

SEAFDEC

ANNUAL REPORT 2010



Southeast Asian Fisheries Development Center

Preparation and Distribution of this Document

SEAFDEC Annual Report 2010 was prepared by the Secretariat of the Southeast Asian Fisheries Development Center (SEAFDEC), in collaboration with the SEAFDEC Departments, namely: the Training Department (TD), the Marine Fisheries Research Department (MFRD), the Aquaculture Department (AQD), and the Marine Fishery Resources Development and Management Department (MFRDMD). The publication is distributed to the SEAFDEC Member Countries and Departments, other relevant fisheries-related agencies and organizations, as well as to the public to promote the activities and visibility of the Center.

Bibliographic Citation

SEAFDEC. 2011. SEAFDEC Annual Report 2010. Southeast Asian Fisheries Development Center, Bangkok, Thailand. 68 pp.

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Executive Summary

In the year 2010, SEAFDEC continued the implementation of programs and activities that aim to enhance sustainable development of fisheries in the Southeast Asian region. These programs and activities were formulated and implemented in-line with the policy directives and priority actions guided by the SEAFDEC Member Countries. The programs were categorized into: Departmental Programs (9 programs), ASEAN-SEAFDEC Strategic Partnership FCG Programs (22 programs) and Other Programs (2 programs); and could be grouped into scopes of activities, namely: 1) Responsible Fishing Technologies and Practices; 2) Exploration and Monitoring of Fishery Resources and Its Utilization; 3) Management for Sustainable Fisheries; 4) Conservation and Management of Aquatic Species under International Concerns; 5) Post-harvest Technology and Safety of Fish and Fisheries Products; 6) Sustainable Aquaculture Development; 7) Fisheries for Food Security and Poverty Alleviation; 8) Activities in Response to the Emerging Needs and Concerns of the Region; and 9) Human Capacity Development in Fisheries.

Throughout the year, SEAFDEC also collaborated with several international/regional organizations as well as with non-Member Countries in the implementation of its activities. These included the ASEAN Foundation; the Association of the Southeast Asian Nations; the Fats and Proteins Research Foundation Inc. (USA); the Food and Agriculture Organization of the United Nations (FAO); the Fisheries Research Agency (FRA), Japan; the GAIA Mariculture Pte. Ltd. (Singapore); the Hokkaido University, Japan; the Japan International Research Center for Agricultural Sciences; the National Agriculture Training Council (NATC), Malaysia; the National Fisheries University (NFU), Japan; the North Carolina State University; the Research Institute for Humanity and Nature (RIHN) of Japan; the United Soybean Board of USA; the University of Tehran, Iran; the Vocational Education Commission of Thailand; the WorldFish Center; as well as several collaborating partners for the preparation and organization of the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 scheduled to be organized in 2011.

This SEAFDEC Annual Report 2010 has summarized the achievements of activities implemented in 2010; and the planned activities for 2011, together with the challenges for SEAFDEC in supporting the Member Countries in their efforts to achieve sustainable development of fisheries, and enhancing the contributions from fisheries to the well-being of people in the region.

CONTENTS

About SEAFDEC	1
SEAFDEC Council in the Year 2010	3
SEAFDEC Senior Officials in the Year 2010	5
Message from the Chairperson of the SEAFDEC Council	6
Message from SEAFDEC Secretary-General	8
Overview of SEAFDEC in the Year 2010	10
Summary of SEAFDEC Activities in the Year 2010	13
1. Responsible Fishing Technologies and Practices	13
2. Exploration and Monitoring of Fishery Resources, and Its Utilization	13
3. Management for Sustainable Fisheries	17
4. Conservation and Management of Aquatic Species under International Concerns	24
5. Post-harvest Technology and Safety of Fish and Fisheries Products	28
6. Sustainable Aquaculture Development	31
7. Fisheries for Food Security and Poverty Alleviation	46
8. Activities in Response to the Emerging Needs and Concerns of the Region	48
9. Human Capacity Development in Fisheries	50
Cooperation with Donors and Partner Organizations in 2010	53
SEAFDEC Programs in the Year 2011	60
Enhancing SEAFDEC Visibility	63
SEAFDEC Income and Expenditures in 2010	66



SEAFDEC/TD

SEAFDEC/MFRD

SEAFDEC/AQD

SEAFDEC/MFRDMD

About SEAFDEC

The Southeast Asian Fisheries Development Center (SEAFDEC) is an autonomous inter-governmental body established in 1967. The mandate of SEAFDEC as endorsed by the 41st Meeting of the SEAFDEC Council is “to develop and manage the fisheries potential of the region by rational utilization of the resources for providing food security and safety to the people and alleviating poverty through transfer of new technologies, research and information dissemination activities”. SEAFDEC comprises 11 Member Countries: Brunei Darussalam, Cambodia, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam. The Center operates through the Secretariat located in Thailand and has four technical Departments, namely: the Training Department, the Marine Fisheries Research Department, the Aquaculture Department, and the Marine Fishery Resources Development and Management Department.

The Secretariat

The SEAFDEC Secretariat is mandated to coordinate and oversee the general policy and planning of the Center and acts as the focal point for channeling and implementing the decisions and resolutions of the SEAFDEC Council of Directors. In addition, the Secretariat also organizes regular SEAFDEC meetings to obtain directives and guidance from the Member Countries on the operation of the organization, as well as regional technical consultations and meetings on issues as recommended by the Member Countries.

The Training Department (TD)

Established in Thailand in 1968, TD has been focusing on the development of modern fishery techniques to aid regional fisheries in a more sustainable approach through the promotion of responsible fishing technologies and practices, exploration of resources, and advancing the coastal fisheries management approach. With the new TD Strategic Plan endorsed in 2006, TD's structure and activities have been adjusted to emphasize on the promotion of coastal fisheries management to ensure responsible resource utilization and sustainable livelihoods in coastal communities, and the promotion of off-shore fisheries through the development of best fishing practices and energy optimization to ensure stable supply of food fish and reduce fishing pressure in coastal areas.

The Marine Fisheries Research Department (MFRD)

MFRD was established in Singapore in 1969, and is responsible for promoting, undertaking, and coordinating research in fisheries post-harvest technology and furthering the development of the fish processing industry in the region. Its task includes research and development on fisheries post-harvest technology and practices, such as fish processing technology to optimize the utilization of harvested fish and enhancing the quality and safety of fish and fisheries products. MFRD also develops technology-based analytical methods to assess seafood safety and quality, and publishes several manuals as reference materials for the Member Countries.

The Aquaculture Department (AQD)

AQD was established in the Philippines in 1973, and has been carrying out research, technology verification, training and information dissemination on a wide range of aquaculture disciplines, including broodstock management and seed quality improvement, promotion of responsible and environment-friendly aquaculture, diagnosis and control of aquaculture diseases, aquaculture for stock enhancement, and culture of aquatic species under international concerns. The aquaculture commodities covered by AQD include fishes, shrimps, mud crab, mollusks, and seaweeds. In addition, AQD also promotes good aquaculture practices and effective management of aquatic resources to support rural development and alleviate poverty.

The Marine Fishery Resources Development and Management Department (MFRDMD)

Established in Malaysia in 1992, MFRDMD is mandated to conduct activities on marine fisheries resources focusing on biological studies of commercially important fish species, resource assessment and management, and conservation and management of aquatic species under international concerns, *e.g.* sharks and marine turtles. MFRDMD also implements activities that support the Member Countries in information gathering of inland capture fisheries, and the use of indicators for sustainable development and management of fisheries.

SEAFDEC COUNCIL IN THE YEAR 2010

Chairperson of the SEAFDEC Council: Dr. Bounkhouang Khambounheuang

SEAFDEC Council and Alternate Council Directors

Brunei Darussalam

Council Director:	Hajah Hasnah binti Ibrahim Director, Department of Fisheries
Alternate Council Director:	Abd. Halidi bin Mohd. Salleh Deputy Director, Department of Fisheries

Cambodia

Council Director:	H.E. Dr. Nao Thuok Director-General, Fisheries Administration
Alternate Council Director:	H.E. Dr. Sam Nouv Deputy Director-General, Fisheries Administration

Indonesia

Council Director:	Dr. Martani Huseini Director-General of Fisheries Product Processing and Marketing
Alternate Council Director:	Dr. Made L. Nurdjana Director-General of Aquaculture

Japan

Council Director:	Mr. Jun Yamashita Deputy Director-General, Fisheries Agency
Alternate Council Director:	Mr. Shigeo Shimizu Director, First Country Assistance Planning Division, Economic Cooperation Bureau

Lao PDR

Council Director	Dr. Bounkhouang Khambounheuang Director-General, Department of Livestock and Fisheries
Alternate Council Director	Dr. Somphanh Chanphenxay Deputy Director-General, Department of Livestock and Fisheries

Malaysia

Council Director:	Dato' Junaidi bin Che Ayub (until August 2010) Director-General of Fisheries Malaysia Dato' Ahamad Sabki bin Mahmood (from November 2010) Director-General of Fisheries Malaysia
Alternate Council Director:	Mr. Ahamad Sabki bin Mahmood (until November 2010) Deputy Director-General of Fisheries Malaysia Mr. Ismail bin Abu Hassan (from December 2010) Deputy Director-General of Fisheries (Development), Malaysia

Myanmar

Council Director:	Mr. Khin Ko Lay Director-General, Department of Fisheries
Alternate Council Director:	Mr. Kyaw Myo Win Deputy Director-General, Department of Fisheries

Philippines

Council Director:	Atty. Malcolm I. Sarmiento, Jr. Director, Bureau of Fisheries and Aquatic Resources
Alternate Council Director:	Mr. Gil A. Adora Assistant Director for Technical Services, Bureau of Fisheries and Aquatic Resources

Singapore

Council Director:	Ms. Tan Poh Hong Chief Executive Officer, Agri-Food & Veterinary Authority of Singapore
Alternate Council Director:	Mr. Leslie Cheong (until March 2010) Director, Food Supply & Technology Department Ms. Tan-Low Lai Kim (from April 2010) Assistant Director (Post-harvest), Agri-food & Veterinary Authority of Singapore

Thailand

Council Director:	Dr. Somying Piumsombun Director-General, Department of Fisheries
Alternate Council Director:	Dr. Wimol Jantararothai (until March 2010) Deputy Director-General, Department of Fisheries Dr. Nuntiya Unprasert (from March 2010) Deputy Director-General, Department of Fisheries

Vietnam

Council Director:	H.E. Dr. Luong Le Phuong Vice Minister, Ministry of Agriculture and Rural Development (MARD)
Alternate Council Director:	Dr. Chu Tien Vinh Director-General, Department of Capture Fisheries and Resources Protection (DECAFIREP)

SEAFDEC SENIOR OFFICIALS IN THE YEAR 2010

Secretary-General

| *Dr. Chumnarn Pongsri*

Deputy Secretary-General

| *Mr. Hideki Tsubata (until March 2010)*

| *Mr. Kenji Matsumoto (from April 2010)*

Training Department (TD)

Chief

| *Dr. Chumnarn Pongsri*

Deputy Chief

| *Mr. Hideki Tsubata (until March 2010)*

| *Mr. Kenji Matsumoto (from April 2010)*

Marine Fisheries Research Department (MFRD)

Chief

| *Mr. Yeap Soon Eong*

Aquaculture Department (AQD)

Chief

| *Dr. Joebert D. Toledo*

Deputy Chief

| *Dr. Teruo Azuma*

Marine Fishery Resources Development and Management Department (MFRDMD)

Chief

| *Ms. Mahyam Mohd. Isa*

Deputy Chief

| *Dr. Osamu Abe (until March 2010)*

| *Dr. Masaya Katoh (from April 2010)*



MESSAGE FROM THE CHAIRPERSON OF THE SEAFDEC COUNCIL

Dr. Bounkhouang Khambounheuang

Fisheries of the Southeast Asian region are operated in the marine, coastal and inland waters. Since the establishment of SEAFDEC in 1967, most of its activities that support the region's fisheries development had been undertaken with priority given to maximize the utilization of marine fishery resources. Later, focus had shifted towards ensuring sustainable utilization and management of coastal resources in response to the priorities and needs of the Member Countries. The initiatives and efforts made by SEAFDEC had been well appreciated by the Member Countries as these had contributed to the fisheries development of the region. While before the expertise of SEAFDEC accentuated in marine and coastal fisheries, after Lao PDR became a member of SEAFDEC in 2003, SEAFDEC started to take into consideration the importance of inland fisheries in ensuring steady supply of food fish for the protein requirements of the peoples in the region, more particularly for Lao PDR being the only landlocked country in this region. Since then, the programs and activities implemented by SEAFDEC put greater emphasis in ensuring the sustainable development of the region's inland fisheries.

The entry of Lao PDR into SEAFDEC and together with all other Member Countries has made SEAFDEC the only fisheries related organization that embraces all the member states of the ASEAN plus Japan. This enabled the ASEAN and SEAFDEC to subsequently establish the ASEAN-SEAFDEC Strategic Partnership. However, within the 11 Member Countries, development disparities and differences in areas of priority in fisheries had become noticeable among and between the countries. Nevertheless, through the ASEAN-SEAFDEC collaborative platform, the activities of SEAFDEC had been aimed at contributing to the sustainable development of fisheries in the region as a whole, while assistance had also been particularly placed to the less developed countries to narrow the disparity and development gap among the countries. As Chairperson of the SEAFDEC Council for 2010-2011, I would like to congratulate SEAFDEC for implementing programs and activities that address the priorities and needs of all Member Countries during the past years, and hope that these activities would be pursued further for the benefit of the countries in the region.

The SEAFDEC Council also acknowledged with much appreciation the initiatives undertaken by SEAFDEC in collaboration with all Member Countries in 2010, especially with regards to the preparatory works for the ASEAN-SEAFDEC Conference “Fish for the People 2020: Adaptation to a Changing Environment” scheduled in June 2011. As a sequel Conference to the first ASEAN-SEAFDEC Conference in 2001, the Fish for the People 2020 Conference is considered very important for the region as the draft Resolution and Plan of Action are envisaged to be adopted by our ASEAN-SEAFDEC Ministers and Senior Officials at the Conference. Consequently, such instruments would provide the Member Countries and SEAFDEC with re-aligned direction in fisheries development and management for food security in preparation for the ASEAN Community Building which is envisaged to be realized in 2015. It is expected that this Resolution and Plan of Action would also give rise to vivid directives for SEAFDEC to adjust its Program Framework as well as its Structure for the sustainable development of fisheries in Southeast Asia.

From my own self, I would also like to express my sincere gratitude to all Council Directors and to the SEAFDEC Secretariat and Departments for the excellent support extended to me during my term as the Chairperson of the Council, which had enabled me to fulfill the required tasks. I am certain that similar support or even better would be given to the new Chairperson of the SEAFDEC Council for the good of SEAFDEC and the peoples of our region in the years to come.



