prevent trespassing trawling activities. They delimit closed areas from trawling that will protect juveniles in shallow nursery grounds and provide fishing sites for artisanal fishers using selective gear to capture large sized fish.

If these structures are considered to be common property of local communities, i.e. open for everybody to use and fish, fishing effort will be very difficult to control. However, these structures could offer an excellent starting point for introducing rights-based fisheries systems, by allowing only clearly defined community groups to fish in and around individual structures or clusters. It is thus encouraged that the ARFADs should be deployed and used in community-based projects where fishers are encouraged to play a major role during the planning, construction and operational phases.

"...these structures could offer an excellent starting point for introducing rights-based fisheries systems, by allowing only clearly defined community groups to fish in and around individual structures or clusters."

The selection of sites of ARFADs should be undertaken through the establishment of Locally Based Coastal Fishery Management, as a tool to help the sustainable exploitation of fisheries resources.

What does it cost?

The table below shows a summary of the overall cost incurred for ARFADs deployed at 25 m depth in 2003. The total cost for the construction of 66 units of ARFADs is around RM 79,000 ($US 20,627): the cost for the construction of concrete anchors and deployment is around RM 68,000 (US$ 17,755) while the remaining structure (appendages, floats and ropes) costs about RM 11,000 ($US 2,872) for the construction of the upper part of ARFADs. The average cost for a single ARFAD is around RM 1,197 ($US 312.50).

No.	Materials	Unit	Cost ($US)
1.	Construction of concrete anchor and deployment	66	17,775
2.	Hard plastic floats (submerged) Styrofoam surface floats Construction of appendages Polypropylene rope (2.2 cm diameter)	66	2,872
	Total Cost		**20,627**

The life span of each ARFAD is expected to be more than 10 years, with the anchors likely to last even longer. Fouling on the appendages will require the setting of additional floats after 6 months.

"The introduction of these ARFADs could even turn some previously unproductive areas into rich ecosystems, while proving local fishermen with a livelihood."

Conclusions

Most of the traditional FADs are made using local materials (bamboo and coconut fronds) which are easily expendable by their nature and they must be continuously renewed every 6 to 8 weeks. The development of durable ARFADs is expensive as the anchor, line and aggregating devices must be able to resist the forces of wind, waves, currents and the corrosive action of seawater. These structures are nonetheless of great interest as they can create convenient artisanal fishing sites while protecting habitats from more destructive forms of fishing. In addition to being effective for artisanal application in which fishing effort is relatively low, well placed ARFADs deployed at suitable sites will in the long term become alike to an artificial reef, enhancing coastal habitats and resources for the benefit of the nearby communities and ecotourism. Potentially, the introduction of these ARFADs could even turn some previously unproductive areas into rich ecosystems, while proving local fishermen with a livelihood.

About the author

Ahmad Ali is the Head of the Resource Exploration and Conservation Unit of SEAFDEC Marine Fisheries Resources Development and Management (MFRDMD). He is working in the field of biology and taxonony of elasmobranch, recreational fishing, and sea turtles.

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INVITATION TO CORRESPONDING WRITERS

With six issues of *Fish for the People* already published, and *Fish for the People* celebrating its second birthday, we hope that we have given you a good idea of the aims and general tone of the publication. Recently, we have been publishing more articles from external contributors. We are further inviting contributions from writers interested in promoting relevant issues on fisheries in developing countries. While the publication will continue to focus on the Southeast Asian region, future issues can address relevant issues from other tropical regions.

Fish for the People is a policy-orientated publication. It is not a forum for publication of research findings, nor is it intended to provide detailed technical information. The publication targets not only experts or scientists, but also other traditionally less technically-oriented fisheries stakeholders, such as policy-makers, donors, government staff, managers, and more generally, an informed lay public with an interest in how our fisheries are managed.

Readable, accessible articles that address the various issues discussed at the ASEAN-SEAFDEC Millennium Conference are most desired. Articles should focus on newly emerging issues relevant to sustainable regional or tropical fisheries management. They should present important issues with clear regional messages, emphases, thrusts, problem areas, and propositions for improving current situations.

Through *Fish for the People*, we hope that authors will gain the attention and consideration of targeted fisheries stakeholders, and contribute to the future achievement of more sustainable fisheries.

Correspondence related to editorial matters should be sent to *fish@seafdec.org*

Tsunami, CONSRN, and *Fish for the People*

In the morning of Sunday, 26 December 2004, a tsunami triggered by the earthquake near Banda Aceh, West Coast of Northern Sumatra, hit the coastlines of many South and Southeast Asian countries, i.e. Indonesia, Malaysia, Myanmar, Thailand, Sri Lanka, India, as well as the Maldives and Andaman Nicobar Islands, causing huge devastation to these areas. The incident brought indescribable damages to people's constructions households, communities and lives, as well as natural habitats both upland and inshore.

As the giant wave directly hit the coastal areas of many Southeast Asian countries, the fishing industries and communities in the areas have been severely damaged; thousands of fishermen have lost their homes, fishing infrastructures, vessels and gears, as well as other livelihood assets. In order to alleviate such situation, and ensure effective and appropriate distribution of the assistance, it is envisaged that coordination and cooperation among the national, regional and international efforts is urgently required.

SEAFDEC now plays its role in coordinating and collaborating with the affected Member Countries and regional and international organizations/agencies, including donors in the fisheries relief program for the disaster. SEAFDEC is an active member the Consortium to restore shattered livelihoods in tsunami-devastated nations (CONSRN), which also brings together the Food and Agriculture Organisation of the United Nations through its Regional Office for Asia and the Pacific (FAO RAP), the Bay of Bengal Programme - Intergovernmental Organization (BOBP-IGO), the Network of Aquaculture Centres in Asia-Pacific (NACA), and the World Fish Centre (WFC).

The next issue of *Fish for the People* will be exclusively focused on the tsunami, its impacts on Southeast Asian coastal communities, and the on-going efforts and relief needs in the region.

Retaining our mangrove greenbelt:
Integrating mangroves and aquaculture

by Jurgenne Primavera

Introduction

For centuries, mangrove systems have contributed significantly to the well being of coastal communities through their provision of a wide array of goods from forestry (wood used for fuel, construction, and fishing poles, and forage for livestock, honey, and medicines) as well as from fisheries (higher-valued fish, crustaceans and molluscs) which they significantly fortify. But mangroves do not stop at being providers of essential goods; they also offer many ecosystem services including coastal protection provided by a buffer zone during typhoons and storm surges, reduction of shoreline and riverbank erosion, flood control, nutrient recycling and habitat for wildlife.

Mangroves cover around 18 million ha world-wide, of which 6.3 million ha, or a third, is found in Southeast Asia. The largest expanse of it, about 4.5 million ha, is found in Indonesia, where the earliest brackishwater culture ponds can be traced.

"But mangroves do not stop at being providers of essential goods; they also offer many ecosystem services including coastal protection provided by a buffer zone during typhoons and storm surges..."

Multilateral agencies, through their external development assistance to aquaculture, have long been promoting that mangroves, and other wetlands, are wastelands to be put into better use such as conversion to ponds. Although conversion to salt beds, agriculture, settlements, and overexploitation by coastal dwellers have caused mangrove decline, aquaculture remains the major causative factor, at least in Southeast Asia.

The high rates of mangrove loss in the region over the last three decades, ranging from 25 to 80% of total areas have coincided with the Shrimp Fever of the

1980s. Clearing of mangrove for shrimp farming have been reported throughout the region as the main cause for mangrove degradation. Given the ecological and socio-economic importance of the mangrove ecosystem, it has become clear that aquaculture needs to be more mangrove-friendly to be sustainable. Already, the culture of seaweeds, molluscs and fish in cages in subtidal mangroves is both compatible with mangroves and amenable to small-scale, family-level operations.