(Bounkhouang Khambounheuang, Ph.D.)
Director-General, Department of
Livestock and Fisheries of Lao PDR,
and Chairperson of the SEAFDEC Council
for 2010-2011



MESSAGE FROM THE SECRETARY-GENERAL

Dr. Chumnarn Pongsri

While acknowledging the importance of fisheries for food security, livelihood and economic development for people in the Southeast Asian region during the recent years, SEAFDEC also recognized the emerging issues and challenges which could impede the sustainable development of fisheries and thus, should be taken into consideration in every effort towards ensuring the sustainability of the sector. The emerging concerns that were particularly given focus by SEAFDEC during the past years include those that relate to the development of technologies that could ensure stable supply of fishery products from capture fisheries and aquaculture, mitigating the impacts of fisheries to the environment and ecosystem (and *vice versa*), enhancing the sustainable utilization of fishery resources and combating IUU fishing to facilitate trade of fish and fishery products, generating science-based information as basis for the formulation of policies and plans for sustainable fisheries, and strengthening human resource expertise in fisheries to ensure the long-term sustainability of the fisheries sector.

The year 2010 had therefore been one of the most significant years of SEAFDEC in terms of the initiatives and activities which had been intensified to ensure that these are in accordance with the priorities and needs of the Member Countries. In addition, activities were also undertaken during the year to pave the way for a new era of sustainable fisheries development in the region through the envisaged outcomes of the ASEAN-SEAFDEC Conference “Fish for the People 2020: Adaptation to a Changing Environment” scheduled to be organized in 2011, preparations of which had been well under way in 2010.

On behalf of the SEAFDEC Departments and the Secretariat, I also wish to take this opportunity to express our sincere appreciation to all the Member Countries for providing guidance and support to SEAFDEC throughout the year 2010. Such continual support has allowed SEAFDEC to develop and implement activities that better serve the priorities and interests of the Member Countries. We could therefore assure the Member Countries that SEAFDEC would sustain its utmost effort in providing the necessary technical services in order to achieve sustainable fisheries in the region. I also wish to express our gratitude to all partner organizations for collaborating with SEAFDEC in the implementation of activities and in sharing/exchanging expertise during the year, which has enhanced the significant effects of the SEAFDEC activities to a wider group of beneficiaries both from within and outside the region. It is also our further wish that such cooperative spirit would be strengthened in the future for the sustainability of fisheries that would ultimately benefit the fisherfolks in the Southeast Asian region.



(Chumnarn Pongsri, Ph.D.)
SEAFDEC Secretary-General

OVERVIEW OF SEAFDEC IN THE YEAR 2010

During the year 2010, the activities of SEAFDEC were implemented in line with the policy directives as given by the SEAFDEC Member Countries during the SEAFDEC annual meetings, *i.e.* the 32nd Meeting of the SEAFDEC Program Committee (16-18 November 2009, Malaysia), 12th Meeting of the Fisheries Consultative Group of the ASEAN-SEAFDEC Strategic Partnership (FCG/ASSP) (19-20 November 2009, Malaysia), and the 42nd Meeting of SEAFDEC Council (5-9 April 2010, Lao PDR).

The formulation and implementation of the SEAFDEC programs of activities in 2010 were also guided by the regional and international fisheries policy frameworks, particularly the Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region adopted by the ASEAN-SEAFDEC Ministers during the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security in the New Millennium: "Fish for the People" in 2001. In addition, since the establishment of the ASEAN-SEAFDEC Strategic Partnership in 2007, SEAFDEC also supported the ASEAN in implementing activities that aim to contribute to achieving the ASEAN goal in the realization of ASEAN Economic Community, particularly on the ASEAN Roadmap for Integration of Fisheries Sector, the ASEAN Integrated Food Security (AIFS) Framework, and the ASEAN Community Building which is expected to be achieved by the year 2015.

The programs implemented by SEAFDEC in 2010 include:

Departmental Programs

1. Center-wide Information Network (Secretariat)
2. Information and Communication Technology (TD)
3. Tailor-made Training and Study Tour (TD)
4. Integrated Mollusk Production (AQD)
5. Mud Crab and Shrimp Domestication (AQD)
6. Marine Fishes (AQD)
7. Small-holder Freshwater Aquaculture (AQD)
8. Seaweed Strain Improvement (AQD)
9. Aquatic Ecology (AQD)

ASEAN-SEAFDEC FCG/ASSP Programs

1. Assistance for Capacity Building in the Region to Address International Trade-related Issues (Secretariat)
2. Improvement of Statistics and Information for Planning and Management of Fisheries in the ASEAN Region (Secretariat)
3. Activities Related to Climate Change and Adaptation in Southeast Asia with Special Focus on the Andaman Sea (Secretariat)

4. Promotion of “One Village, One Fisheries Products (FOVOP)” System to Improve the Livelihood for the Fisheries Communities in ASEAN Region (Secretariat)
5. Human Resource Development (HRD) for Poverty Alleviation and Food Security by Fisheries Intervention in the ASEAN Region (Secretariat)
6. ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 (Secretariat, in collaboration with all Departments)
7. Responsible Fishing Technologies and Practices (Fishing in Harmony with Nature) (TD)
8. Sustainable Utilization of Potential Fisheries Resources and Reduction of Post-harvest Losses (TD)
9. Fisheries Resource Survey and Operational Plan for M.V. SEAFDEC 2 (TD)
10. Deep Sea Fisheries Resources Exploration in the Southeast Asia (TD)
11. Information Collection of Highly Migratory Species in Southeast Asian Waters (TD)
12. Development of Regional Database for Fishery Management (TD)
13. Promotion of Rights-based Fisheries and Co-management Towards Institutional Building and Participatory Mechanism for Coastal Fisheries Management (TD)
14. Rehabilitation of Fisheries Resources and Habitats/Fishing Grounds through Resource Enhancement (TD)
15. Chemical and Drug Residues in Fish and Fish Products in Southeast Asia: Biotoxins Monitoring in ASEAN (MFRD)
16. Traceability Systems for Aquaculture Products in the ASEAN Region (MFRD)
17. Promotion of Sustainable and Region-oriented Aquaculture (AQD)
18. Resource Enhancement of International Threatened and Over-exploited Species in Southeast Asia through Stock Release (AQD)
19. Accelerating Awareness and Capacity-building in Fish Health Management in Southeast Asia (AQD)
20. Food Safety of Aquaculture Products in Southeast Asia (AQD, in collaboration with MFRD)
21. Tagging Program for Economically-important Pelagic Species in the South China Sea and Andaman Sea (MFRDMD)
22. Research and Management of Sea Turtles in Foraging Habitats in the Southeast Asian Waters (MFRDMD)

Other Programs

1. Cetacean Research in Southeast Asian Waters: Cetacean Sighting Program (TD)
2. Promotion of Inland Small-scale Fisheries Management through Rights-based Fisheries and Co-management Towards Institutional Building and Participatory Approaches (TD)

The progress of the program activities implemented in 2010 has been approved by the 33rd SEAFDEC Program Committee Meeting (30 November - 2 December 2010, Thailand) and the 13th Meeting of the Fisheries Consultative Group of the ASEAN-SEAFDEC Strategic Partnership (FCG/ASSP) (3-4 December 2010, Thailand).

SUMMARY OF SEAFDEC ACTIVITIES IN THE YEAR 2010

1. Responsible Fishing Technologies and Practices

TD has implemented activities to promote responsible fishing technologies and practices in collaboration with the Southeast Asian countries, particularly under the program on “Responsible Fishing Technologies and Practices (Fishing in Harmony with Nature)”. In 2010, TD continued the activities by extending technical assistance to the Member Countries on the aspects of selective fishing gears and devices to reduce discards and by-catch of juveniles and trash fish in the region. Specifically, TD advanced the adoption of selective fishing gears to the Department of Fisheries of Thailand (1-2 September 2010), while assistance for assessing the impacts from various kinds of fishing gears and practices on the fisheries resources, environment and ecosystem was also extended to the Philippines (18-22 October 2010) in collaboration with its Bureau of Fisheries and Aquatic Resources with support from Tokyo University of Marine Science and Technology of Japan (TUMSAT) and Kasetsart University of Thailand.



Practical Session on discards and by-catch management

In addition to the activities implemented at the national level, TD also collaborated with the FAO/UNEP/GEF Project for the project on “Reduction of Environmental Impact from Tropical Shrimp Trawling through the Introduction of By-catch Reduction Technologies and Change of the Management” or “REBYC”, especially in the promotion of Juvenile and Trash Excluder Devices (JTEDs) in the region.

Under this collaborative framework, TD collaborated with FAO for the organization of the Regional Workshop on Discards and By-catch Management from 4 to 7 May 2010, which focused on the development of a logical framework to consider the national and regional prioritized issues. The log-frame analysis had served as basis for the formulation of Phase II of the REBYC Project which has SEAFDEC as the regional collaborating agency. The workshop also came up with project annual plan to further enhance the application of JTEDs, particularly in the Philippines where the country’s Local Governmental Units have recently adopted the JTEDs, as well as in other countries in the region.

2. Exploration and Monitoring of Fishery Resources, and Its Utilization

2.1 Exploration and Fishery Resources Survey in the Southeast Asian Waters

In order to obtain better understanding on the status of fishery resources in the Southeast Asian waters, SEAFDEC in collaboration with the Member Countries has been undertaking collaborative fishery resources surveys using the M.V. SEAFDEC 2 since the vessel was

granted by the Government of Japan in 2003. Activities were also undertaken to explore the under-exploited fisheries resources including aquatic animals living at the un-trawlable grounds in the Southeast Asian waters, as well as development of appropriated on-board and on-shore post-harvest technologies for the catches.

In 2010, fisheries resources surveys and data collection was conducted in the waters of Brunei Darussalam and Malaysia. For Brunei Darussalam, the consultation visit was conducted during 25-28 May 2010 to discuss the research survey plan in the EEZ of Brunei Darussalam; and the deep-sea fisheries resource survey was carried out from 15 September to 14 October 2010. The main activities include oceanographic survey using ICTD, IKMT, bongo and neuston nets, temperature-dept sensor, current indicator, as well as other water quality parameters. Demersal resources surveys were also conducted using bottom beam trawl, otter-board trawl and deep sea trap, as well as acoustic survey.

For Malaysia, TD, in collaboration with the Department of Fisheries Malaysia and Fisheries Research Institute of Sarawak, SEAFDEC/MFRDMD, and Office of State Fisheries Sabah, undertook a cruise to conduct actual survey on fisheries resources (including biological and physical oceanographic parameters) in Sabah and Sarawak Area from 28 June to 11 August 2010. Sampling gears, namely beam trawl, bottom vertical longline, deep-sea trap, squid jigging, pelagic longline, were used for the survey. During these two cruises, on-the-job training on methodologies for fisheries resources survey in un-trawlable ground of Malaysian and Brunei waters also provided.



Onboard sorting of fish species caught during the fishery resources surveys

Moreover, from 16-20 October 2010, TD also organized a Training Workshop on the Research Methodology for the Study of Impacts from Fishing on Deep-sea Ecosystems, in collaboration with the Department of Fisheries Brunei Darussalam to enhance human resource capacity and knowledge on research methodologies to study the impacts of fishing activities on the ecosystems.

2.2 Information Collection on Highly Migratory Species

TD had initiated the program on “Information Collection on Highly Migratory Species in Southeast Asian Waters” since 2008 to review and evaluate the status of tuna fisheries and production in the Southeast Asian waters. The program also intends to develop the regional database for tuna using the information collected from selected landing sites of four participating countries, namely: Indonesia, Philippines, Thailand and Vietnam, and the tuna statistics reported to SEAFDEC by these countries. A Working Group was established with representatives from the participating countries as members, to support the coordination, planning and implementation of the activities.

In 2010, collection of information on the origin of tuna and neritic tuna species caught in the participating countries was continued based on records at the selected landing sites using a one-year cycle data collection framework. In addition, the Third Meeting of the Working Group for Information Collection of Highly Migratory Species was organized on 24-25 May 2010 in Phuket, Thailand where the representatives from the participating countries presented the progress of their data collection activities at selected tuna landing sites since 2008. The Meeting also discussed and identified the future project activities that would support tuna information collection, including the implementation of pilot study on the use of tuna fishing logbook to improve the collection of tuna information especially in the project participating countries, namely Indonesia, Philippines, Thailand and Vietnam (IPTV countries).

Based on the outcomes of the Third Meeting of the Working Group, further consultations with the participating countries recommended that a pilot program on the use of tuna fishing logbook would be developed in close consultation with the countries considering the specificities of each IPTV countries. Moreover, as planned the results of the analysis of data from the worksheet for tuna data collection would be used as basis for the development of the regional database.

2.3 Tagging Program for Important Pelagic Species

Pelagic fishes usually migrate over variable distances across the oceans for their spawning and feeding requirements, as well as towards the required optimum environmental conditions for the fishes, *e.g.* water current, temperature, salinity, plankton abundance. Tagging is one of the methods for studying the migratory patterns of small pelagic fishes, and the information obtained from tagging activities would be useful for the identification of small pelagic fish stocks and shared stocks in the Southeast Asian region. Since 2008, MFRDMD in collaboration with TD has conducted the “Tagging Program for Economically-important Pelagic Species in the South China Sea and Andaman Sea” with the involvement of Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Thailand, and Vietnam.

During the early phase of the program, the Standard Operation Procedures (SOP) for tagging small pelagic fish in the region was formulated. Posters on the tagging activities were also published using the respective national languages and distributed in the concerned countries to promote awareness of the tagging activities and to inform the public on the need to provide information and feedback on the recaptured tagged fish. Databases such as the “Data Management Software for Small Pelagic Fish” and “Data on Tagging” were developed and used to gather the data collected under this program.

On 8-9 March 2010, MFRDMD organized the “Third Meeting of Core Experts on Tagging Program for Economically-important Pelagic Species in the South China Sea and Andaman Sea” in Malacca, Malaysia. The Meeting discussed the outcomes of the tagging activities



Participants of the 3rd Core Expert Meeting on economically-important pelagic fish species held on 8-9 March 2010 in Malacca, Malaysia.

conducted by each participating country, and formulated the implementation plan for 2010 and onwards.

The tagging operations were conducted in the South China Sea and Andaman Sea in 2010 where the target species included the Indian mackerel (*Rastrelliger kanagurta*), Indo-pacific mackerel (*R. brachysoma*), shortfin scad (*Decapterus macrosoma*), and Japanese scad (*D. maruadsi*), which are also the major species exploited by the fisheries in the region, especially using purse seines. Until December 2010, a total of 12,600 fishes were tagged in the Andaman Sea comprising 56% of the target number of the fishes to be tagged. The percentage of achievement was slightly lower in the South China Sea where only 44% of the target 54,400 fishes were tagged. Information of the tagged fish was verified and



Tagging activities in Brunei Darussalam: a) Transfer of live fish from purse seine to holding cages; b) Healthy fish for tagging; c) Tagging process ensures proper handling of fish; and d) Active tagged fish ready to be released.

inputted into the database by the technical officers of the participating countries. Currently, the recovery of the released tagged fish was 137 and 255 fishes in the Andaman Sea and in the South China Sea, respectively.

3. Management for Sustainable Fisheries

3.1 Supporting the Establishment of Regional Fisheries Management Mechanism

SEAFDEC has continued to actively cooperate with the Member Countries and major regional initiatives for the promotion and strengthening of regional cooperation and joint approaches in major fisheries management issues. Under the ASEAN-SEAFDEC Strategic Partnership (ASSP), SEAFDEC have been able to support the ASEAN policy development through the ASEAN Working Group on Fisheries (ASWGFi) and the Senior Officials Meeting of the ASEAN Ministers on Agriculture and Forestry (SOM-AMAF). The support provided by SEAFDEC was instrumental in the development of the ASEAN Fisheries Consultative Forum (AFCF), where in its Work Plan, the identified priority fisheries management areas had close linkage with several activities undertaken by SEAFDEC. The “key cluster areas” identified by AFCF with corresponding lead countries are: 1) Combating IUU Fishing (Indonesia); 2) Promoting Sustainable Fisheries Practices comprising the sub-clusters (a) Fishing Capacity and Responsible Fishing Practices (Malaysia), (b) Conservation of Biodiversity and Enhancing Fisheries Resources (Vietnam), and (c) Fish for Aquaculture Feeds (Myanmar); 3) Fisheries Co-management (Cambodia); 4) Adaptation and Mitigation of the Impacts of Climate Change (Philippines); 5) Fisheries Post-harvest and Food Safety (Singapore); 6) Strengthening ASEAN Joint Approaches/Positions on International Trade-related Issues (Thailand); 7) Information, Education and Communication to Support Development and Management of Fisheries (Brunei Darussalam); and 8) Capacity Building (Lao PDR). During its participation in the second Meeting of the AFCF (21-22 June 2010 in Brunei Darussalam), SEAFDEC provided inputs on the activities that it has been implementing in relation to each key cluster area. In this respect, SEAFDEC was identified as a key partner in many aspects of the implementation of the Work Plan. In the subsequent regional consultations, it was deemed necessary to strengthen and boost the initiatives undertaken by the lead countries with regards to their respective key cluster areas.

Moreover, in promoting regional fisheries management approaches including trade and socio-cultural aspects, the importance of building upon the process to develop the ASEAN Community by 2015 was recognized, more particularly, the ASEAN Economic Community Blueprint and the ASEAN Socio-Cultural Blueprint, during the ASEAN-SEAFDEC Regional Technical Consultation on Adaptation to a Changing Environment on 1-4 November 2010 in Bangkok, Thailand.

Along this direction and in order to provide advice to SEAFDEC Council on issues relevant to fisheries management in the region, the Regional Advisory Committee for Fisheries Management in Southeast Asia (RAC) was established as an advisory body to the SEAFDEC Council. Specifically, the issues identified and recommendations made during the second



Regional Technical Consultation on Adaptation to a Changing Environment (above); and SEAFDEC Secretary-General participation in the 18th ASWGFi Meeting (left)

Meeting of RAC on 2-4 September 2009 in Thailand, were reported to SEAFDEC Council during its 42nd Meeting in April 2010.

3.2 Combating IUU Fishing

SEAFDEC has been supporting the implementation of activities to combat the Illegal, Unreported and Unregulated (IUU) fishing, with particular emphasis on sub-regional and regional fisheries management. Specifically in 2010, activities related to the issues on management of overfishing capacity and harmonizing fishing records at the regional level were carried out. The Expert Consultation on Managing Fishing Capacity to Combat IUU Fishing in Southeast Asia was conducted on 15-17 September 2010 in Bangkok, Thailand to address the growing concern among the ASEAN-SEAFDEC Member Countries on the need to combat IUU fishing in the region, improve cooperation among concerned agencies, and develop a mechanism for “information sharing” among countries in order to address fishing over-capacity and combat IUU fishing. Considering that definitions, terminologies, and classification of fisheries vary among the Southeast Asian countries, SEAFDEC was in particular requested to compile and analyze the existing registration systems, catch documentation procedures and port State measures implemented by the Member Countries and come up with a “harmonized” mechanism that could address IUU fishing and comply with the EC regulations and requirements. Furthermore, a series of the On-site Training Sessions and Workshops on Integration of Fisheries and Habitat Management and the Management of Fishing Capacity were conducted, such as those in Medan, North Sumatra,

Indonesia (19-22 July 2010), and in Langkawi, Malaysia (23-26 November 2010). The main objective of these activities was to raise awareness and provide capacity building on key management issues especially those concerning the process of establishing MCS network(s), fishing vessel record, port monitoring, including providing inputs into the forms for Vessel Record and Inventory and Port Monitoring at provincial level starting with the Andaman Sea countries.

SEAFDEC also participated in relevant events to share information and experiences based on the activities undertaken by SEAFDEC on management of fisheries capacity and combating IUU fishing, such as the Second ASEAN Fisheries Consultative Forum (21-25 June 2010, Brunei Darussalam), the National Workshop on the Bay of Bengal Large Marine Ecosystem of Mergui Archipelago (13-14 July 2010, Ranong Province, Thailand), the Third APFIC Regional Consultative Forum Meeting (1-3 September 2010, Juju, Korea), and the Seminar on Monitoring, Control and Surveillance (MCS) Network and Fishery Resources and Management under the Sub-Regional Group of Southern and Eastern Area of South China Sea (SESCS) and Sulu-Sulawesi Seas (SSS) (8-10 December 2010, Malacca, Malaysia). SEAFDEC also collaborated with FAO/APFIC, the FAO Global Program and the Regional Plan of Action to Promote Responsible Fishing Practices including Combating IUU Fishing in the Region (RPOA-IUU). Furthermore, SEAFDEC since mid-2010 had explored ways and means of having the activities of the SEAFDEC-Sida project complement with those of the new JTF initiative on combating IUU fishing, in order to reach a common goal.



Participants in the Expert Consultation on Managing Fishing Capacity to Combat IUU Fishing in Southeast Asia



On-site Training on the Integration of Fisheries Management into Habitat Management and the Management of Fishing Capacity

3.3 Ecosystem Approach to Fisheries

With a common objective of promoting an ecosystem approach to fisheries, the collaboration for the integration of fisheries management into habitat management was established among the ASEAN and ASEAN Member Countries (especially in the Andaman Sea and Gulf of Thailand areas), SEAFDEC, FAO/APFIC, Mangroves for the Future Project, and other concerned agencies. The cooperation includes the newly started project under the Bay of Bengal Large Marine Ecosystem (BOBLME) Project focusing on sub-regional and on-site level human resource development activities. Through the BOBLME Project, India which is not a member of SEAFDEC was invited to the First Meeting of the Andaman Sea Sub-region in October 2009. As a result, the outcomes resulted in better and more coordinated implementation of the activities in the Andaman Sea Sub-region, while the set of criteria for the spatial designation of larger fisheries resources conservation areas (*refugia*) was established. Moreover, the capacity of staff at provincial and district levels in management of fisheries had been enhanced, particularly on aspects related to critical coastal habitats, protected coastal features and fishing capacity, including aspects of adaptation to the impacts of climate change. On-site training sessions were held in four provinces, namely: North Sumatra (Indonesia), Langkawi (Malaysia), Ranong (Thailand), and Yangon (Myanmar) with support from the BOBLME. The outcomes provided enhanced understanding on critical habitats and the importance of mitigating measures to adapt to climate change. Inviting participants from neighboring countries to each of the aforementioned activities had paved the way for better understanding of the broader impact in promoting agreements between and among countries on habitat and fisheries management including the need to adapt measures to mitigate the impacts of climate change.

Furthermore, drafting of plans was initiated by the countries around the Andaman Sea Area that are intended, in a broader ecosystems approach context, to promote sustainable exploitation of resources, maintain coastal geographical features, and mitigate the potential impacts of future disasters and climate change by giving emphasis on the integration of fisheries management into habitat management (*refugia*). More importantly, the next step will be a continued dialogue focusing on trans-boundary resource management including trans-boundary habitats and important fish stocks. Initial indications point towards the need to look at mackerels (*Rastrelliger* spp.) and related fish species.

3.4 Habitat Conservation and Resources Enhancement

Starting in 2010, TD had initiated the program on “Rehabilitation of Fisheries Resources and Habitat/Fishing Grounds for Resources Enhancement”, which aims to develop strategies and guidelines, and enhance human resources of the region to support future activities relevant to resources enhancement. Under the program, an environmental survey was carried out at the installed artificial reefs in Banphe District, Rayong Province, Thailand on 31 August to 4 September 2010. Information on several fish species and environmental parameters, e.g. species diversity, were collected through fishing operation survey using

fish trap, bottom gill-net, hand line, benthos collector, juvenile fish trap. In addition, species diversity observation using the underwater video recorder was also conducted.



Survey on identification and evaluation of fisheries ecosystem



TD in collaboration with the Fisheries Research Agency of Japan organized a Workshop on Artificial Reefs for Enhancement of Fishery Resources

At the regional level, TD collaborated with the Fisheries Research Agency (FRA) of Japan to support the sharing of information and experiences among the Southeast Asian countries and Japan on various aspects related to artificial reefs. Moreover, FRA also organized the Workshop on Artificial Reefs for Enhancement of Fishery Resources in Tokyo, Japan on 11-12 November 2010, where information on installation of artificial reefs, scientific-based designs, and methods for evaluation of artificial reef deployment projects, were shared and discussed among the representatives from the countries as well as those from SEAFDEC and FRA.

Apart from the activities on artificial reefs, enhancements of fishing grounds have also been monitored as well as the rehabilitation the sea grass beds especially in Sriboya Island of Krabi Province, Thailand, which was identified as a pilot site. Specifically, the status of the sea grass beds of Sriboya Island in the Andaman Sea covering 2,720 ha with 11 known sea grass species was investigated through the fisheries resources survey conducted from 22 to 26 November 2010.

For resource enhancement in inland ecosystems, the preliminary survey on identification and evaluation of fisheries ecosystems was conducted from 8 to 11 June 2010 in the freshwater reservoirs of Lao PDR such as the Nam Ngum, Nam Houm, and Nam Mang. The survey aimed to gather information on the status of the fisheries resources and the environment conditions of the three reservoirs as well as to discuss with officers of the Department of Livestock and Fisheries of Lao PDR and other relevant institutions the relevant project operation plans, and to investigate the appropriate reservoir to be selected as pilot site under the program.

SEAFDEC also supported the discussion and expert consultation on issues relevant to resources enhancement, habitat improvement and ecosystem intervention, as well as on reduction of impacts from fishing on marine and coastal resources. The Regional Technical Consultation on Sustainable Fisheries Management was organized at TD on 12-15 October 2010, where the recommendations made would serve as basis for discussion on the relevant

issues during the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 scheduled in June 2011.

3.5 Promotion of Innovative Fisheries Management

TD has been promoting the application of innovative fisheries management, particularly through co-management and rights-based fisheries for over a decade. Fisheries co-management and right-based fisheries are considered as applicable approaches to help reduce conflicts among users sharing common fishery resources, particularly for coastal and inland fisheries. While “fisheries co-management” is a known credible concept to provide opportunities for user-based organizations to share certain management authorities and collaborate with government-based agencies in the management of fisheries resources, “rights-based fisheries” focuses in securing the small-scale fishers’ rights to fish and is vigorously promoted in the region. In addition, rights-based fisheries has also been envisaged to help reduce competition and social conflicts in the exploitation of fishery resources, and contribute to the effective management of fishing capacity and fishing efforts.

Ultimately, these approaches could improve the livelihood and well-being of fishers, and ensure the sustainable utilization of fishery resources in the region. Thus, starting in 2008, this initiative was placed under the program on “Promotion of Rights-based Fisheries and Co-management towards Institutional Building and Participatory Mechanism for Coastal Fisheries Management” implemented by TD. In order to enhance the promotion of innovative fisheries management, TD organized two regional training courses, namely: the “Regional Training Course on Co-management Using Group User Rights for Enhancing Small-scale Fisheries Development and Management” on 20-28 September 2010 in Samut Prakan, Thailand; and the “Regional Training Course on Coastal Fisheries Management and Extension Methodology” from 2 to 26 November 2010 also in Samut Prakan. The former course aimed to promote and strengthen the capability of the participants to comprehend the concept and regional guidelines for co-management using group user rights for small-scale fisheries, while the latter was aimed to familiarize the participants with the principles, concepts and needs for radical change in coastal fisheries management and the roles of fishing communities in the sustainable development and management of coastal resources as well as strengthen the practical competence of the participants in planning and carrying out extension work focusing on the essential participation of fishers and fishery organizations.

3.6 Fishery Statistics and Information

Since 2007, SEAFDEC has been implementing the program on “Improvement of Statistics and Information for Planning and Management of Fisheries in the ASEAN Region: Towards Better Utilization and Harmonized Information for Fisheries Management in Southeast Asia”. The program aims to enhance the capacity of the Member Countries in the collection of fishery statistics and information to support sustainable management of fisheries, and harmonize the standards, definitions and classification of fishery statistics of the region with the international standards developed under the global framework of the Coordinating Working Party on Fishery Statistics (CWP). Compilation of fishery statistics of the Member

Countries is an on-going activity under the program. In 2010, the Fishery Statistical Bulletin for 2008 was published while those of 2009 are being compiled based on the new Regional Framework for Fishery Statistics of Southeast Asia using questionnaires and streamlined reporting of statistics that had been harmonized with the FAO processes. Database system was also developed to enhance public accessibility to the fishery statistics compiled by SEAFDEC since 1976, as well as data and information derived from other projects undertaken by SEAFDEC. The database can be accessed through <http://fishstat.seafdec.org/>.

During the year, SEAFDEC organized the Regional Technical Consultation on Fishery Information and Statistics in Southeast Asia on 19-21 January 2010 in Bangkok, Thailand particularly to provide a platform for exchanging experiences in the development of the National Status and Trends on Fisheries and Aquaculture (STF and STA) by the participating countries, namely: Philippines, Thailand and Indonesia. The Consultation provided recommendations on policy directives, priority areas and strategies for future development and implementation of activities, and on future cooperation relevant to the improvement of fishery statistics and information in the region. Moreover, SEAFDEC also provided relevant regional statistical information during the 23rd Session of CWP and the 6th Session of the Fishery Resources Monitoring System (FIRMS) Steering Committee on 22-26 February 2010 in Hobart, Australia. The involvement of SEAFDEC in CWP and FIRMs would ensure that the development of statistics of the region are in line with those undertaken at the international level, and that the regional specificity and uniqueness of fisheries in the region are properly reflected and globally recognized.