"Multilateral agencies, through their external development assistance to aquaculture, have long been promoting that mangroves, and other wetlands, are wastelands to be put into better use such as conversion to ponds."

But, there remains a need for Mangrove-Friendly Aquaculture (MFA) technology in the intertidal forest, or swamp, which does not require clearing of the trees. MFA may be defined on two levels:

1. Silvofisheries or aqua silviculture, where the low-density culture of crabs, shrimp and fish is integrated with mangroves, and
2. Mangrove filters where mangrove forests are used to absorb the excess nutrients in the effluents from high-density culture ponds.

This review aims to evaluate existing MFA practices belonging to the first category although pioneering research on the use of natural or constructed mangrove wetlands to treat pond effluents holds much promise towards making aquaculture sustainable. Discussion shall be on a country basis, moving from traditional systems in Indonesia, to the introduced technologies in Indonesia, Vietnam, the Philippines and Malaysia. It is hoped that such a review will be useful to scientists, aquaculturists, policy makers, and government/non-government organisations interested in making aquaculture more ecologically sound and socially responsible.

Mangrove-friendly aquaculture: a great regional variety

Among five Mangrove-Friendly Aquaculture (MFA) systems in four Southeast Asian countries, the traditional Indonesian tambak is decades to centuries-old technology, while the rest – silvofisheries in Indonesia, mixed shrimp-mangrove systems in Vietnam, and aquasilviculture ponds and mangrove pens in the Philippines and Malaysia – are more recent state-initiated projects. Indonesian traditional tambak and silvofisheries ponds as well as Vietnamese shrimp-mangrove farms are widespread over thousands of hectares whereas MFA systems in the Philippines and Malaysia are still at the verification and early dissemination stages.

"This review aims to evaluate existing MFA practices belonging to silvofisheries, where the low-density culture of crabs, shrimp and fish is integrated with mangroves."

Both Indonesian silvofisheries and Vietnamese mixed systems were established by the state primarily to relieve land use conflict between forestry and fisheries, unlike the other MFA systems, which were developed to provide food and income through fish, shrimp and crab production, and to rehabilitate/conserve mangroves.

Variety in designing...

Ponds are the predominant MFA system featuring gates, elevated dikes, and excavated channels which alter mangrove hydrology and ecosystem functions in the process. By contrast, pens in mangrove areas only require enclosures made of net or bamboo, and have minimal impact on mangrove hydrodynamics and vegetation.

The silvofisheries pond system itself has two models - with mangrove trees either growing inside (mixed), or separately from, the watered area (pond). The mixed system is difficult to manage because the mangrove trees and cultured fish may have conflicting requirements (e.g., shallow vs. deeper water). Management of the separated pond-mangrove system is easier, but it is more vulnerable to illegal pond expansion in the mangrove area.

Variety in operating...

Most MFA ponds rely on wild fish or shrimp fry that enter with the tide. Pond systems in Indonesia (traditional and silvofisheries), and in the Philippines, also depend on stocked seed of tilapia, milkfish and mud crab. Feasible with two-species combinations, polyculture becomes more difficult as species are added. Only mud crabs *Scylla spp*. are stocked in mangrove pens in the Philippines and Malaysia.

MFA systems with wild (tidal) fish/ shrimp, and milkfish stocked at low densities rely on natural food; supplementary feeds (e.g., pellets and raw fish) are given to stocked omnivorous and carnivorous species like tilapia and mud crab. Aquaculture production of <500 kg/ha/yr, in ponds dependent on natural food, is characteristic of extensive systems; yields increase to 1-3 t/ha/yr when feeding is provided in the more intensive systems.

Apart from the unsustainable use of raw (trash) fish that may be consumed by local people, mud crab culture in pens is the most financially lucrative and environment-friendly among MFA systems, because of minimal impacts on the mangrove habitat. However, continued dependence on natural seedstock may impact negatively on wild crab fisheries.

Indonesia: the traditional tambak

The beginnings of brackishwater pond culture in Asia may be traced in East Java in Indonesia. As has been stated, Javanese law codified in 1400AD already described punishment for stealing fish from a tambak or saltwater pond. In Indonesia, extensive pond culture integrates mangroves in either the ages-old traditional system, or through the more recent government-initiated silvofisheries programs.

"The beginnings of brackishwater pond culture in Asia may be traced in East Java in Indonesia."

A good example of the former can be found in the Solo-Brantas delta of East Java, and other regions in Indonesia, where tidal wetlands are formed by the complex of ponds which retain mangroves on dikes, as strips between ponds, or in remnant patches inside ponds. Individual ponds are usually 1- 4 ha in size, and ecologically similar to tidal lakes. This significant landscape has been reported to provide wildlife habitat, contribute aesthetic and amenity values, and enhance the living environment of human settlements.

Indonesia: introducing silvofisheries

While tambak are integrating mangroves into the system, their unregulated development could still negatively affect mangrove integrity. This became clear in the 1970s, when mangrove lands under the State Forestry Corporation (Perum Perhutani) have been progressively and illegally transformed into culture ponds. To reduce potential conflicts between excessive tambak development and mangrove conservation, the Corporation initiated a Social Forestry Program in 1976 that integrated fish production and forest management.

The terms tambak tumpang sari (alternative purpose ponds), tambak empang parit (mixed-farming crop ponds), hutan tambak (forest canal pond system) and silvofisheries have been applied to this new system. But regardless of the terminology, there are two basic silvofisheries models defined, depending on whether mangroves are inside or separate from the ponds. Research, demonstration and promotion of these models have been undertaken by universities and national programs in the Ministry of Forestry and Directorate-General of Fisheries, exploring different ratios of mangrove to watered area and its impact on shrimp, crab and fish culture in terms of production and net profitability.

The benefits from silvofisheries include mangrove conservation, increased incomes from fish products, and food security. Nevertheless, when compared to open ponds, they are reported to be more difficult to

Indonesia's Tambak – Traditionally integrating mangrove and fish culture

Mangroves are planted on pond dikes and adjacent tidal flats to stabilise dikes, reclaim land for future tambak construction, provide green manure as fertiliser to stimulate natural food (plankton) production, and provide fuel for smoking fish and industrial use. Mangrove patches mainly of *Avicennia* are also left on islands inside ponds because of added costs for clearing.

The primary species of mangroves planted on dikes are *Avicennia marina* and *Rhizophora mucronata*, followed by *Excoecaria agallocha* and *Xylocalpus moluccensis*. Other plant species are grown for fruits (papaya, banana), fodder (*Leucaena*) and amenities (*Hibiscus*). Where green manure is wanted, *A. marina* is planted and harvested by cutting the lateral branches (for fuel wood) and using the leaves as green manure (preferred because they lack tannin, unlike *Rhizophora*), and allowed to regenerate for a few seasons. In other places, where building materials (e.g., tree poles) are more important, *R. mucronata* is planted, harvested when the trunks reach 5-10 cm in diameter, by cutting down the whole tree and replanted, since the species of the family *Rhizophoraceae* cannot regenerate branches.

Cost-benefit and other financial analysis have shown that a land-use pattern of 1 tambak to 1 mangrove ratio works well .The traditional ponds may be managed by the tambak operator himself, or by a hired supervisor/ employee. During final harvest, the mberi (a customary system of dividing wealth) is practised, whereby neighbouring communities participate, and also receive production shares from the harvest.

Silvofisheries in Indonesia: future directions to explore

Further research is needed on rates of litter production and decomposition of different mangrove species to support maximum pond productivity, and on stocking strategies for compatibility of aquatic species for polyculture. Pond design needs to be evaluated in terms of mangrove to water area ratio, water area to dike length ratio (reflecting potential production relative to construction costs), gate width (for entry of wild fry and flushing out mangrove debris), tidal flushing rate, etc. Finally, empang parit, or mixed silvofisheries projects, have been mostly successful on community or government-owned land, where capital costs for dike and gate construction have been subsidised by the state). Some farmers living on government land cannot avail of bank credit for improvements, and are therefore reluctant to maintain the trees. The separate, or alternate, mangrove/pond silvofisheries model is best suited to privately-owned land, because of superior management control and potential production; there would be little incentive for the land owner to plant back mangroves, as required in the mixed model.

manage, more expensive to construct, and have less efficient water circulation. Unless thinned properly, growing mangrove trees can also provide habitat for predatory birds and snakes, and shade out plankton and benthic algae, leading to decreased fish production. Moreover, tannic acid in *Rhizophora* leaves is potentially toxic to aquatic organisms – shrimp silvofisheries operations are even reported not to be profitable if *Rhizophora* are planted inside ponds, because of low survival of black tiger shrimp under these conditions. The preference of the State Forestry Corp. for the genus *Rhizophora* (due to convenience in planting and resistance to inundation inside fishponds) may be a source of tension with local people who prefer *Avicennia*. The branches of the latter can be harvested (for firewood) without disturbing fish inside the ponds while the leaves can increase pond fertility, and regulate pH during the rainy season.

Without its protective mangrove belt, the coast is open typhoons, storm surges, or to riverbank erosion such as here in Aklan, Philippines

Some also observe that conservation and biodiversity are not enhanced in silvofisheries, because of monoculture mangrove planting, and the effects on wildlife of pesticide used to eradicate unwanted fish. Moreover, mangroves planted high in the intertidal or landward zone, beyond the reach of ordinary high tides, also show abnormal growth and high mortality.

Vietnam: integrated shrimp-mangrove farming systems

In the late 1980s, illegal mass migration to build shrimp ponds in the southern provinces in Vietnam, such as in Minh Hai, which resulted in the destruction of many mangrove areas. To relieve the ensuing land use conflict, the State Fishery and Forestry Enterprises (SFFE) promoted integrated shrimp-mangrove farming systems that would allow shrimp culture as food and cash crop while rehabilitating mangroves. Each household was allocated an area of 4-8 ha, of which 70% is reserved for mangrove forest, 20% for ponds, and 10% for housing. The SFFE provides capital for felling of miscellaneous trees and planting of *Rhizophora* while the farmer contributes labour and money for excavating canals and building dikes. *Rhizophora* are initially densely planted and are subsequently thinned by 20-30% every 5 years, until completely harvested after 20 years. Economic analysis of ponds with different levels of mangrove forest gave the highest returns with medium mangroves density (30-50%) and the lowest returns when all mangroves were cleared. Nevertheless, many farms have expanded the shrimp ponds up to 80% of total farm area, because of higher financial returns from shrimp in the short term.

In another province, Ca Mau, two kinds of farms are known: mixed and separated. In both systems, individual ponds consist of long (250-800 m), narrow (3-4 m), and shallow (about half a meter) channels parallel to each other. These farms culture shrimp on a very extensive manner, stocking low density of wild larvae and having low production yields. In mixed farms, these channels are dug through the mangroves so that dikes or levees are vegetated, but often the excavated soil from the canals is dumped onto the vegetated flats, resulting in poor growth of mangroves due to their increased elevation and less tidal flushing. In separated systems, the mangroves are usually grown on an area next to the pond and the levees are bare of vegetation. Nowadays, production in these farms is often reported to be too low, sometime due to too dense mangrove cover, but often linked with issues of poor pond design or inadequate management of the tidal flow.

Philippines: aquasiviculture

In the Philippines, mangrove-friendly aquaculture has not gone beyond the verification and demonstration of integrated mangrove ponds, and pens for fish and crabs. These include projects of the Bureau of Fisheries and Aquatic Resources (BFAR), the Ecosystems Research Development Bureau of the Department of Environment, and the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC AQD) in the provinces of Quezon, Mindoro Oriental, Palawan, Bohol and Aklan.

Established in 1987, and patterned after Indonesian silvofisheries, the BFAR project in Ubay, Bohol, features 1.6 to 2.6 ha ponds, with 80% area planted to *Rhizophora* mangroves. In the first five years, stocked milkfish were harvested at 1 t/ha/yr. Subsequently there has been free entry of wild fish (siganids, mullets, tilapia, tenpounder, tarpon, snappers, groupers, barracuda), crustaceans (shrimps, blue crabs), and molluscs (oyster, clams, snails). Wild ducks, and other birds, also use the area as a sanctuary. Problems encountered include difficulty in assessing and harvesting fish stocks due to the mangrove prop roots, death of mangroves caused by prolonged flooding, and overgrowth of filamentous algae killing fish.

In Puerto Galera, Mindoro Oriental, a mangrove area was converted to one ha aquasilviculture ponds with the central portion (80% of total pond area) planted with nipa palm, *Nypa fruticans*, because of its higher economic value as a source of shingles for housing material. Fish production in the canals was high, at a rate above 3 t/ha/yr for both tilapia and milkfish, giving when combined with nipa shingles, good returns. Fruit crops (banana, pineapple, and jackfruit) and vegetables (tomato, beans) planted along the dikes even further added to income.

Replanting mangroves trees, here in Iloilo, Philippines

AQD has initiated research and verification trials on mud crab *Scylla spp.* culture in mangrove pens and ponds in Aklan and Palawan. Mangrove pens range from 200 m^2 to one ha in size with 20-30% of the pen area occupied by half a meter deep canals to retain water during low tide. Mud crab production and profitability are good and gives a 60-90% return on investment according to the pen size, with smaller pen showing more profitable. Nevertheless, tree damage from prolonged inundation of *Avicennia pneumatophores*, due to altered hydrology and unintentional cutting of roots, has been observed. The feeding of raw (trash) fish to crabs is also problematic, because some local people consume such fish, which therefore could be put into a better use.

Malaysia: mudcrab pen culture

In 1992, pen culture of the mud crab species *Scylla olivacea* and *S. tranquebarica* was introduced by the Inland Fisheries Division of the Department of Agriculture to logged-over mangrove areas in Sematan, Sarawak, and to increase the income of artisanal fishermen. Small pens of less than 200m^2 were constructed using trunks of the nibong palm *Oncosperma tigillarum*; a 2.4 m high fence keeps predators out, and cultured crabs in. Small perimeter drains or canals are always filled with water. Existing mangroves in the pens are left intact and bare areas are planted, mainly to *Rhizophora*. Crabs are stocked at relatively low densities to avoid high mortality and are fed raw fish, yielding enough to ensure acceptable revenue to the farmers. Following the success of the initial experiments, the number of pens rapidly

increased in Sematan, and other districts in Sarawak .The high proportion of young crabs caught in the Sematan mangroves, despite the large number used for stocking suggests that considerable recruitment is contributed by the pens. However, problems of shortage of crab seed and non-availability of feed (low-value fish) during the rainy season have been reported.