SEAFDEC representative chairing the CWP Inter-session Meeting in Phuket, Thailand



The 23rd Session of CWP and the 6th Session of the Fishery Resources Monitoring System (FIRMS) Steering Committee

SEAFDEC also participated in the COFI Sub-committee Meeting on Aquaculture organized from 27 September to 1 October 2010 in Phuket, Thailand and the 1st CWP Inter-session Aquaculture Group Meeting on 2 October 2010 in Phuket, Thailand. The participation of SEAFDEC in such fora could support the further streamlining of regional statistics with international standards, classification and definition of fishery statistics at the international level especially on aquaculture statistics. Specifically, in the development of the CWP Handbook on Standard of Aquaculture Statistics, SEAFDEC was requested to provide expertise to enhance the capacity and improve the methodologies in data collection as well as the streamlined definitions and standards for statistics data collection in the future.

4. Conservation and Management of Aquatic Species under International Concerns

4.1 Sea Turtles

Seven species of sea turtles are known to inhabit the waters of the Southeast Asian region which are also recognized as one of the world's major sea turtles nesting sites. Regional cooperation among countries in the region in the conservation of sea turtles is therefore vital to ensure the survival of the species. In 2010, MFRDMD in collaboration with TD initiated the program on "Research and Management of Sea Turtles in Foraging Habitats in the Southeast Asian Waters" which aimed to collect information on sea turtles in foraging habitats, reduce sea turtle mortality caused by fishery activities, and formulate management plan to protect sea turtles in the region. In March 2010, MFRDMD organized the Regional Planning Workshop to discuss the overall project plan covering the period 2010-2014, and the research plan of 2010. In July 2010, an ecological survey was conducted in a pilot foraging habitat of sea turtles, *e.g.* on bottom fauna and flora, with technical officers from Brunei Darussalam and Malaysia taking part to enhance their capacity in the survey. Water quality parameters such as salinity, temperature, turbidity, and chlorophyll content were also monitored in the foraging habitat.

Tagging of sea turtles using inconel tags was continued by MFRDMD at the focused nesting sites of the participating countries, while tag recovery had been monitored. In Malaysia, more than 1,300 turtles were tagged in 2010 comprising 80% green turtles while the rest were hawksbill, olive Ridley and leatherback turtles. Moreover, 65 sea turtles were also tagged in Myanmar, 423 in the Philippines, and 357 in Vietnam. In addition to inconel tagging, satellite telemetry studies for a leatherback turtle was also conducted in collaboration with the Department of Fisheries Malaysia. On the part of TD, collection of information on the interaction of sea turtles with fishing was continued in order to come up with responsible fishing gears that could reduce the sea turtles by-catch. The activity was also aimed at promoting and raising awareness on the use of C-hook in hook-and-line fishing in the SEAFDEC Member Countries to minimize the by-catch of sea turtles.



Research on sea turtle foraging populations by satellite telemetry study



Research on sea turtle foraging populations by genetic study

4.2 Sharks

In the Southeast Asian region, the issue on conservation and management of shark is among those given high priority since 2002 due to the rising number of proposals for the listing of several commercially-exploited species of sharks into the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendices. Upon the request of the Member Countries, SEAFDEC developed the framework to support the collection of data and information on sharks production and utilization in the region, and supported the establishment of National Plan of Action on Conservation and Management of Sharks by countries in the region.

The result could provide scientific evidence as required by CITES in order that listing of shark species in the Appendices could be refrained. Since there were several proposals for listing of sharks species in the CITES Appendices in 2010, it had become imperative for SEAFDEC to organize the *ad-hoc* Meeting of Shark Experts in the Southeast Asian Region on 28-29 January 2010 in Samut Prakan, Thailand, to discuss and compile the scientific and technical information on sharks available in the region, and develop policy recommendations on and for the improvement of information collection and initiatives that could support management and assessment of shark stocks. The outcome of the Meeting was further discussed at the Regional Technical Consultation on International Fisheries-related Issues on 2-4 February 2010 in Bangkok, Thailand, where a harmonized position was developed among the Member Countries opposing the proposed listing of shark species in the CITES Appendices. Such position was successfully reflected by the Member Countries during the 15th Session of the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (COP15-CITES) in March 2010.

During the 13th FCG/ASSP Meeting on 3-4 December 2010 in Bangkok, Thailand, the issue on possible re-listing of sharks species into CITES Appendices was considered. In this regard, SEAFDEC was requested to continue providing support to the Member Countries in coming up with relevant information and scientific evidence to support the development of the common position of the Member Countries in the future. In particular, the FCG/ASSP identified the priority areas that should be undertaken by SEAFDEC, *i.e.* improvement of data collection on sharks at the national level to improve compilation of fishery statistics and information on sharks and rays in the region (*e.g.* CPUE, stock assessment, population dynamics), and implementation of HRD activities on the species identification of major shark species in the region.

4.3 Cetaceans

Cetaceans are among the species under international concern, where the issues on conservation and management of the species have been raised at various fora, particularly those convened by CITES and the International Whaling Commission (IWC). The program on “Cetacean Research in Southeast Asian Waters: Cetacean Sighting Program” was therefore initiated and undertaken by TD starting in 2008.



Onboard sighting survey of cetaceans

The on-going activities focused on gathering information on cetaceans (both marine and freshwater species) through sighting programs making use of the existing research cruises of SEAFDEC and the Member Countries, gathering of relevant secondary data, and enhancing human resources capacity of the Member Countries in undertaking relevant research to better understand the abundance of cetaceans in the EEZs and beyond of the Southeast Asian countries. In 2010, cetacean sightings were

conducted during the cruises of the M.V. SEAFDEC 2 to/from the EEZ waters of Brunei Darussalam (25-28 May 2010) and Malaysia (28 June-11 August 2010)

From 23 to 25 November 2010, TD also organized the “Regional Training Program on Cetacean Information Gathering and Research Methodology on Cetacean Stock Assessment” in Chachoengsao Province, Thailand, where the experiences and lessons learnt from national and regional initiatives and research studies relevant to cetacean (particularly on stock assessment) were shared. The training was envisaged to enhance the human capacity of the Member Countries in the conduct of cetacean sighting and stock assessment, and provide orientation on actual sighting survey of cetaceans and onboard actual sighting survey to enable the Member Countries to conduct their own sighting surveys in the future.

4.4 Resource Enhancement of International Threatened and Over-exploited Species in Southeast Asia through Stock Release

Undertaken by AQD, this project aims to contribute to: 1) resource conservation of internationally threatened and over-exploited species in Southeast Asia; and 2) sustainable utilization and exploitation of natural coastal resources in the region through environment-friendly stock enhancement. The project has two main components: 1) research on stock enhancement of internationally threatened species and regionally over-exploited species; and 2) human capacity building. As a sequel to the project on ‘Stock Enhancement of Threatened Species under International Concern’ which was completed in 2009, this new project which is funded by the Japanese Trust Fund 5 focuses on the refinement of hatchery and nursery technologies as well as development of release strategies for internationally threatened and over-exploited species. In 2010, the major outcomes attained include the following:

- a) In the refinement of the feeding study to improve seed production of seahorse *Hippocampus* spp., the broodstocks of *H. comes* fed with Mysids had better reproductive performance and the juveniles (1-6 months old) had better growth and survival, compared to those fed different types of food such as *Artemia*, *Acetes*, and their combinations.

- b) The Napoleon wrasse *Cheilinus undulatus*, a high-value and over-exploited fish species in tropical waters, spawned naturally under captive conditions almost all year-round. However, the hatching rates were very low and survival period after hatching was only until day four. Although various types of food were tested, further search for suitable larval food is still needed for the establishment of the appropriate hatchery production techniques of this species.
- c) For the community-managed sandfish *Holothuria scabra* sea ranching and stock release, assessment of potential sites for sea ranching and stock release; production of juveniles from broodstock obtained from the release site; and identification of the fisherfolk partners in the study site on Molocaboc Island of Negros Occidental, Philippines were pursued. The knowledge and skills of the partners had been strengthened through seminars on the biology, ecology and culture of sandfish.
- d) In the monthly monitoring survey of abalone *Haliotis asinina* in Carbin Reef, Negros Occidental, Philippines, better survival was obtained when bigger hatchery-reared abalone were released in the wild. The hatchery-bred abalone exhibited the same habitat preference as their wild conspecifics, with highest density observed in areas with branching coral cover.



The stock enhancement team prior to release of AQD hatchery-bred *H. asinina* in Sagay Marine Reserve



AQD hatchery-bred *H. asinina* inside PVC pipes after release.

- e) For the genetic variation of abalone and mud crab using microsatellite analysis, samples collected from the wild and hatchery reared were brought to Japan. The preliminary results from the mtDNA sequence information at the two coding regions (COI and COII) showed 23 different haplotypes based on the analysis of 155 abalone samples. This indicates that mtDNA sequence markers based on COI and COII can be used to distinguish the hatchery from wild stocks making it an effective tool for monitoring stocks in enhancement and conservation programs. Results from the microsatellite analysis have yet to be completed in order that its efficacy as a monitoring tool will be confirmed.
- f) On the abundance of mud crab *Scylla* spp. and efficiency of the fishing gears used in mud crab fisheries in the mangroves of Barangay Nanding Lopez in Dumangas, Iloilo, Philippines which was chosen for stock enhancement, *S. olivacea* was the most abundant species and bamboo traps were more efficient to catch mud crabs

than the crab pots. In this regard, *S. olivacea* will be released in the site for the stock enhancement activity.

- g) Results of the ongoing socio-economic study which aims to assess the strategies for managing enhanced stocks of donkey's ear abalone *H. asinina* and sandfish *Holothuria scabra* in Sagay Marine Reserve in Negros Occidental, Philippines, led to the promulgation of a science-based ordinance on abalone catch-size regulation in Barangay Molocaboc, Sagay. In order to enhance compliance to the regulation, abalone ruler was developed and distributed to fisherfolks while continuing awareness seminars were also held. The study also facilitated the formation of the Barangay Fisheries and Aquatic Resources Management Council (BFARMC) in Molocaboc, as an important and crucial unit for the management of community-based enhancement in the demonstration site.



Abalone ruler as a tool to enhance compliance of fisherfolks to abalone catch-size regulation



Organized fishers play a key role in stock release and enhancement demonstration site management.

5. Post-harvest Technology and Safety of Fish and Fisheries Products

5.1 Quality Assurance Systems for Small- and Medium-sized Fish Processing Establishments

In the ASEAN region, traditional fish products represent significantly large portion of total fish utilization, and are major sources of animal protein for human consumption. However, many small- and medium-sized fish processing establishments (SMEs), e.g. Pre-processing Establishments (PPEs) and Traditional Products Processing Establishments (TPEs), in the Member Countries are facing difficulties in the implementation of quality assurance systems due to economic and technical constraints. The program on "Quality Assurance Systems for Small- and Medium-sized Fish Processing Establishments in ASEAN Member Countries" was therefore implemented by MFRD from 2007 to 2009 to develop quality assurance systems for these SMEs that incorporate Good Manufacturing Practice (GMP) and Standard Sanitation Operating Procedures (SSOP) as the first step towards the implementation of Hazard Analysis and Critical Control Points (HACCP), and help these SMEs meet safety and quality assurance requirements. The first regional project activity to develop GMP for selected PPE was conducted in 2007-2008 and a handbook on the GMP developed for selected PPE was published.

From 2008-2009, MFRD in collaboration with the ASEAN Member Countries (except Cambodia) conducted the second regional project activity to develop GMP for their selected TPEs, namely: tiny shrimp paste (*belacan*) for Brunei Darussalam; salted boiled fish (*pindang*) for Indonesia; dried fish (*pa heang*) for Lao PDR; fish cracker (*keropok lekor*) for Malaysia; fermented fish (*ngachin*) and fish sauce (*ngan pya ye*) for Myanmar; shrimp paste/sauce (*alamang*) and smoked fish (*tinapa*) for Philippines; fish balls/fish cakes for Singapore; dried shrimp and fish sauce (*nam pla*) for Thailand; and fermented tiny shrimp paste (*mam tom*) and fish sauce (*nuoc mam*) for Vietnam. Based on outcomes of the implementation of the program, MFRD compiled and published the handbook on “GMP for Small-and Medium-sized Traditional Fish Products Processing Establishments in ASEAN” in 2010. The handbook describes the GMPs developed for the selected TPEs as well as outlines the processes and steps involved. The handbook is distributed to all ASEAN Member Countries to serve as guide for their respective governments and fish processing industries in establishing the appropriate GMPs in relevant traditional fish products processing plants.

5.2 Chemical and Drug Residues in Fish and Fisheries Products

Marine biotoxins represent a significant and expanding threat to human health in many parts of the world. The impact is visible in terms of human poisoning or even death following the consumption of contaminated shellfish or fish, as well as mass killings of fish and shellfish, and the death of marine animals and birds. Monitoring seafood for toxicity is essential to manage the risks. However, there are several limitations in monitoring for toxicity such as the variation in toxin contents between individual shellfish, different detection and even extraction methods for the various toxins requiring a decision which toxins should be tested for, and the frequency of sampling to ensure that toxicity does not rise to dangerous levels in temporal or spatial gap between sampling times or locations.

As a follow-up activity to the project on Chemical and Drug Residues in Fish and Fish Products in Southeast Asia conducted from 2004 to 2008, MFRD embarked on a new phase of the project on Biotoxins Monitoring in Fish and Fisheries Products in Southeast Asia starting 2009. To be undertaken until 2012, the new phase of the project aims to increase the attention in expanding and improving initiatives to monitor, detect and share information on marine biotoxins in order to reduce risks in public health associated with the consumption of contaminated shellfish and fish. Thus, the project would develop the methodologies on biotoxins analyses through human resource training and obtain an understanding of levels of biotoxins occurrences and incidences in fish and fisheries products in the ASEAN countries.

On 27 June-8 July 2010, MFRD organized the “Regional Training Course in Biotoxins Analysis” at the Toxins Laboratory in the Veterinary Public Health Centre of the Agri-Food and Veterinary Authority (AVA) of Singapore. With the Lead Trainers comprising three Japanese experts from the National Research Institute of Fisheries Science and Kitasato University Japan; and two Trainers from Oasis Solutions Pte. Ltd. and Tropical Technology Centre of Japan, the course was attended by participants from 10 ASEAN countries. Five methods

for analysis of various biotoxins that were selected during the 2009 Regional Technical Consultation in 2009 were taught in the training course. These included: 1) Multi-component of Diarrhetic Shellfish Poisoning (DSP) and lipophilic toxins (Yessotoxin (YTX), Pectenotoxins (PTX)) using High Performance Liquid Chromatography Tandem Mass Spectrometer (LC/MS/MS) method; 2) DSP rapid method; 3) Paralytic Shellfish Poisoning (PSP) using High Performance Liquid Chromatography (HPLC); 4) PSP Enzyme-linked Immunosorbent Assay (ELISA) rapid method; 5) and Tetrodotoxin (TTX) using LC/MS/MS.

Based on the methodologies introduced during the training, the participants were expected to set up their biotoxins analysis methods in their respective countries, and continue the activities in conducting a survey on biotoxins monitoring in 2011 focusing on the PSP in green mussels and baby clams. The results of the survey would be collated by MRFD for the Technical Compilation of Biotoxins Monitoring in the ASEAN region.