Conclusions

The "mangrove-friendliness" of different MFA systems can be evaluated in terms of how they affect the basic resource and regulatory functions of the mangrove ecosystem. Usually, species diversity of both mangrove flora and fauna is lower inside mangrove ponds compared to adjacent natural mangroves and open waters. However, high mangrove species diversity can be retained in pens.

"Usually, species diversity of both mangrove flora and fauna is lower inside mangrove ponds compared to adjacent natural mangroves and open waters."

MFA systems have lower plant and animal species diversity, because focus has been shifted to the production of selected species (shrimp, milkfish, *Rhizophora*), at the expense of natural food webs and the onsite and offshore fisheries productivity they support. Natural mangrove vegetation is only fully retained in traditional systems such as the Indonesian tambak, but mangrove seedlings are planted in Indonesian silvofisheries ponds and in the shrimp-mangrove farms in Vietnam.

The regulatory functions of coastal protection, erosion control, flood regulation, and nutrient recycling are not jeopardised by this loss of diversity, so long as an adequate mangrove greenbelt is retained along shorelines and riverbanks.

This underlines a need for further research on appropriate mangrove and fish species for stocking and on an adequate mangrove to pond ratio, but also on an improved pond design and management to refine the major MFA systems which in the region have been mostly state-, rather than technology-driven.

About the author

J. H. Primavera, Ph.D., is a mangrove specialist and a researcher in the Southeast Asian Fisheries Development Center in the Philippines. Her work demonstrates that protecting mangroves can save lives and property from destructive typhoons, filter out silt runoff that kills coral reefs, provide nurseries to juvenile fish and shrimp, and renew fisheries catches. She has been awarded a Pew Fellowships in Marine Conservation for 2005 based on her outstanding work on mangroves.

Koi Herpesvirus – A new threat to fish culture: Mobilizing Southeast Asian Capacity

by Kazuya Nagasawa

Mass mortality of common carp cultured in Lake Kasumigaura, Japan (Photo courtesy of Takaji Iida, NRIA, Japan)

Introduction

Aquaculture production is the fastest growing agricultural sector in the world, especially in Asia. In 2002, countries in Asia produced 91.2 % of the total world aquaculture production (51.4 million tons by volume including aquatic plants). Although China is the biggest producer, countries in Southeast Asia also contribute a high percentage of world aquaculture production.

Diseases are the major constraint to the growth of aquaculture production in various parts of the world including Southeast Asia. Viral, bacterial and parasitic diseases cause significant losses in aquaculture production. In this region, some transboundary pathogens and diseases, like White Spot Syndrome Virus (WSSV), Epizootic Ulcerative Syndrome (EUS), Viral Nervous Necrosis Virus (VNNV) and Taura Syndrome Virus (TSV) have been reported to spread with the movement of live aquatic animals.

"Koi herpesvirus (KHV) is a new pathogen in Southeast Asia, where its infection was first detected in common and koi carps"

KHV in Southeast and East Asia: a New, Serious Threat to Freshwater Aquaculture

Koi herpesvirus (KHV) is a new pathogen in Southeast Asia, where its infection was first detected in common and koi carps (*Cyprinus carpio*) from Indonesia in March 2002. There is also fragmentary information that KHV is present in Malaysia. In neighbouring East Asia, KHV disease was found in pond-reared koi from Taiwan in December 2002 and in common carp cultured in Japan in November 2003. In Indonesia, there have been numerous cases of KHV-induced mass mortality of common carp and koi since 2002. Losses were

estimated to be more than 15 million US dollars as of December 2003. It has been thought that KHV was brought to Indonesia with koi imported from Hong Kong.

"The common carp is an important food resource in the rural areas of Southeast Asia and is abundantly cultured, especially in Indonesia."

The common carp is an important food resource in the rural areas of Southeast Asia and is abundantly cultured, especially in Indonesia. Koi, on the other hand, is internationally traded as an ornamental fish among Southeast Asian countries. Considering its high virulence and devastating impact on both food and ornamental aquaculture sectors, KHV is regarded as a new and very serious threat to carp culture in the region.

The Regional Fish Disease Project of SEAFDEC

The "Regional Fish Disease Project" is implemented at the SEAFDEC Aquaculture Department (AQD), in the Philippines, through the Government of Japan Trust Fund to address various fish disease problems and food safety issues in Southeast Asia. The first phase of the project entitled "Development of Fish Disease Inspection Methodologies for Artificially-Bred Seeds" started in 2000 and will end in 2004. It was initially planned to end in 2003 but it was extended to 2004 because of the urgent need to study KHV infection. After this first 5-year project, the second phase of the Regional Fish Disease Project has been proposed under the title of "Development of a Fish Disease Surveillance System" for another 5 years from 2004 to 2008.

Koi carp is internationally traded as an ornamental fish among Southeast Asian countries.

The Regional Fish Disease Project aims to: (1) enhance disease diagnosis and health management of aquatic animals in aquaculture in Southeast Asia; (2) promote healthy and wholesome trading of aquaculture products in the region; and (3) develop a fish disease surveillance network in the region.

Research is the main activity component of the Regional Fish Disease Project. Various aspects of viral, bacterial and parasitic diseases of fishes and shrimps have been studied. When the project started in 2000, research was carried out only by scientists of AQD. Subsequently scientists of research institutions under the Department of Fisheries, Thailand, and those of the Marine Fisheries Research Department of SEAFDEC in Singapore joined the project in 2001 and 2002, respectively. A total of 24 research studies were conducted from 2000 to 2003 in terms of (1) the establishment and standardisation of diagnostic methods, (2) biology and pathogenesis of disease pathogens, (3) disease prevention and control, and (4) establishment of evaluation methods for residual chemicals in aquaculture products.

Planning Meeting: KHV to be the focus of the Regional Fish Disease Project

Study leaders involved in the Regional Fish Disease Project met at the Annual Progress and Planning

The Regional Fish Disease Project: Activities

To achieve its objectives, the project conducted the following activities from 2000-2004:

1. ***Research*** to (1) develop standardized diagnostic methods for major diseases affecting economically important aquaculture species in the region; (2) develop effective prevention and control measures against microbial and parasitic diseases; (3) assess the pathogenesis of newly emerging diseases; and (4) develop monitoring methods for residual chemicals in aquaculture products.

2. ***Hands-on training*** to develop the capability in aquatic animal health diagnosis and management of technical staff working at research centres and institutions in the region.

3. ***International meetings*** to (1) discuss the status of fish disease problems, available diagnostic methods, and prevention and control measures employed in the region; (2) discuss the results of research studies conducted under the project and those generated in other countries in the region; (3) identify and discuss aquatic animal disease issues to be solved for further sustainable aquaculture growth; and (4) discuss collaboration with other international organizations like the Office Internationale des Epizooties (OIE).

4. ***Extension*** to disseminate research results and technology generated by the Project through (1) training courses on fish diagnosis and health management; (2) production of manuals; (3) publication of primary results in international scientific journals; and (4) presentation of results in international meetings.

Meeting held in Iloilo City, Philippines on 2nd-3rd December 2003 and discussed fish disease issues for 2004 and onward. During the discussion, several viruses were identified as serious, transboundary, pathogens that the Fish Disease Project should tackle as targets for fish disease surveillance in Southeast Asia. For fishes, these were KHV, spring viremia of carp virus (SVCV), and grass carp (*Ctenopharyngodon idella*) hemorrhagic virus (GCHV). For shrimps and prawns, the viruses were white spot syndrome virus (WSSV) and Taura syndrome virus (TSV) of black tiger shrimp (*Penaeus monodon*) and Pacific white shrimp (*Litopenaeus vannamei*), and the extra small virus (XSV) associated with white tail disease of the giant freshwater prawn (*Macrobrachium rosenbergii*). In particular, KHV was recognized as the pathogen that the project must combat most urgently.