The Consultation on Chemical and Drug Residues in Fish and Fish Products in Southeast Asia



Participants in the Regional Training Course at the Toxins Laboratory in the Veterinary Public Health Centre of AVA

5.3 Traceability Systems for Aquaculture Products

Traceability is becoming a major concern of the aquaculture industry, especially since it has become a legitimate export product requirement in major international markets such as the EU and the US. Furthermore, as aquaculture production becomes more market and consumer driven, the greatest pressure for product traceability now comes from the general public. Consumers are getting more and more concerned on what they eat – whether the food comes from safe and sustainable source, and whether production, transportation, and storage conditions can guarantee food safety.

The *Codex Alimentarius* Commission defines traceability or product tracing as “the ability to follow the movement of a food through specified stage(s) of production, processing and distribution”. In an increasingly competitive food system, traceability has become a major tool in dealing with concerns of food safety, quality assurance, risk prevention, and in gaining consumer trust. Traceability can be used to achieve different purposes or objectives, such as for food safety, bio-security and regulatory requirements or to ensure quality and other contract requirements. For instance, external traceability allows the tracking of a

product and/or attribute(s) of that product through the successive stages of the distribution chain (from farm to fork) while internal traceability (or enterprise traceability) is aimed at productivity improvement and cost reduction within a production unit (e.g. fish processing plant). Governments and organizations around the world have also been developing different systems on seafood traceability e.g. TraceFish (EU) and TraceShrimp (Thailand).

In view of such developments, MFRD started in 2010 the implementation of a 5-year project on Traceability Systems for Aquaculture Products in the ASEAN Region to enable the regional aquaculture industries to enhance their capabilities in implementing appropriate traceability systems for aquaculture products and to meet international traceability requirements in the network of aquaculture production, marketing, and trade. The project aimed to provide a platform for the sharing of information and experiences among the ASEAN countries on the implementation of traceability systems for aquaculture products in the region and to promote the implementation of the traceability systems in the ASEAN region.



Regional Technical Consultation on Traceability Systems for Aquaculture Products in the ASEAN Region conducted in Singapore

On 12-14 October 2010, MFRD organized the “Regional Technical Consultation on Traceability Systems for Aquaculture Products in the ASEAN Region” in Singapore, with the participation of representatives from the ASEAN-SEAFDEC Member Countries. The Resource Speakers were from the Department of Fisheries of Thailand and commercial companies providing solutions for the development of food traceability systems. In addition to the sharing of knowledge and experiences by the participants, discussion was also made on all the project outputs,

activities and timeframe. In particular, it was agreed that the 1st on-site training on food fish traceability systems would be conducted in Vietnam in 2011, and the 2nd on-site training on shrimp traceability systems in Thailand in 2013.

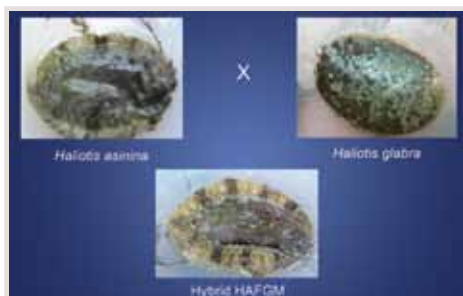
6. Sustainable Aquaculture Development

6.1 Integrated Mollusk Production

In the broodstock and hatchery phases for the donkey's ear abalone *Haliotis asinina*, maturation diets were developed with varying protein and energy ratios in order to improve the spawning frequency, hatching rate and quality of trocophore larvae. In assessing the use of diatoms (*Cocconeis* and *Nitzschia*) as food for abalone larvae, the growth physiology of the diatoms was investigated for mass culture after exposing them to different light intensities and different enrichment media. The results indicated that the cell yield of both diatom strains was not affected by the varying light intensities tested but was significantly affected by the type of enrichment medium used.



Newly developed broodstock and microparticulate diet for *H. asinina*



Hybrid HAFGM was attained by using female *H. asinina* with male *H. glabra*



Hybrid HAFPM was attained by using female *H. asinina* with male *H. planata*

However, in order to reduce dependence of abalone on the diatoms, a microparticulate diet with average particle size of 4–5 μm , for young post-larvae was formulated. The protein content of the diet was 37%, which was higher than that of the diatom feed (14.9%). Moreover, in the refinement of transport techniques for abalone, the results of transport trials for abalone veligers (with and without shaking) showed that survival was affected by the combined effects of loading density and transport time. After 1 hour and 5 hours transport time, the survival of larvae at different loading densities was comparable but after 10 hours of transport, survival of larvae was significantly lower when packed at a density of 100 larvae ml^{-1} compared to those packed at 50 and 25 larvae ml^{-1} (41.62%). Similarly, in the transport of juvenile abalone, survival increased with decreasing loading density, with significantly higher survival rate attained after 24 hours of transport when abalone were packed at 25 individuals/pipe compared to higher packing density of 50 individuals/pipe.

In another development, to prevent inbreeding, improve the quality of seeds and to develop a strategy for genetic management of abalone, new set of breeders were collected from Palawan, Bohol and Masbate in the Philippines. The breeders produced batches of F_1 cohorts which were

monitored simultaneously with HB (Hatchery-bred) cohorts to compare the settlement of post-larvae, growth and survival of juveniles. Moreover, in order to establish information on potential pathogens and microbial species that may boost abalone production or define their synergistic action, samples of biofilms from settlement plates obtained in two hatchery cycles (90 days, wet and dry season) were also examined.

Artificial diets with high poly-unsaturated fatty acids (PUFAs), specifically the marine thraustochytrids was investigated, since thraustochytrids are known to contain high amounts of docosahexaenoic acid (DHA) and can be an alternative source of DHA. The use of thraustochytrids as enrichment for larval food such as rotifers and brine shrimp as well as ingredient for nursery and grow-out feed for fish and abalone would be explored.

In the nursery phase, abalone is usually cultured using the flow-through systems accounting for 15-30% of the hatchery operating cost. Results of a study to reduce operating cost, have shown higher survival in *Gracilaria*-fed abalone reared in both flow-through system and recirculating system compared to the artificial diet-fed abalone reared in both flow-through and recirculating systems. Furthermore, highest growth and survival were recorded when abalone juveniles were reared in black boxes followed by those reared in round mesh cages.



Transport of abalone juveniles using oxygenated bags with 12% water

For the grow-out phase, the daily growth rate of abalone cultured in black prefabricated trays for 270 days was decreasing but could be attributed to the sexual maturation of abalone at 30-35 mm standard length and the onset of spawning. The survival rate after the culture period was 55%. Since abalone species are slow growers and the taste of *H. asinina* is inferior compared to other abalone species, hybridization trials were continued in 2010 to improve the growth and enhance the market potentials of this species. The growth performance (increase in shell length and body weight) and vigor (tolerance to stress/salinity) of the two hybrids such as HAFPM (from crosses of *H. asinina* female x *H. planata* male) and HAFGM (from crosses of *H. asinina* female x *H. glabra* male) were compared with pure *H. asinina*. The results indicated that hybrid abalone required 360 days to achieve optimum growth of 30.46 g while pure *H. asinina* required 405 days to attain a maximum growth of 30.06 g. Moreover, the HAFPM hybrid showed better tolerance (higher survival) to different salinities compared with the pure *H. asinina* and HAFGM hybrid.

6.2 Mud Crab and Shrimp Domestication

Selective breeding programs and improvement of husbandry techniques were carried out to address the problem of declining supply of good quality broodstock and seed of indigenous crustacean species particularly for shrimps, *Penaeus monodon* and *P. indicus* and mud crab, *Scylla* spp. When *P. indicus* broodstock were fed diets containing marine annelid meal as well as squid and mussel meat, significantly higher % maturation was observed in shrimps fed diets with 5% annelid incorporation with or without live annelids supplementation than those fed diets with 10% supplementation. While for the wild sourced *P. monodon* broodstock, giving them formulated diets containing annelid extracts using a foreign-produced diet supplemented with either trichloro-acetic polychaete extract or powdered freeze-dried polychaete and SEAFDEC-formulated diet supplemented with locally available polychaete meal, gave significant differences on the efficiency of the two diets in terms of stimulating ovarian development, number of spawning and attainment of maturation within a shorter period. When fresh frozen

polychaetes were used, the resulting feed had low efficiency in stimulating ovarian development, while the broodstock fed the diet had significantly lower spawning rates.



Penaeus indicus broodstock



Ablation of new F₁ *P. indicus* broodstock

Using wild-sourced marine annelid *Perinereis quatrefagesi*, as an ingredient to replace a mixture of fish meal, shrimp meal and/or squid liver meal in the diets of juvenile crustaceans, the results showed that feeding the diet containing *Perinereis* meal promoted high growth in shrimp and mud crab juveniles. Considering the importance of feeding marine annelid-meal could reduce dependence on fish meal for feeds, the biology of two species of marine annelids was studied for better understanding of their culture requirements. *Perinereis* oil which is found to contain relatively high lipids with good HUFA profile has high potential to replace fish oil in aquafeeds.

The umbrella-stage brine shrimp *Artemia* was tested as a substitute for rotifers as food for the early zoeal stages of the mud crab but the results showed that rotifer was still a much superior feed. In another experiment, survival was higher in mud crab larvae fed *Artemia* enriched with DHA protein than those fed *Artemia* without enrichment. A diet formulated for later mud crab larval stages, natural food (*Artemia* nauplii) or a combination of both, were given to mud crab to reduce the occurrence of molt death syndrome at zoea 5/megalopa. Those fed the formulated diet alone were not able to molt to megalopa stage while those fed natural food (*Artemia* nauplii) and combination of both gave similar growth and survival. In assessing the different doses of antibiotics to be used in crab hatchery production to improve survival and result in least morphological abnormalities, the percentage occurrence of abnormalities was highest when hatchery water was treated with 1 ppm furazolidone followed by 3.0 ppm oxytetracycline, 0.5 ppm furazolidone, and 6.0 ppm oxytetracycline. A series of experiments was conducted to determine the effect of Tryptophan (Trp), a precursor of serotonin which has been implicated as a key physiological regulator of agonistic behavior in crustaceans, and exogenous serotonin on aggressive behavior and dominance in crabs. Mud crabs fed the diet containing 1% Trp had the lowest frequency and intensity of attacks compared with those receiving the 0% or 0.50% Trp diets.

Injecting mud crab with 3 µg/g body weight serotonin significantly reduced the frequency and intensity of attacks, and increased the defensive stance in subordinate crabs. In a study investigating their competition for shelter, it was noted that during the day a significantly

higher percentage of crabs injected with crab saline or with 0.3 $\mu\text{g/g}$ serotonin had maintained dominance in shelter occupancy over smaller crabs compared to those injected with the higher dose of serotonin. However, a similar percentage of saline-injected and serotonin-injected crabs were found outside the shelters during night time, may be due to their nocturnal feeding characteristic.



Mud crab inside bamboo pen for fattening



Mud crab fattening set-up during low-tide

6.3 Marine Fishes

Broodstock management, seed production, and grow-out technologies for marine fishes such as milkfish, grouper, sea bass, mangrove red snapper, rabbit fish, pompano, black-spotted scat, Napoleon wrasse, hybrid red tilapia, and seahorse, have been promoted for livelihood in coastal areas. In this regard, the effects of dietary vitamin C on reproduction, egg and larval quality and immune responses in grouper *Epinephelus fuscoguttatus* were continued as well as fortification of the milkfish broodstock diet with vitamins and lipids to improve the spawning frequency, egg production and fertilization rate.

Interventions made to improve the seed production of highly value marine fishes were largely through feeding with formulated diets with less dependence on brine shrimp and minced trash fish. For potential substitutes for brine shrimp and for trash fish, a laboratory scale of an air lift culture system was developed and adapted for the intensive culture of mysids, which is a good live food substitute for *Artemia* in grouper larval culture. Experiments were also started to develop the breeding and seed production techniques for other emerging species which include the pompano, black-spotted scat (*Scatophagus argus*), and Napoleon Wrasse, *Cheilinus undulates*.

Red snapper, *Lutjanus argentimaculatus*, fingerlings stocked in brackishwater ponds and given commercial diet containing 46-48% protein, attained average body weights ranging from 48 to 60 g (FCR=1.3) after 150 days of culture. When siganids, *Siganus guttatus* were fed filamentous algae for the first 45 days after which they were given formulated diet of 32-39%



Cage culture trial of sea bass in freshwater reservoir in the Philippines



Night view of sea bass nursery culture in illuminated floating cages in ponds at AQD's Dumangas Brackishwater Station

protein, the average body weight attained was 27 g after 60 days of culture. In feeding the Pompano with milkfish commercial feed, commercial milkfish feed + commercial pompano feed or commercial pompano feed, initial results showed that those fed commercial pompano feed had the highest average body weight (536 g) while lowest, in stocks fed milkfish commercial feed.

Various studies were continued to find alternatives to fish meal in aquaculture feed. Adding soy protein concentrate (SPC) in diets containing fish meal and soybean meal resulted in optimum growth of fish given the diets at 30%. Using meat and bone meal as alternative protein sources to fish meal for milkfish reared in seawater or freshwater, the survival of juveniles was 100% and weight gain ranged from 95-179% after 30 days of culture in freshwater. In determining the feeding frequency using grouper diet with cowpea, feeding once a day was observed to be appropriate for groupers. Other studies included the characterization of innate immune response of grouper, *Epinephelus coioides*, to *Vibrio* sp; and the bioenergetic aspect of early development in grouper. During the transition from endogenous to exogenous feeding, larvae at the mixed feeding period showed the highest oxygen consumption compared with those at the endogenous and exogenous feeding periods.

6.4 Small-holder Freshwater Aquaculture

The development of optimal breeding, seed production and grow-out culture strategies for regionally important freshwater commodities such as the giant freshwater prawn, Asiatic carps, tilapia, *Clariid* catfish and indigenous freshwater fish species were initiated by AQD as well as the implementation of effective health management strategies for all the farmed species for their sustainable production.

In comparing the two genetic strains (Old Calumpit-OC and New Calumpit-NC) of giant freshwater prawn, *Macrobrachium rosenbergii*, in terms of reproductive efficiency and growth performance, there was no particular trend as to the best stock of freshwater prawns in relation to breeding parameters. Moreover, neither treatment (feeding scheme) nor strain had significant effects on growth and survival but regardless of strain, the treatment (feeding scheme) used in cage culture trials had significant effect on growth and survival. However, when two feeding treatments were used, the growth and survival performance especially of the OC strain were adversely affected by domestication. In the seed production methods for the commercial *M. species (M. rosenbergii dacqueti)* that had been refined to suit the Philippine conditions, reliable mass production techniques for freshwater prawn post-larvae using greenwater system are already established. A study on the development of diets for giant freshwater prawn post-larvae and juveniles is ongoing. For the identification and control of freshwater and marine fungi affecting *Macrobrachium spp.* broodstock and larvae, fungi isolated from incubating eggs and infected larvae of *M. rosenbergii* were characterized and identified based on their morphological attributes. Three of four isolates have characteristics that would classify them under the genus *Lagenidium*.

In a grow-out trial to evaluate the growth and survival of Nile tilapia under low feeding rates with daily and skip feeding, no significant differences in growth and survival of Nile tilapia were observed between the two treatments. This experiment is under the ACIAR-funded study conducted in Laguna de Bay. In preliminarily comparing the performance (growth, survival and fillet yield) of different tilapia lines, Nile tilapia had better meristic traits than the red tilapia and the Mozambique tilapia stocks. The Mozambique tilapia, the most saline tolerant of the three species, had the highest survival (100%) in brackishwater.

For the studies on the silver therapon, *Leiopotherapon plumbeus*, found in several freshwater habitats, two candidate larval food species (*i.e.* protozoan and small algal species) are being cultured to evaluate their potential as food for first feeding larvae of silver therapon. Those grown in lake-based net cages attained similar mean body weights when fed trash shrimp feed or commercial prawn feed. Growth was higher for both treatments than the unfed control.

A new study being co-funded by ACIAR focuses on the carrying capacity, decision support tools for freshwater systems in Australia and the Philippines. The results from this research will be beneficial particularly for setting policies in the sustainable management of freshwater systems (lake) which are used for aquaculture.



Cage culture of freshwater prawn by a Philippine local multi-purpose cooperative



Freshwater prawn (*M. rosenbergii*)



Experimental set-up for rearing *M. rosenbergii* post-larvae in indoor tanks



Assessing the sexual maturity of bighead carp broodstock during the Freshwater Fish Breeding and Farming Course at AQD's Binangonan Freshwater Station

6.5 Seaweed Strain Improvement

In isolating the protoplasts of *Kappaphycus*, the use of combinations of cell-wall lytic enzymes such as fresh abalone extract and acetone extract powder in combination with cellulase enzyme mixture improved the density of isolated protoplasts. However, temperature highly affected the density of protoplasts isolated. Mortalities in an intensive culture system are often caused by the accumulation of toxic compounds from uneaten feeds, feces and urine of cultured organisms. One measure to reduce these compounds is to make them useful to other organisms (e.g. seaweeds where the amount of nitrogen from different sources and the amount of nitrogen the seaweeds can utilize should be established). In investigating the assayable nitrogen and phosphorus in the shrimp *P. indicus* fed SEAFDEC formulated diet, the post-larvae were found to consume the highest amount of total nitrogen while juveniles and adults consumed almost similar quantities, and the concurrent results were also obtained in total phosphorus. The total nitrogen and total phosphorus wastage in the form of excess feed was also lowest in post-larvae, followed by adults, while total nitrogen and total phosphate wastage of juveniles was 8-44 times higher than those of post-larvae and adults.

To develop molecular-based techniques for genetic identification and differentiation of red seaweed species and variants, six varieties of *Kappaphycus* and *Eucheuma* were selected as the first batch of samples for the optimization of DNA extraction and PCR protocols. In all tested samples DNA yield (up to 105 ng/μl) and purity, with the freshly frozen and freeze-dried samples showed comparably higher DNA yield than the dried-powdered form. In the identification of commercially-important seaweeds that could potentially be useful as source of anti-microbial substances against common aquatic pathogens, six seaweed species of *Kappaphycus* and *Eucheuma* were used in optimization of water and ethanol extraction protocols. In the initial anti-bacterial screening of the six crude ethanol extracts, no significant zone of inhibition was observed against the luminous bacteria, *Vibrio harveyi*, by disc diffusion assay.



Discussion with seaweed farmers in central Philippines



Screening for anti-*Vibrio harveyi* activity of *Kappaphycus* crude ethanol extracts by disc assay method

6.6 Aquatic Ecology

Aquaculture production is known to generate particulate organic waste from fecal materials and uneaten food, where intensive production system relying mostly on protein-rich diets has the greatest potential to generate wastes, which could enrich the aquatic ecosystems and bring about physical and chemical changes in the sediments resulting in the anoxic conditions. Pond, pen, cage and mariculture systems of both finfish and crustaceans are some of the culture systems that generate huge amount of organic wastes that could lead to drastic changes in the adjacent natural ecosystems.

In SEAFDEC/AQD, studies have been designed to generate environment-based aquaculture technology through the integration of environmental factors. These are aimed at assessing the impacts of aquaculture on the environment and the impacts of different pond practices on biodiversity in ponds and adjoining mangroves and shores, and developing bioremediation measures to mitigate the negative impacts of aquaculture to the environment.



Brackishwater pond is totally drained to collect the aquatic species and assess the composition and volume of the pond by-catch



Sample of by-catch or non-crop species collected from brackishwater pond

Four cages stocked with the same density of milkfish and fed the same amount and type of food were monitored for physico-chemical parameters and organic matter, where constantly increasing ammonia, phosphate and sulfide concentrations were observed in the water and sediment, but started to decrease upon the start of partial harvesting of milkfish. The highs and lows of nutrient concentrations were attributed to the volume of feeds deposited on the substrate, but nitrate and nitrite concentrations were highest only at the start of sampling and maintained low concentrations up to the last water sampling. In assessing the impacts of different pond practices on biodiversity in ponds and adjoining mangroves and shores, the ponds used for technology verification projects at Dumangas Brackishwater Station (DBS) were totally drained and by-catch (non-crop) species were obtained for identification. Results showed a very high diversity of non-crop species (fishes, crustaceans, mollusks, echinoderms), mostly naturally seeded by the tides, but chlorinated ponds had much lower diversity and volume of non-crop species. Catch from the small-scale fishing around the mangrove outside the DBS includes many of the same species caught inside the ponds.

Fish-to-sandfish ratio and size at stocking experiments, performed in fiberglass tanks for four weeks each were completed for pompano (*Trachinotus blochii*), sea bass (*Lates calcarifer*) and milkfish (*Chanos chanos*). Although the three species seemed compatible for co-culture with sandfish, growth of both fish and sandfish seemed best with the sea bass and milkfish. Using *Penaeus indicus* fry showed that shrimps were incompatible with sandfish, as they continuously crawled over the sandfish and eventually caused evisceration and death (no sandfish survived at the end of the 4-week experiment).

In the investigation of the daily burrowing and surfacing cycle, sandfish juveniles seemed to burrow in sandy-muddy substrates. During peak burrowing times, 35% preferred to burrow in mudflat-type (sandy-mud) substrate with *Halodule* grass, 26% preferred seagrass-bed-type substrate with *Thalassia* grass, 18% preferred coarse and granulated sand without

grass, while only 16% burrowed in mangrove soil. High feeding preferences were observed in substrates with grass structures, while growth performance was very poor in mangrove pond substrate. Both substrates of *Halodule* and *Thalassia* grass gave positive growth for sandfish in the first two weeks but considerably declined soon after because of depletion in natural food.

A study that determines the social acceptability of marine cage culture as a livelihood option for fishers affected by oil spill in four coastal barangays in Nueva Valencia, Guimaras indicated that cage culture is socially and economically acceptable as livelihood option for those fishers and that the negative impacts of aquaculture to the environment can be addressed appropriately if cage culture is managed effectively and efficiently.



Sandfish juveniles on sandy-muddy substrate, typical of coastal mudflat with *Halodule* seagrass



Anodontia philippiana (clams) used as bioremediator in an intensive milkfish cage culture in Igang Marine Station, Nueva Valencia, Guimaras

6.7 Other R&D Activities

The Institutional Capacity Development on Sustainable Aquaculture (ICDSA) is being implemented in partnerships with the local government units, donor communities, fisherfolks/farmers and other stakeholder groups by providing a mechanism for the assessment of socio-economic and environmental impacts of AQD aquaculture technologies, and building the capacity of beneficiary communities. Through the 2010 mini-workshop, consolidation and integration of the information and lessons learned in the various ICDSA projects were compiled while the R&D templates and Road Map to the attainment of the Project Goals were developed. Other accomplishments under include: 1) site assessments in Romblon, Dinagat Island and Surigao City and submission of corresponding reports to potential ICDSA clients; 2) establishment of trilateral agreement (Taytay sa Kauswagan, Petron Foundation and SEAFDEC/AQD) on the "Organizational and Entrepreneurial Development" of participating fisherfolk organizations from four villages in Nueva Valencia in support of the "Milkfish cage culture livelihood project"; 3) publication of a Manual on "Mud crab nursery in ponds"; and 4) presentation of related ICDSA papers in various national and foreign fora.



Participants tried their hands at deboning, marinating, and smoking bangus during the milkfish post-harvest course held in April 2010



AQD Chief JD Toledo signed the closure agreement with ABOT clients in their milkfish farm in Cebu City, Philippines

Under ABOT (agree-build-operate-transfer) AquaNegosyo (aquaculture business) Program which aims to disseminate science-based aquaculture technologies to encourage private sector investments in aquafarming for livelihood generation and food security, 23 clients (private entrepreneurs, commercial farmers from the Philippines) availed of the program, including five in 2010. Apart from several local inquiries, queries from potential foreign clients from Madagascar for a mud crab project and Mauritius for a multi-species marine fish hatchery and grow-out project have been received.

6.8 Development of Technologies and Human Capacity Building for Sustainable Aquaculture

As a follow-up of the project on 'Development of Technologies and Human Capacity Building for Sustainable Aquaculture' implemented under the TF4 Programs and completed in 2009, this new project aims to: 1) promote sustainable aquaculture practice in Southeast Asia through biologically, environmentally and socio-economically acceptable, region-oriented approaches; and 2) contribute to secure/stable supply of aquaculture products not only in the region but also globally. The main components of this new project under TF5 Programs are: 1) Genetic improvement of commercially-important species and development of hatchery technology; 2) Development of environment-friendly feeds using regionally available ingredients; 3) Establishment of managing technology of aquaculture environment; 4) Socio-economic assessment and impact analysis of transfer and adoption of sustainable aquaculture technologies; and 5) Technology extension and demonstration. It focuses on: 1) development of more practical technology (from laboratory based to commercially viable); 2) establishment of environment-friendly, cost effective and regionally available technology; and 3) further dissemination and capacity building. All of these are requirements for ensuring the region-oriented aquaculture practices. The major outcomes in 2010 include the following:

- a) F_1 and F_2 mud crab *S. serrata* have been produced while an effective evaluation technique for larval quality useful for selective breeding was established.

- b) For the selective breeding of black tiger shrimp *P. monodon*, F₁s were produced by crossing wild-sourced broodstock obtained from different sites previously identified to have stocks with high genetic variability.
- c) In examining the impact of domestication on hatchery-bred prawn stocks, preliminary results showed that giant freshwater prawns *M. rosenbergii* domesticated for five generations still possess production traits that are comparable with newly domesticated ones.
- d) The laboratory culture condition of young plantlets of *Kappaphycus* spp. has been optimized, which could serve as basis for the establishment of seaweed mass production technology.
- e) Low salinity rearing condition resulted in better survival and growth for kikerio *Scatophagus argus*, a representative emerging species that requires development of hatchery techniques.
- f) Profiles of feed ingredients surveyed in the Philippines showed a rich source of carbohydrates.
- g) The presence of mangroves inside the pond or in the receiving environment and the use of probiotics and disinfectants do not guarantee the absence of disease for black tiger shrimp *P. monodon*.
- h) A forum in a study site undergoing serious environmental degradation would help enhance the farmers' knowledge on tilapia culture and the alternative use of the aquatic plant (giant water lettuce).



The participants and AQD scientist during the practical session of the Training Course on Marine Fish Hatchery



The participants and AQD staff during the closing ceremony of the Training Course on Mud Crab Seed Production and Grow-out.



Participants of the International Training Course on Community-based Freshwater Aquaculture for Remote Areas of Southeast Asia.

To facilitate the transfer and dissemination of basic and/or applied aquaculture technologies and knowledge, and human capacity building in SEAFDEC Member Countries, four training programs were implemented: Marine Fish Hatchery Training Program (26 May-1 July 2010); Abalone Hatchery Training Program (8-28 July 2010); Rural Aquaculture Program – International Training Course on Community-based Freshwater Aquaculture for Remote Areas of Southeast Asia (08-18 November 2010); and On-site Feed Preparation Training

Program (24-26 November 2010). The training program on Giant Freshwater Prawn Production was rescheduled for 2011.

6.9 Establishment of Disease Surveillance System of Aquatic Animals

The main objectives of this project which is a follow-up of the former project on 'Development of Fish Disease Surveillance System' implemented under the TF4 program, are: 1) to accelerate the delivery of information and build awareness among the aquaculture farmers on technological developments in aquatic animal health management; and 2) to ensure a holistic contribution to a stable supply of safe aquaculture products in the Southeast Asia, through the following activities: 1) accelerating awareness about fish health management in technologically-deprived countries through industry-wide capacity building; and 2) innovative research to guarantee food safety and sustainable production. In 2010, the following major outcomes were achieved:

- a) As part of the activity to identify the gaps and needs in fish health management, surveillance system for diseases and food safety was established in Myanmar, but the need to strengthen the expertise of government fish health staff was identified to effectively disseminate the available information on fish health management.
- b) Screening cultured freshwater fish species for the presence of fish pathogenic parasites especially those that are harmful to humans was conducted in Myanmar in December 2010, where the results are still being processed.
- c) Plasmid positive control for White Spot Syndrome Virus (WSSV) was developed and can be used initially in the conventional PCR assay. Having positive controls in plasmid form which is standard in all commercial PCR kits, will improve the currently used diagnostic protocols.
- d) Immunization of sea bass, grouper, and pompano with inactivated beta-nodavirus vaccine effectively induced the production of serum neutralizing antibodies that peaked at 2 months, but neutralizing antibody titers gradually declined to significantly low levels at 12 months post-vaccination. The booster vaccination of these fishes with the same vaccine resulted in the rapid increase in antibody titers to significantly high levels, indicating effective amplification of humoral anamnestic responses re-exposure to the vaccine. These results suggest the feasibility of establishing a vaccination regimen in sea bass, grouper and pompano broodstocks so that vertical transmission of the virus in hatcheries can be prevented.
- e) To establish novel prophylactic and therapeutic methods for the prevention of viral infections in tropical finfishes, bacterial strains were isolated from the kidneys of healthy pompano, grouper, carp, and rearing water of carp. While the screening of these bacterial strains for anti-beta-nodavirus activity is ongoing, a yellow-pigment producing bacterium was experimentally confirmed to be highly pathogenic to healthy pompano juveniles.
- f) Field trials confirming the applicability of practical shrimp vaccination technologies to pond grow-out conditions demonstrated that growth and survival were improved with the use of formalin-inactivated vaccine against WSSV.

- g) The parasitological survey on cultured abalone *Haliotis asinina* obtained monthly from grow-out cages found that a number of less significant pathogens exist: ciliates were the most prevalent parasites (35%) found within the gill filaments and on foot surfaces with no pathology. Very little inflammatory response was associated with infection while burrowing polychaetes such as Serpulidae, Dorvilleidae and Spionidae were found in the shell.