Activities of SEAFDEC for KHV Disease under the Regional Fish Disease Project

Based upon the output of the meeting, AQD made a plan to implement various activities for KHV infection through the Regional Fish Disease Project. Some research studies were planned for 2004 under the first phase of the project, while others were for 2004-2008 under the second phase. AQD believes that the project should proceed efficiently in coordination with the SEAFDEC Member Countries.

Important activities for KHV disease, some of which were initiated in the first half of 2004, are as follows:

Research

During the first phase of the project, planned research includes the survey of the distribution of KHV in the region, standardization of the PCR (polymerase chain reaction) detection methods for the virus,

characterization of the virus isolated from the region, mode of transmission of KHV, and pathology of KHV-infected fish. These studies are presently being undertaken at AQD. Also, there will be a study to develop vaccines for KHV, using inactivated virus or a recombinant viral envelope protein, at the Fish Health Research Laboratory in Jakarta, Indonesia.

During the second phase of the project, when new information on KHV infection becomes available in the SEAFDEC Member Countries, AQD will dispatch a diagnosis team to disease sites to isolate the virus and diagnose the disease together with scientists of the country in question. In April and July 2004, a survey was actually conducted by scientists from AQD in Indonesia and Taiwan, respectively, in collaboration with the scientists of each respective country.

In addition to these activities under the Regional Fish Disease Project, in 2004 AQD joined a 3-year research project on KHV infection, which was funded by the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan. The National Research Institute of Aquaculture (based in Nansei and Tamaki, Mie, Japan) leads the project. Comparison of characteristics of KHV isolates from Asian countries is a research subject to be tackled at AQD.

Hands-on training

Since 2002, AQD has conducted annually a hands-on training on viral diseases of fishes and shrimp for scientists and technical staff working at research centres and institutions in Southeast Asia. The training course aims to provide executive training on the diagnosis of viral diseases to core persons from the SEAFDEC Member Countries. The trainees are expected to play key roles in the diagnosis, prompt information exchange, and surveillance of fish diseases and to serve as national trainers in their respective countries. For 2004, a special training course on KHV and some other important viral pathogens is planned for scientists from some countries of the region.

International meetings

The Regional Fish Disease Project organized two meetings in March 2004 and also convened another meeting in June 2004.

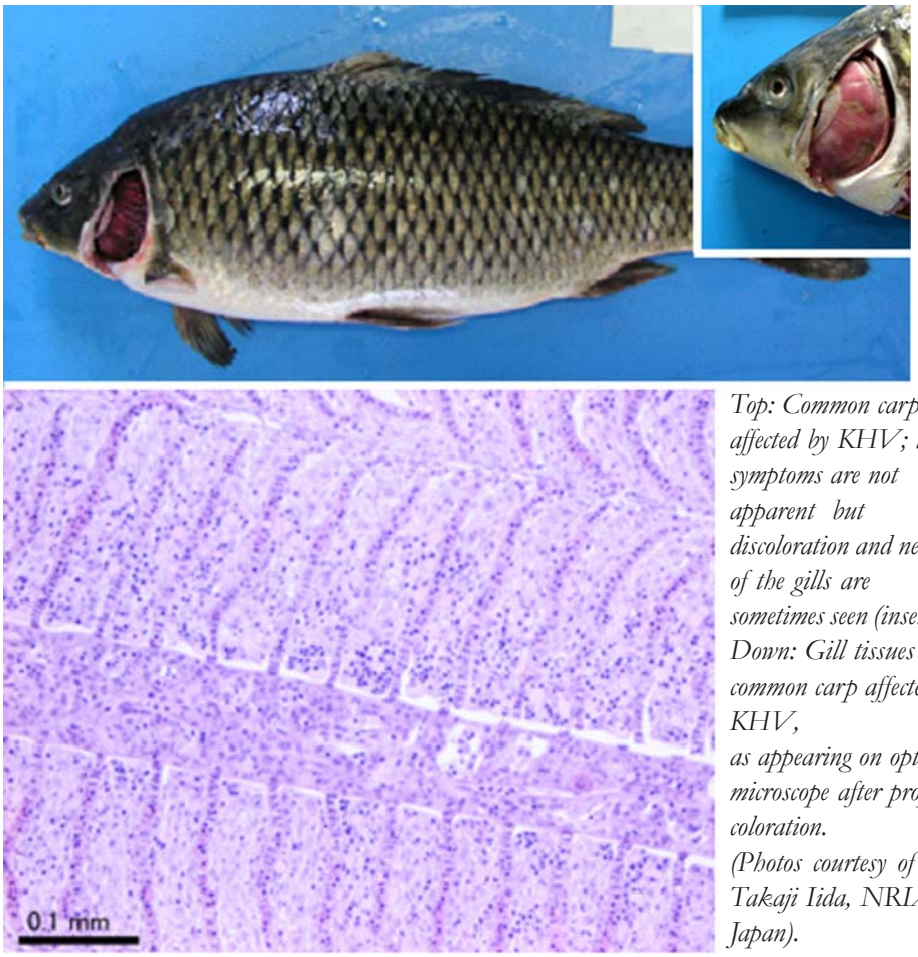
The Pre-KHVD Symposium Meeting was held at the Fisheries Research Agency (FRA) of Japan in Yokohama, Japan, on 12th March 2004 as a satellite meeting to the International Symposium on Koi Herpesvirus Disease. Participants in this meeting were nine scientists from the SEAFDEC Member Countries

The International Symposium on Koi Herpesvirus Disease was co-organized by FRA, SEAFDEC (through the Regional Fish Disease Project), MAFF and OIE in Yokohama on 13th March 2004 (photos courtesy of the Fisheries Research Agency, Japan).

(one participant from each country, except for Brunei) and three scientists from AQD. The scientists from the Member Countries reported on the current status of the KHV disease, fish disease quarantine and surveillance in their respective countries.

The International Symposium on Koi Herpesvirus Disease was co-organized by FRA, SEAFDEC (through the Regional Fish Disease Project), MAFF and OIE in Yokohama on 13th March 2004. This meeting was attended by scientists from Japan, the United States, South Korea, China, Israel and the Netherlands and scientists from the SEAFDEC Member Countries and AQD. A total of 16 papers were presented by invited speakers, and four of these speakers came from the region (Indonesia, Thailand, Singapore, and AQD). Information presented at the symposium varied from basic knowledge of KHV through epidemiology of KHV infection in Indonesia and Japan, KHV vaccine development in Israel, to fish disease quarantine in Singapore and Thailand. It was useful in understanding of various aspects of KHV infection including control and prevention.

A Meeting on the Current Status of Transboundary Fish Diseases in Southeast Asia: Occurrence, Surveillance, Research and Training was held in Manila, Philippines, on 23rd-24th June 2004. The meeting aimed to exchange the latest information on transboundary fish diseases and fish surveillance, research and training in Southeast Asian countries. The Regional Fish Disease Project funded 11 scientists from all SEAFDEC Member Countries, two invited speakers from Taiwan and Canada and 10 scientists from AQD to participate in the meeting. Two scientists, from OIE in Tokyo and the Network of Aquaculture Centres in Asia-Pacific (NACA) in Bangkok, also attended. Transboundary fish and shrimp pathogens, KHV, WSSV and TSV were highlighted. Thus, the meeting consisted of five discussion sessions: (1) KHV; (2) WSSV and TSV; (3) quarantine services of aquatic animal diseases; (4) surveillance, monitoring and diagnosis of aquatic animal diseases; and (5) research and training on diseases of aquatic animals. For each session, at least one invited lecture was given, followed by reports from the 10 Southeast Asian countries. During the first session, the current status of KHV infection was reported by scientists from Indonesia, Taiwan and Japan. Through the country reports, detailed information on the current status of KHV, WSSV and TSV also fish disease



Top: Common carp affected by KHV; the symptoms are not apparent but discoloration and necrosis of the gills are sometimes seen (inset) Down: Gill tissues of common carp affected by KHV, as appearing on optical microscope after proper coloration. (Photos courtesy of Takaji Iida, NRIA, Japan).

quarantine, surveillance, monitoring, diagnosis, research and training in Southeast Asian countries was assembled.