This project also implemented training programs to facilitate the transfer and dissemination of information and technology on fish health management to the Member Countries, such as: 1) Distance learning course on principles of health management in aquaculture (AquaHealth Online) (26 July to 17 December 2010); and 2) On-site training on basic fish health management of freshwater fishes with emphasis on zoonotic parasites (6-8 December 2010 in Myanmar). Moreover, 13 scientific papers related to fish health management were published in international journals.



Practical session of the On-site Training on Freshwater Fish Health Management in Myanmar

6.10 Food Safety of Aquaculture Products in Southeast Asia

In response to the growing-awareness on issues of food safety of aquaculture products, SEAFDEC is taking the lead in establishing regional guidelines on the right usage of antibiotics and other chemical inputs in aquaculture. This project aims to: 1) contribute in the establishment of guidelines on the production of safe aquaculture products from Southeast Asia; 2) determine the presence and levels of commonly used chemicals in aquaculture products such as fish and shrimps; 3) investigate the status of antibiotics and chemical use in aquaculture in Southeast Asian countries; and 4) compile and disseminate SEAFDEC guidelines on the use of antibiotics and chemicals in aquaculture to the ASEAN region. The activities comprise the followings: 1) determination of withdrawal period of antibiotics in selected fish species cultured in the tropics; 2) surveillance of chemical contaminants in aquaculture products and feeds; 3) investigation on antibiotics/chemicals usage and regulations; and 4) formulation of guidelines on appropriate administration and regulation of antibiotics and other chemicals.

The main outcomes of the studies conducted in 2010 are as follows:

- a) The withdrawal periods of antibiotics (oxytetracycline and oxolinic acid) administered at a dose of 75 and 30 mg/kg fish per day for 10 days, were experimentally confirmed

to be 22 and 27 days, respectively, for milkfish cultured in the tropics. While this study does not encourage the use of antibiotics in aquaculture, the present findings suggest that for the fish administered with such antibiotics, the harvest of fish after these periods should be done to guarantee the zero residue in the fish.

- b) Through analyses of chemical contaminants in aquaculture products obtained in the Philippines, only small samples (two out of 34 samples already analyzed) gave positive results for oxytetracycline and oxolinic acid. Analyses of other samples are still on-going.



Sampling of fish and commercially formulated aquaculture feeds to assess the levels of chemical contaminants



Samples of fish, shrimps and local feeds are being analyzed for oxytetracycline and oxolinic acid

7. Fisheries for Food Security and Poverty Alleviation

Since 2008, SEAFDEC intensified its activities on addressing the contribution from fisheries to food security and poverty alleviation in the region. Two ASEAN Foundation supported projects were undertaken, namely: 1) the Promotion of “One Village, One Fisheries Product” or FOVOP System to Improve the Livelihood for the Fisheries Communities in the ASEAN Region; and 2) Human Resource Development (HRD) on Poverty Alleviation and Food Security by Fisheries Intervention in the ASEAN Region. For the program on the Promotion of “One Village, One Fisheries Product” or FOVOP in the ASEAN Region from 2009 until early 2010, a series of national HRD workshops and on-site trainings were conducted in participating countries namely: Cambodia, Indonesia, Lao PDR, Myanmar, Thailand and Vietnam. Moreover, in order to conclude the achievements and outputs from the project implementation, the Second Regional Technical Consultation on the Promotion of FOVOP in the ASEAN Region was organized on 22-26 March 2010 in Chiang Mai, Thailand. The RTC served as the venue for sharing of the experiences gained during the pilot process implementation and came up with the draft Regional Guidelines and Regional Strategies for further promotion of FOVOP in the region, which was submitted and endorsed by the high authorities of SEAFDEC and the ASEAN. The Regional Guidelines is envisaged to serve as reference for ASEAN Member Countries in mobilizing the FOVOP initiative and approach as alternative supplementary livelihood to fishers and their communities to alleviate poverty, and reduce pressure to the fishery resources.

For the HRD on Poverty Alleviation and Food Security by Fisheries Intervention since 2009, a series of activities were undertaken under five thematic areas, namely: 1) Local/indigenous institution and co-management (led by TD); 2) Responsible fishing technologies (led by TD); 3) Backyard fishery post-harvest technology (led by MFRD); 4) Rural aquaculture (led by AQD); and 5) Inland fisheries development (led by MFRDMD), starting from the train-the-trainer activities, followed by on-site HRD activities in participating countries, namely: Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand and Vietnam. Training materials on each thematic area were developed and used during the project on-site training activities conducted in Vietnam (6-10 January 2010), Thailand (11-15 January 2010), Philippines (8-12 February 2010), Lao PDR (18-22 January 2010), and Thailand (15-19 March 2010). Following the on-site activities, the Second RTC was organized on 17-19 August 2010, Bangkok, Thailand to exchange experiences in the implementation of activities, and come up with the draft "Regional Policy Recommendations on Poverty Alleviation by Fisheries Intervention". The draft Regional Policy was submitted to the 13th Meeting of the FCG/ASSP in December 2010, and later to the higher authorities of the ASEAN and SEAFDEC for consideration and endorsement.



The 2nd Regional Technical Consultation on the Promotion of "FOVOP" in the ASEAN Region

To create awareness and enhance policy support towards sustainable fisheries for food security in the region, SEAFDEC is also planning to organize the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 "Fish for the People 2020: Adaptation to a Changing Environment" on 13-17 June 2011, as a sequel conference to the ASEAN-SEAFDEC Conference "Fish for the People" organized in 2001. In 2010, several activities were undertaken in preparation for the Conference, which would mainly comprise plenary sessions, and technical panels to discuss eight thematic areas, namely: 1) Enhancing Governance in Fishery Management; 2) Sustainable Aquaculture Development; 3) Ecosystem Approach to Fisheries; 4) Post-harvest and Safety of Fish and Fisheries Products; 5) Emerging Requirements for Trade in Fisheries Products; 6) Climate Change Adaptation & Mitigation Towards Food Security; 7) Livelihood among Fishing Communities and Prospect of Employment; and 8) Sustaining Food Supply from Inland Fisheries. To provide basis for the conduct of the Conference, the progress made by countries in the implementation of the Resolution and Plan of Action adopted in 2001 were reviewed, while national

activities were conducted to identify recent and important emerging issues, challenges and recommendations that should be addressed in the sequel conference. At the regional level, SEAFDEC organized a series of RTCs on: 1) Sustainable Aquaculture Development (17-19 March 2010, Thailand); 2) Post-harvest and Safety of Fish and Fishery Products (20-22 July 2010, Singapore); 3) Sustainable Fisheries Management (12-15 October 2010, Thailand); and 4) Adaptation to a Changing Environment (1-4 November 2010, Thailand), to develop several technical recommendations on each thematic area. In addition, two sub-regional dialogues (9 November in Indonesia, and 11 November in Thailand) were also organized to obtain more views from public and private sectors for the preparation of the Resolution and Plan of Action on Sustainable Fisheries for Food Security (Towards 2020) which would comprise as one of the major outcomes of the Conference.

8. Activities in Response to the Emerging Needs and Concerns of the Region

8.1 International Fisheries-related Issues

During the year, SEAFDEC in close consultation with Member Countries continued to monitor the international fisheries-related issues that emerged at the regional and international levels that could impact the sustainable development of fisheries of the region. One important issue that had been paid particular attention was the proposed listing of sharks and other economically-exploited aquatic species in the CITES Appendices. In this regard, SEAFDEC organized the *ad-hoc* Meeting of Shark Experts in the Southeast Asian Region (28-29 January 2010, Samut Prakan, Thailand) to discuss the scientific and technical information available in the region, and develop policy recommendations on sharks, especially on the improvement of information collection and works to support the management and assessment of sharks in the region. The issue of listing commercially-exploited aquatic species to CITES Appendices was further discussed at the Regional Technical Consultation on International Fisheries-related Issues (2-4 February 2010, Bangkok, Thailand), where harmonized position was developed among the Member Countries to oppose the listing of several sharks and precious coral species into the CITES Appendices, which was successfully reflected by the Member Countries during the 15th Session of the CITES (COP15-CITES) in March 2010.



The *ad hoc* meeting of shark experts

In addition, other issues that were raised and discussed at the Regional Technical Consultation on International Fisheries-related Issues included the EC Regulation and FAO Legally-binding Instrument on Port State Measures, Fisheries Subsidies, FAO Technical Guidelines for Aquaculture Certification. The relevant common/coordinated position adopted at the Consultation was submitted

and endorsed by the SEAFDEC Council and ASEAN through the ASWGFi, to be used by the Member Countries in reflecting the region's views during the relevant regional/international fora.

During the 13th FCG/ASSP Meeting (3-4 December 2010, Bangkok, Thailand), the issue on future possible listing of sharks species into CITES Appendices was also raised, and SEAFDEC was requested to continue to support the Member Countries in coming up with technical information and scientific evidence to support the development of the common position of the Member Countries in the future.

8.2 Climate Change and Fisheries

Considering the potential impacts of climate change and natural hazards to the sustainable development of fisheries, SEAFDEC has implemented since 2009 the program on "Activities Related to Climate Change and Adaptation in Southeast Asia with Special Focus on the Andaman Sea". The activities aim to: improve capacity of participating countries and enhance coordination on fisheries and habitat management; maintain ecosystems' health and increased resilience among coastal fishing communities; improve cooperation on the management of fishing capacity; and support processes to establish regional and sub-regional fisheries and habitat management mechanisms and agreements that could contribute to strengthening the fisheries sector and its adaptive capacity in response to climate change and its possible impacts. In 2010, the activities addressed the integration of fisheries and habitat management, and awareness building of local communities on the adaptation to climate change and its impacts. A series of the On-site Training Sessions and Workshops on the Integration of Fisheries and Habitat Management and the Management of Fishing Capacity organized in Medan, Indonesia (19-22 July 2010) and in Langkawi, Malaysia (23-26 November 2010).

Moreover, through the activities options have been put forward in the ASEAN countries for the adaptation to "changing environments". Parallel with such forward looking approach, two important Consultations were organized in 2010, namely: the ASEAN-SEAFDEC Regional Technical Consultation on Adaptation to a Changing Environment (1-4 November 2010, Bangkok, Thailand), and the 2nd Regional Technical Workshop on Safety at Sea for Small Fishing Boats (20-23 April 2010, Samut Prakan, Thailand). The RTC on Changing Environment discussed thoroughly issues relevant to climate change including the mitigating measures adopted by the fisheries sector and the people involved in and dependent on fish and fisheries products.

During the Consultation, it was highlighted that existing programs and actions being implemented are of utmost importance to improve fisheries management and the well-being of people involved in fisheries and fisheries-related activities (coastal/inland fisheries, commercial fishing, processing and post-harvest), and are also relevant in terms of the responses from the sector to climate change and local variations in monsoon and hydrology patterns. However, the Consultation also recommended that methods and indicators on how actions taken contribute to building up of adaptive capacity should be developed, to mitigate



The ASEAN-SEAFDEC RTC on Adaptation to a Changing Environment

the effects of climate change and to reduce the impacts of the sector to climate change.

Along this issue, SEAFDEC participated and delivered a statement during the ASEAN High Level Workshop on the ASEAN Multi-Sectoral Framework on Climate Change (AFCC): Agriculture and Forestry towards Food Security (21-22 July 2010 in Bogor, Indonesia), which was organized to provide platform among different sectoral bodies to discuss and collaborate the concerns

on climate change. The on-going initiatives and activities that complement the ASEAN cooperation on fisheries in the implementation of AFCC were elaborated, which include the planned ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 “Fish for the People 2020: Adaptation to a Changing Environment”, which is envisaged to provide an overarching platform in laying down regional strategies and plan of action on fisheries, cutting across key policy directives and challenges including those on climate change.

9. Human Capacity Development in Fisheries

In order to enhance human capacity development in supporting the region’s fisheries sector, the SEAFDEC Secretariat and Technical Departments organized a number of activities for the Member Countries, *e.g.* consultative meetings, workshops, training courses, both at the national and regional levels. As envisaged, these activities would help in enhancing human capacity under the wide scope of fisheries to ensure sustainable development of fisheries and boost the contribution of fisheries to food security, national economy, as well as to the well-being of the people especially for the generations to come. The number of participants from the SEAFDEC Member Countries in such SEAFDEC activities during the year is summarized as follow:

	Country										
	Brunei Darussalam	Cambodia	Indonesia	Japan	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
Consultations, meetings, seminars and workshops at the regional/sub-regional levels	32	40	61	26	59	57	32	42	24	110	43
Consultations, meetings, seminars and workshops at the national/local levels	0	0	0	0	0	0	0	0	0	135	0
Regional training courses	16	5	8	0	19	42	39	26	6	17	9
National, On-site training courses	0	0	19	0	30	3	0	148	0	769	111
Total	48	45	88	26	108	102	71	216	30	1,031	163

Specifically for SEAFDEC/TD, 13 exhibitions and display of TD activities were organized to present and promote the roles of SEAFDEC in sustainable fisheries development in the ASEAN region. More than 55,600 visitors came to the TD booth. Moreover, three volumes of Advance Fisheries Technology Magazine and TD souvenirs such as key chains, bookmarks, T-shirts and polo-shirts were produced and distributed to the public and worldwide. The website of the World Small-scale Fisheries Congress was designed and integrated in the TD website. TD collaborated with the SEAFDEC Secretariat and other Departments for the production of a VCD on SEAFDEC to promote SEAFDEC visibility. Nineteen publications and reports were printed and served as updated information to develop the capacity of all those who are engaged in the fisheries, and distributed in all occasions to share and exchange information among fisheries-related organizations and through networks. TD also collaborated with FAO/GEF for the organization of the FAO/



Practical session on media production as part of the Extension Training Course conducted by TD



Information dissemination of SEAFDEC information materials

GEF Regional Workshop on Strategies for Fisheries By-catch Management on 4-7 May 2010. Moreover, TD emphasized the need to intensify human capacity development in the region and worldwide. Twelve tailor-made training courses, study tour programs and practical training programs were conducted following up on the issues of urgent concern in the region and worldwide.

SEAFDEC/AQD continued to demonstrate its significant contributions to aquaculture development in the region through building institutional capacities and developing a critical mass of experts on aquaculture technologies. In 2010, AQD conducted a total of 28 training sessions on various aspects of aquaculture and trained 472 participants, representing the government workers, private sector practitioners, fisherfolk and farmer communities from the Philippines and representatives of partner countries from the ASEAN region. Several students, mainly from the Philippines, and foreign interns were also trained during the year.