Extension

Research results will be published in international scientific journals, and standardized PCR diagnostic techniques will be disseminated through manuals and hands-on training. As the output of the Pre-KHVD Symposium Meeting, one report is available from AQD. FRA will publish in 2005 the proceedings of the International Symposium on Koi Herpesvirus Disease in the Bulletin of the Fisheries Research Agency, Supplement 2. By October 2004, AQD will publish the proceedings of the Meeting on the Current Status of Transboundary Fish Diseases in Southeast Asia: Occurrence, Surveillance, Research and Training (see further reading).

"...the Regional Fish Disease Project will mobilize existing [regional] capacity through various activities of research, training, international meetings and extension, and put in place an efficient regional network to control the spread of fish disease."

Conclusion

Transboundary pathogens of fish and shrimp can easily invade and spread through the international trade of aquatic animals in the region. We have so far experienced serious outbreaks of EUS and some other transboundary viral diseases caused by WSSV, VNNV and TSV. Now, we have another new viral pathogen, KHV. The SEAFDEC Aquaculture Department will continue to exert all efforts to prevent the spread of these transboundary diseases in the region in collaboration with each SEAFDEC Member Country and international organizations (e.g., OIE, NACA, and FAO). With these partners, the Regional Fish Disease Project will mobilize existing capacity through various activities of research, training, international meetings and extension, and put in place an efficient regional network to control the spread of fish disease.

Further reading

Lavilla-Pitogo, C.R. and K. Nagasawa (eds.)(2004). Transboundary Fish Diseases in Southeast Asia: Occurrence, Surveillance, Research and Training. Southeast Asian Fisheries Development Center/ Aquaculture Department, Iloilo, Philippines.

About the author

Kazuya Nagasawa, Ph.D. in fish parasitology and diseases, was a senior scientist of the Hokkaido Prefectural Fisheries Experimental Station (1981-1991) and National Research Institute for Far Seas Fisheries (1991-2001) and Director of the Nikko Branch of the National Research Institute of Aquaculture (2001-2003) in Japan. Since April 2003, he is Fish Disease Expert at the Aquaculture Department of Southeast Asian Fisheries Development Center (SEAFDEC), based in Tigbauan, Philippines.

Decentralization of marine fisheries management in Indonesia

A review with an economic perspective

By Arif Satria

Introduction

Decentralization in Indonesia was implemented under the establishment of *Undang-Undang (UU) 22/1999* (known as the local autonomy law) which is a result of the Reform movement initiated to correct the centralism practiced in the New Order of Soeharto era (1966-1998). By this law, local government has gained new authority in marine-fisheries management. According to this law, the sea area as far as 12 miles from the shoreline is under the provincial government authority, and within those 12 miles there are four miles directly under the authority of the local or district government. The local authorities' mandate includes: (a) exploration, exploitation, conservation, and marine resources management of the water area, (b) administrative management, (c) zone management, and (d) law enforcement of local regulations or central government regulations that are devolved to local government.

The content of UU 22/1999 indicates that the decentralization policy can be categorized as devolution, which is the strongest type of decentralization. This policy has the potential to have a positive impact by strengthening a community-based fisheries management system. Aside from devolution, the central government is also mandated to minimize its role as the project executive, and is willing to limit its role to regulation only. However, many projects are recommended to be only deconcentrated or delegated to the local level as the central government appears reluctant to share this authority.

"Decentralization in Indonesia was implemented under the establishment of the local autonomy law which is a result of the Reform movement initiated to correct the centralism practiced in the New Order of Soeharto era"

This deconcentration of authority, in Indonesia, is often meant as the execution of national development projects by the local government under the plans, budget, and supervision of the central government. The performance of such deconcentration in the marine and fisheries sector is the concern of this article.

Decentralization, deconcentration, delegation, and devolution: What are we talking about?

Decentralization has been defined as the transfer of authority and responsibility for public functions from the central government to subordinate or quasi-independent government organizations or even the private sector and community associations. There are three types of administrative decentralization: deconcentration, delegation, and devolution. *Deconcentration* is the transfer of decision making authority and management responsibilities to local government, which is still under the supervision of central government ministries. This form is often considered the weakest form of decentralization and is usually strongly implemented in unitary states. *Delegation* is the transfer of responsibility for decision-making and administration of public functions to semi-autonomous organizations whereas central government retains the right to take the power back. Eventually, *devolution* is the transfer of authority for decision-making, finance, and management to quasi-autonomous units of local government with corporate status and without reference back to central government.

Performance of Deconcentration

One of the indicators of deconcentration is the amount of budget managed by the local government. Since the establishment of the local autonomy law in 1999, the deconcentrated budget of marine and fisheries development and management has significantly increased, from Rp 142.67 billion in 2001 to Rp 764.14 billion in 2004. When looking at the funding of deconcentrated projects in regard to the total project funding, there is an increase from 34.77% in 2001 to 56.19% in 2004. Although serious progress has been achieved in 3 years, the central government still retains a large role in managing and executing projects together with the local government. To elaborate the performance of deconcentration of marine and fisheries development and management, the analysis can be divided into three types: (a) regional, (b) program type, and (c) the government level basis.

"One of the indicators of deconcentration is the amount of budget managed by the local government."

Regional Basis

The country is divided into a notional two parts: the Western Part of Indonesia (WPI) and Eastern Part of Indonesia (EPI). WPI covers Sumatra, Java, Bali, and some Kalimantan provinces, while EPI covers Sulawesi, Nusa Tenggara, Maluku, and Papua. WPI is recognized as a more developed region compared to EPI, as a consequence of national policy during the New Order that concentrated national development in the WPI region. However, when the reform era was initiated in 1999, the central government realized that the former development strategy focusing on WPI should be reformed and changed to being fairer between the two regions.

For the marine and fisheries sector, the deconcentrated budget is still dominantly allocated to the WPI, even though it is gradually declining toward a balanced situation. Although, in absolute values, the deconcentrated budget for WPI has increased from Rp 195.42 billion to Rp 413.26 billion between 2002 and 2004, its share of the total deconcentrated funding was reduced from 58.20% in 2002 to 54.08% in 2004. Meanwhile, the EPI thus received an increased share of the funding from 41.80% to 45.92%.

"Although serious progress [in decontrating fisheries management] has been achieved in 3 years, the central government still retains a large role in managing and executing projects together with the local government."

When looking at the amount of deconcentrated budget allocated to the provinces, it quickly appears the first three are the major provinces in Java: Central Java (7.98%), East-Java (6.16%), and West Java (5.50%). The province in the EPI that gains the highest share of deconcentrated budget is Maluku (4.73%). Why Maluku gets the highest budget among other provinces in EPI is linked to the national policy that attempts to help regions that have suffered in the past from severe damage because of social unrest. Maluku is damaged economically, physically, politically, and socially because of religious conflicts that have occurred since 1999.

From this detailed review, it can be concluded that even though there is shift in national development strategy to be more equal among regions, the majority of deconcentrated budget is still allocated to the WPI. This will be hopefully and progressively addressed as the potential for development of marine and fisheries resources in the EPI is much higher than in its western counterpart, already heavily exploited.

Program Basis

The Ministry of Marine Affairs and Fisheries classifies the program of marine and fisheries development into six types, as follows:

(a) Monitoring, Control, and Surveillance (MCS), aimed at increasing MCS activities to assure optimal and sustainable marine and fisheries development and management, with a goal of minimssing conflicts over marine and fisheries resource utilization, and to arrange a legal framework.

(b) Fisheries Resources Management and Development (FRMD), aimed at managing, developing, and utilizing marine and fisheries resources in optimal and sustainable ways to improve the people's income, quality of human resources, increased national income and foreign exchange, and employment.

(c) Conservation and Rehabilitation of Marine and Fisheries Resources (CRMF) aimed at promoting CRMF to enhance quality, and productivity of the resources, and to maintain sustainability also.

(d) Spatial Management (SM), aimed at optimizing the utilization of the space of coastal, shore, and small islands through an integrated approach, in an attempt to avoid any conflict of interest in the utilization of space.

(e) Research and technology development (RTD), aimed at supporting the optimisation of marine and fisheries management through promoting

Table 1. Allocation of Deconcentrated Budget Based on Program (in million rp.): Monitoring, Control, and Surveillance (MCS), Fisheries Resources Management and Development (FRMD), Conservation and Rehabilitation of Marine and Fisheries Resources (CRMF) Spatial Management (SM), Research and technology development (RTD), and Human Resources Development (HRD)

Program	2002		2003		2004	
	Value	%	Value	%	Value	%
MCS	4,400	0.94	6,800	0.98	21,440	2.68
FRMD	448,511.8	95.55	665,500	95.83	757,540	94.67
CRMF	4,050	0.86	6,500	0.94	6,800	0.85
SM	0	0.00	0	0.00	0	0.00
RTD	10,425	2.22	15,650	2.25	14,440	1.80
HRD	2,000	0.43	0	0.00	0	0.00
Total	**469,386.8**	**100.00**	**694,450**	**100.00**	**800,220**	**100.00**

RTD in various areas, including capture fisheries, aquaculture, marine technology, non-renewable resources, processing, and socio-economics, and the dissemination of information and technology.

(f) Human Resources Development (HRD), aimed at developing human resources of the government in various areas: planning, execution, and regulation.

From the six types of program held by the government, FRMD is primarily dominant in the allocation of the deconcentrated budget (Table 1). During 2002-2004, around 95% of the deconcentrated budget was allocated for FRMD programs, whereas CRMF was less than 1%. RTD's allocation has decreased from 2.22 % to 1.8%. This data show that the central government is still mostly focusing on promoting the economic benefit of marine and fisheries development in regional areas. This also reflects that the economic aspect of fisheries development is the main concern of central government.

Government Level Basis

There are three levels in the deconcentration process: provincial government, municipal government, and Technical Executing Unit (TEU), which belong to central government. The central government still focuses the allocation of the deconcentration budget to the provincial government. In 2004, the allocation for the provincial government (30.81%) is highest than for the other levels, even though it is less compared to previous years. Meanwhile, the deconcentrated budget for the municipal government (allocated to the Empowerment of Economic Coastal Communities or EECC program, as described below) was equivalent to 9.78% in 2004 while the deconcentrated budget for TEU is 15.59%, which is higher than the share received by municipal government.

"The central government is still mostly focusing on promoting the economic benefit of marine and fisheries development in regional areas,... with the economic aspect of fisheries development still the main concern."

The dominance of the provincial government in handling deconcentration programs leads to some problems. The provincial government does not often involve the municipal level in either the planning or implementation processes of the programs. In effect, the municipal governments are not responsible over the program or projects even though those are held within the municipal territory. This situation affects the performance of the projects and has some "missing link" with the programs initiated directly by the municipal government. Therefore, this "missing linkage" leads to inefficiency and ineffectiveness of the deconcentrated programs. In other words, the municipal government often becomes "a guest" in its own "home".

One case of deconcentration to a regency government, through the EECC program, is in Lombok Barat, Nusa Tenggara Barat Provinces. The program started in 2001 until 2004 with the amount of block

Table 2. Funds for Economic Empowerment for Coastal Community Programs in Lombok Barat (in Rp.)
Source : Dinas Perikanan dan Kelautan, LBR, 2004

Years	Block Grant	Accompanying Fund (provided by the LBRG)	Percentage
2001	600,000,000	70,200,000	11.7
2002	950,000,000	98,000,000	10.3
2003	962,500,000	160,044,000	16.6
2004	791,660,000	769,781,000	97.2

grant provided by the central government as shown in Table 2. One of the requirements to get this block grant from the central government was that the local government would be providing an increasing accompanying fund. The Lombok Barat regency Government (LBRG) has provided amounts ranging from 10.3% to 97.2% from 2001 to2004.

Deconcentration of the EECC program to the regency governments was criticized by the provincial government, which stated that the program should be deconcentrated to the provincial level rather than the regency level. One of the reasons advanced is that the provincial government has the mandate to be "representative" of central government to the lower levels, so all programs initiated by the central authorities should be handled by the provincial government. Meanwhile, the regency government thinks that the provincial government is a coordinating agency instead of an executing agency, so all programs that are deconcentrated by the central government should go directly to the regency.

"The provincial government does not often involve the municipal level in either the planning or implementation processes of the programs. In effect, the municipal governments are not responsible over the program or projects even though those are held within the municipal territory."

As a result, the central government tried to moderate the opposite views and placed the provincial government as an agency for monitoring and controlling the program. Moreover, the provincial government was endorsed as a channel for the regency to submit its proposal or application to the central government. The implementation of the program nonetheless remained under the authority of the regency government.

Back to LBRG, the deconcentration of the EECC program is perceived as the proper way of deconcentration. Some positive effects of such deconcentration were reported as follows:

a) the LBRG becomes more responsible to make the program successful

b) the LBRG is better informed about the local conditions, leading to a better implementation of the program

c) It is easier for the LBRG to coordinate and link the related programs and thus avoid overlap

"This exemplifies the old concept that marine areas belong to all."

Fiscal Decentralization

The implementation of the fiscal decentralization in Indonesia is based upon another *Undang-Undang* (No 25/1999) concerning a financial sharing system between central and local government. Based upon this law, the central government obtains20% of the value of local fisheries revenue, which may stem from taxes or fees, whereas 80% goes to the local government. It is important to state that the total amount collected at the central level from the marine and fisheries sector is redistributed to all the local governments of Indonesia, without exception, even to local areas not involved in fishing. This is different from the forestry case, where 80% will be returned only to local areas producing

forestry products, whereas non forestry-production areas will not benefit from the sharing system. Moreover, the 20% remaining goes to the central government. This two-fold regulation seems unfair and discourages the areas where livelihoods rely upon fishing. This exemplifies the old concept that marine areas belong to all.

Aside using the sharing system, the regencies governments have other sources of revenue, called *Dana Alokasi Khusus (DAK)* or the specific allocation fund for the marine and fisheries sector. DAK, which stems from the national budget, is allocated by the central government for infrastructure development purposes, like the rehabilitation of fish landing sites, hatchery stations, or fish markets. In 2004, the value of DAK for marine and fisheries sector was Rp 305.47 billion, distributed to 202 regencies with more than Rp 1 billion for each municipality. To get access to DAK funding, the municipal governments are required to choose the projects, prepare proper proposals, and provide a Municipal Budget as a complement for DAK. The central government has several criteria for consideration when deciding how the DAK will be distributed, which the municipal governments must take into account. These are as follows:

1.) Because of limited budgets, the municipal government are required to choose the projects based upon their top priority

2.) The project scale is determined by the minimum need identified

3.) Infrastructure development or rehabilitation must avoid conflict over land use

4.) The municipal governments are obliged to provide accompanying funds of at least 10 % of the DAK, and an initial budget for land clearance, project design, consultancy costs, and supervision costs.

5.) The municipal governments are required to consult and coordinate with the provincial government concerning the preparation of projects, including the selection of site, detailed design, and budget

6.) The provincial governments are required to continuously monitor and evaluate the implementation of the projects within their area of authority

Concluding Remarks

The establishment of *UU* 22/1999 is effectively encouraging the central government to share authority to the lower levels. In the deconcentration of marine and fisheries development and management authorities, there is a positive trend shown by a rise of budget allocated to local government. Nevertheless, there are some critical points regarding such deconcentration processes that remain to be addressed.

Firstly, the central government still prevails in the management and execution of the most costly projects rather than the local government. Secondly, even though there is a shift in national development strategy toward more equality between regions, the majority of deconcentrated budget is still allocated to the Western Part of Indonesia. Thirdly, central government appears to concern with the economic aspects of fisheries resources management and development (FRMD) programs for deconcentration. Fourthly, central government still focuses the allocation of the deconcentration budget to the provincial government rather than the municipal government. The regencies government's capacity on these issues, even if still limited, is not acknowledged fully yet. On the contrary, deconcentration to the municipal level is actually very effective as shown by EECC program case.

"there is a shift in national development strategy toward more equality between regions, although the majority of deconcentrated budget is still allocated to the Western Part of Indonesia"

To strengthen the decentralization of the marine and fisheries development and management responsibility, the central government should be consistent in sharing the authority with the local government and improving the legal framework and policy process with respect to the spirit of decentralization. On the other hand, at the local level, the capacity of the local government must be enhanced to meet the principles of decentralization: accountability, efficiency, and effectiveness. Lastly, the mutual trust among the central, provincial, and municipal government is necessary for better decentralization of the management of the marine and fisheries sector.

Further Readings:

Satria Arif, Yoshiaki Matsuda. 2004. Decentralization Policy : An Opportunity for Strengthening Fisheries Management Systems. *The Journal of Environment and Development*, Vol 13, No 2, 179-196

Satria Arif, Yoshiaki Matsuda. 2004. Decentralization of Fisheries Management in Indonesia. *Marine Policy* Vol 28, 437-450

Satria Arif, Yoshiaki Matsuda: 2004. Decentralization Policy: An Opportunity for Strengthening Fisheries Management Systems, *the Journal of Environment and Development*, Vol 13, No 2, 179-196

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About the author

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[Events Calendar]

Date / Venue	Events	Organizer
2004		
7-9 Sep Malaysia	Regional Technical Meeting on Sea Turtle Tagging	SEAFDEC/MFRDMD
7 Sep - 6 Oct Philippines	Training Course on Crab Seed Production	SEAFDEC/AQD
13-16 Sep Malaysia	Third Technical Consultation Meeting on Information Collection for Sustainable Pelagic Fisheries in the South China Sea	SEAFDEC/MFRDMD
27 Sep – 15 Oct Singapore	MFA-JICA Regional Training Course in Seafood Safety Management	SEAFDEC/MFRD
18-22 Oct Philippines	Special Training on PCR Diagnosis for Koi Herpes Virus	SEAFDEC/AQD
21 Oct – 9 Nov Philippines	Training Course in Mangrove-Friendly Aquaculture	SEAFDEC/AQD
26-29 Oct Thailand	Regional Technical Consultation on Regionalization of the Code of Conduct for Responsible Fisheries (RCCRF) Phase IV: Post-Harvest Practices and Trade	SEAFDEC/Secretariat and MFRD
8-9 Nov Malaysia	Technical Working Group Meeting on the Indicators for the Sustainable Development and Management of Capture Fisheries in the ASEAN Region	SEAFDEC/MFRDMD
8-24 Nov (on-line course)	On-line Training Course on Principle Photography for Extension Work	SEAFDEC/TD
9-12 Nov Thailand	Regional Workshop on Artificial Reefs in Southeast Asia	SEAFDEC/TD
17-26 Nov Philippines	Training Course in Abalone Hatchery and Grow-out	SEAFDEC/AQD
22-24 Nov Malaysia	Technical Consultative Meeting on Information Collection for Sustainable Pelagic Fisheries in the South China Sea	SEAFDEC/MFRDMD
23-26 Nov Thailand	Regional Technical Consultation on Right-Based Management for Small Scale Coastal Fisheries	SEAFDEC/Secretariat
25-26 Nov Malaysia	Turtle Expert Meeting	SEAFDEC/MFRDMD
7-17 Dec Thailand	Training Course on Ecosystem Effects of Fishing	SEAFDEC/TD
14-16 Dec Singapore	2nd Regional Technical Consultation on ASEAN-SEAFDEC Fish and Fish Products Safety Information Network and 1st Planning Meeting	SEAFDEC/MFRD
2005		
17-20 Jan Philippines	Special Training Course on Detection White Spot Syndrome Virus by PCR	SEAFDEC/AQD
20-22 Jan Philippines	International Workshop of the Biology, Culture, Fisheries, and Stock Enhancement of Portunid Crabs	SEAFDEC/AQD
1-3 Feb Thailand	Regional Technical Consultation on Fish Trade and Environment	SEAFDEC/Secretariat
15-18 Feb Indonesia	FAO-SEAFDEC Regional Workshop on the Improvement of Fishery Data and Information Collection Systems	SEAFDEC/Secretariat
28 Feb-4 Mar Thailand	Regional Workshop/Training on the Use of Geographical Information System for Fisheries Management	TD
1-4 Mar Philippines	RTC on the Aquaculture of *P. Vannamei* and Other Exotic Shrimps in Southeast Asia	SEAFDEC/AQD
8-25 Mar Thailand	International Training Course on Coastal Fisheries Management	SEAFDEC/TD

Southeast Asian Fisheries Development Center (SEAFDEC)

What is SEAFDEC?

SEAFDEC is an autonomous intergovernmental body established as a regional treaty organization in 1967 to promote sustainable fisheries development in Southeast Asia.

Objectives

SEAFDEC aims specifically to develop fishery potentials in the region through training, research and information services in order to improve food supply through rational utilization of fisheries resources in the region.

Functions

To achieve its objectives the Center has the following functions:

1. To offer training courses, and to organize workshops and seminars, in fishing technology, marine engineering, extension methodology, post-harvest technology, and aquaculture;
2. To conduct research and development in fishing gear technology, fishing ground surveys, post-harvest technology and aquaculture, to examine problems related to the handling of fish at sea and quality control, and to undertake studies on the fisheries resources in the region; and
3. To arrange for the transfer of technology to the countries in the region and to make available the printed and non-printed media, which include the publication of statistical bulletins for the exchange and dissemination related to fisheries and aquaculture development.

Membership

SEAFDEC members are the ASEAN Member Countries (Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam) and Japan.

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In the occasion of the Millennium Conference, a drawing contest was organized for the children among ASEAN-SEAFDEC Member Countries, on the theme of 'Fish and the Culture'. This is the best drawing from Malaysia.