SEAFDEC/AQD participated in AgriLink, the Philippines' largest agricultural trade fair



AQD exhibit during the 47th Fish Conservation Week celebration in the Philippines

AQD has also continued to enhance its visibility in the international community through publications. AQD published 26 scientific papers in ISI-CC covered journals, another five in non-CC covered journals and six, in books or conference proceedings. AQD Researchers also participated actively in various international fora held in 2010. To disseminate the newest information and technology packages to fish-farmers and other stakeholders in Southeast Asia, AQD published six 'How-to manuals' that include: 1) sandfish seed production; 2) prevention of viral nervous necrosis in marine fish hatcheries; 3) abalone grow-out; 4) mud crab nursery in ponds; 5) sea bass grow-out in ponds; and 6) milkfish fingerling production. AQD also produced five flyers on various aquaculture practices as well as two books on reforming Philippine science and sea turtles. Two videos on the AQD stations in Dumangas and Igang were made and distributed. AQD also participated in 5 aquaculture fairs and exhibits held in the Philippines. AQD also published an annual report (*AQD Highlights 2009*) and a monthly newsletter (*AQD Matters*) that has more than 700 recipients on the mailing list. AQD continued updating its website (www.seafdec.org.ph) and sending out press releases to enhance the Center's visibility. More than a hundred news items in the mass media and the internet have appeared about SEAFDEC or AQD.

COOPERATION WITH DONORS AND PARTNER ORGANIZATIONS IN 2010

In 2010, SEAFDEC has continued to establish collaborative arrangements, and undertaken collaborative activities with other donors and partner organizations. These include activities undertaken in collaboration with:

ASEAN Foundation

Project on Promotion of “One Village, One Fisheries Product” or FOVOP System to Improve the Livelihood for the Fisheries Communities in the ASEAN Region

The year 2010 marked the final year of the ASEAN Foundation supported project on the “Promotion of ‘One Village, One Fisheries Product’ or FOVOP System to Improve the Livelihood for the Fisheries Communities in the ASEAN Region”. As an outcome of the project which commenced in 2007, the Regional Guidelines and Regional Strategies for Further Promotion of FOVOP in the Region was developed and was endorsed by SEAFDEC and the ASEAN to serve as reference for the ASEAN Member Countries in mobilizing the FOVOP initiative and approach as alternative supplementary livelihood for fishers and their communities to alleviate poverty, reduce pressure to the fishery resources, and eventually attain sustainable fisheries development and management.

Project on Human Resource Development (HRD) on Poverty Alleviation and Food Security by Fisheries Intervention in the ASEAN Region

The year also marked the completion of the ASEAN Foundation funded project on “Human Resource Development (HRD) on Poverty Alleviation and Food Security by Fisheries Intervention in the ASEAN Region”. Implemented from 2008 to 2010, the program came up with a series of training materials on each thematic area, which was used during the project on-site training activities. In 2010, the draft “Regional Policy Recommendations on Poverty Alleviation by Fisheries Intervention” was submitted to the Thirteenth Meeting of the Fisheries Consultative Group of the ASEAN-SEAFDEC Strategic Partnership (3-4 December 2010, Thailand) and was endorsed for submission to the higher authorities of the ASEAN and SEAFDEC for further consideration and endorsement.

ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020

In August 2010, SEAFDEC and the ASEAN Foundation signed a project contract to collaborate in the organization of the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 “Fish for the People 2020: Adaptation to a Changing Environment”, on 13-17 June 2011 in Bangkok, Thailand, which would be hosted by the Department of Fisheries of Thailand. In particular, the assistance from the ASEAN Foundation in the Conference would mainly come in the form of providing

support to the participation of representatives from the ASEAN-SEAFDEC Member Countries to the Conference. Moreover, the support from the ASEAN Foundation in the conduct of the Conference and the development of the new decade Resolution and Plan of Action which is expected to be one of the important outputs of the Conference, has been envisaged to contribute to achieving sustainable fisheries development and ensuring the important contribution of fisheries to food security in the ASEAN region by the year 2020, as well as supporting the ASEAN in achieving the ASEAN Economic Community building by the year 2015.

Association of the Southeast Asian Nations

Programs under the Fisheries Consultative Group of the ASEAN-SEAFDEC Strategic Partnership (FCG/ASSP)

SEAFDEC and the ASEAN continued the close collaboration under the ASEAN-SEAFDEC Strategic Partnership (ASSP) framework, particularly in the implementation of the programs under the Fisheries Consultative Group of the ASEAN-SEAFDEC Strategic Partnership (FCG/ASSP).

On 3-4 December 2010, the Thirteenth Meeting of the Fisheries Consultative Group of the ASEAN-SEAFDEC Strategic Partnership was organized, where 22 FCG/ASSP programs and activities implemented in 2010 were endorsed as well as the 25 programs and activities to be implemented in 2011 that aim to contribute to the further development of sustainable fisheries in the region.

ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020

ASEAN and SEAFDEC also jointly planned and prepared for the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 "Fish for the People 2020: Adaptation to a Changing Environment", to be organized on 13-17 June 2011 in Bangkok, Thailand. In 2010, the technical preparatory works for the Conference were carried out with the organization of several Regional Technical Consultations to discuss and develop technical recommendations relevant to the eight themes identified for the Conference. These include the RTCs on: 1) Sustainable Aquaculture Development (17-19 March 2010, Thailand); 2) Post-harvest and Safety of Fish and Fishery Products (20-22 July 2010, Singapore); 3) Sustainable Fisheries Management (12-15 October 2010, Thailand); and 4) Adaptation to a Changing Environment (1-4 November 2010, Thailand). SEAFDEC was also involved in two Sub-regional Public-Private Dialogues (9 November in Indonesia, and 11 November in Thailand) organized by ASEAN with funding support from USAID to obtain more views from the public and private sector for the preparation of the draft Resolution and Plan of Action under the Conference framework.

Fats and Proteins Research Foundation Inc. (USA)

SEAFDEC/AQD and Fats and Proteins Research Foundation Inc. (USA) forged an agreement for a joint research study on the “Digestibility and Effective Level of Meat and Bone Meal in Formulated Diet for Milkfish (*Chanos chanos*), Grown in Freshwater and Seawater”. The Agreement which was contracted last 18 May 2010 commits AQD to undertake and complete the study within the 12-month period.

Food and Agriculture Organization of the United Nations (FAO)

FAO/Aquaculture Management and Conservation Service (FIMA)

SEAFDEC/AQD entered into a contract agreement on 11 January 2010 with the Aquaculture Management and Conservation Service (FIMA), Fisheries and Aquaculture, Management Division of the Fisheries and Aquaculture Department of FAO, under its Programme on Aquatic Biosecurity and Aquatic Animal Health. The Agreement which was effective until April 2010 involved a collaboration on the preparation of “Diagnostic Guide to Aquatic Animal Diseases”, of which AQD was expected to assist in the preparation of the document “Fisheries and Aquaculture Technical Paper Diagnostic Guide to Aquatic Animal Diseases” by providing technical inputs to the different chapters and coordination with global disease experts.

In addition to the above collaboration, AQD and FAO agreed in 2009 to collaborate on an activity that would support the preparation, conduct and documentation of the workshop on “On-farm Feeding and Feed Management in Aquaculture”, which aimed to: 1) review and analyze the existing knowledge on the application of feed management; 2) identify the major issues and constraints of feed management; and 3) prepare a list of recommendations and the most appropriate course of action to address the issues. AQD assisted in the organization and facilitation of the workshop (technical and administrative matters) and preparation of detailed workshop outputs. In 2010, a follow-up agreement was made on the preparation of a global synthesis of “On-farm Feeding and Feed Management in Aquaculture”.

FAO/Global Environment Facility (GEF) Project

In 2010, SEAFDEC/TD in close collaboration with FAO organized the Regional Log-frame/Project Planning Workshop for the FAO/Global Environment Facility (GEF) Project Strategies for Trawl Fisheries By-catch Management (REBYC II-CTI) at the Training Department in Samut Prakan on 4-7 May 2010. The Workshop aimed to develop a Project Log-frame based on national and regional priorities; discuss the Project management arrangements, financing and partners; and agree on the next steps to be carried out in the Project development process.

FAO/Coordinating Working Parties on Fishery Statistics (CWP) and Fisheries Resources Monitoring System (FIRMS)

SEAFDEC continued the collaboration with the Coordinating Working Parties on Fishery Statistics (CWP) and Fisheries Resources Monitoring System (FIRMS) under the scope of fishery statistics and information. In 2010, SEAFDEC participated in the 23rd Session of CWP and the 6th Session of FIRMS Steering Committee (22-26 February 2010, Hobart, Australia) to ensure that the development of statistics of the region are in line with those undertaken at the international level, and that the regional specificity and uniqueness of fisheries in the region would be properly reflected and globally recognized. SEAFDEC also participated in the COFI Sub-committee Meeting on Aquaculture (27 September to 1 October 2010 in Phuket, Thailand), and the 1st CWP Inter-sessional Aquaculture Group Meeting (2 October 2010 in Phuket, Thailand), where the CWP Handbook on Standard of Aquaculture Statistics was discussed, and where SEAFDEC was requested to consider providing expertise to enhance the capacity and improve the methodologies in data collection as well as the streamlined definitions and standards used for statistics data collection in the future.

Fisheries Research Agency (FRA), Japan

Under the MOU between SEAFDEC and Fisheries Research Agency (FRA), FRA and SEAFDEC organized the workshop on “The FRA-SEAFDEC Joint International Workshop on Artificial Reefs for Fisheries Resource Recovery” on 11 November 2010 in Japan. One researcher from SEAFDEC/TD and participants from Brunei Darussalam, Indonesia, Japan, Malaysia, Philippines and Thailand attended the workshop.

GAIA Mariculture Pte., Ltd. (Singapore)

SEAFDEC/AQD entered into a Memorandum of Understanding (MOU) with GAIA Mariculture Pte., Ltd. for the period from September 2010 to September 2015, where AQD is expected to provide technical assistance on the technologies generated and ready for adoption. GAIA is a privately owned company based in Singapore, which is interested in promoting the appropriate technologies in aquaculture research and development in the Philippines, and eventually develop a sustainable integrated mariculture production system in the country.

Hokkaido University, Japan

In line with the collaborative work under the MOU between SEAFDEC/TD and Hokkaido University on deep-sea ecosystem and impact of fishery in the Southeast Asian Waters, staff SEAFDEC/TD and SEAFDEC Secretariat attended the “Fostering Program for Young and Female Researchers in Sustainable Fisheries Sciences in Southeast Asia” from 5 June to 3 July 2010. This fellowship program is intended for young and female researchers to conduct short-term research at the Faculty of Fisheries Science, Hokkaido University in Japan.

Japan International Research Center for Agricultural Sciences

SEAFDEC/AQD entered into a contract agreement with the Japan International Research Center for Agricultural Sciences (JIRCAS) for the conduct of the research on “Co-culture of sandfish *H. scabra* and black tiger prawn *P. monodon* in the mangroves”. The project, which commenced on 1 April 2010 and will be completed on 31 January 2011, aims to determine the feasibility of co-culturing sandfish, *H. scabra* and black tiger prawn, *P. monodon* in mangroves by comparing growth and survival of sandfish and prawns in monoculture and co-culture conditions. Moreover, water and sediment quality between monoculture and co-culture conditions will be compared and correlated with growth and survival of both sandfish and prawn. Under the study, the feasibility of co-culture of prawn and sandfish within mangrove forests would also be explored through field experiments.

National Agriculture Training Council (NATC), Malaysia

Under MOU with NATC, TD in collaboration with NATC organized two training courses on purse seine in May and July 2010 in Malaysia as on-site training activities. Moreover, the training course on long line technology was also organized in Malaysia in May 2010.

National Fisheries University (NFU), Japan

Under the SEAFDEC-NFU academic and educational cooperation framework, two SEAFDEC/TD researchers joined the research and training cruise in Vietnam waters using the training vessel T/S KOYO MARU of National Fisheries University (NFU) of Japan, from 6 to 13 November 2010.

North Carolina State University

SEAFDEC/AQD and the North Carolina State University of USA forged an agreement for joint participation in the AQUAFISH Collaborative Research Support Program (CRSP), funded by the United States Agency for International Development (USAID). The joint cooperation which covers the period April 2007 until September 2014 focuses on improving the cost effectiveness and sustainability of aquaculture in the Philippines and Indonesia.

Research Institute for Humanity and Nature (RIHN)

In 2010, the signing and exchange of the Memorandum of Understanding between SEAFDEC and the Research Institute for Humanity and Nature (RIHN) of Japan was convened at the Training Department on 12 October 2010. The objective of the cooperation is to establish long-term scientific and technical cooperative relationships in the conduct of mutually beneficial academic collaborative research, and in exchanging information, techniques, and publications.

United Soybean Board, USA

Smith Bucklin Corporation (USA) representing the United Soybean Board (USA) continued its collaboration with SEAFDEC/AQD to complete the study on "Use of Soybean Meal and Soy Protein Concentrate as Alternatives to Fish Meal in Practical Feeds for Milkfish". The 'end result contract agreement' which covered the period January to December 2010 expected AQD to submit a progress report and a final report. The project which aimed to refine the optimal soy diet for milkfish and conduct a pilot feeding trial in sea cages with the optimal soy diet, was envisaged to support the strong R&D and extension activities of AQD and to promote sustainable milkfish aquaculture in the Philippines and in Southeast Asia.

University of Tehran, Iran

SEAFDEC/AQD Chief signed a Memorandum of Understanding (MOU) with the Vice Chancellor of Research, University of Tehran, Iran last 27 October 2010 to collaborate in the areas of research, training and extension programs, based on each institution's priority programs, needs and capabilities. The MOU is valid for a period of five years. Tehran University is a state university in Iran which promotes and undertakes aquaculture and aquatic animal health research and provides training and other extension services, including dissemination of information and technology to concerned sectors in the fields of aquatic biology and related sciences.

Vocational Education Commission of Thailand

SEAFDEC/TD in collaboration with the Vocational Education Commission of Thailand organized four-month Training Course on Fishing Vessel Operation, starting from 4 October 2010 to 25 February 2011 for students from Tinsulanonda Fisheries College, Songkhla Province. The training course aimed to provide knowledge and skills on six subjects, namely: 1) Ship Construction and Stability; 2) Marine Communication; 3) Laws and Regulations of Navigation; 4) Navigation Technology Practices; 5) Marine Machinery Technology and Practices; and 6) Fishing Gears Technology and Practices. Moreover, as part of the practical training of the students, hands-on experience and practice onboard the M.V. SEAFDEC and the M.V. Plalung were promoted including a study tour of communities and facilities relevant to the training subjects.

WorldFish Center

A Memorandum of Understanding (MOU) was forged between the WorldFish Center and SEAFDEC/AQD on 21 July 2010, as an expression of intent by both Parties to cooperate in areas of mutual interest. Specifically, the MOU aims to: 1) develop collaborative activities in the furtherance of the common goals and objectives of AQD and the WorldFish Center; 2) to participate in cooperative research and training programs in sustainable, small-scale

aquaculture development; 3) to promote the exchange of scientists, researchers and other personnel between SEAFDEC-AQD and the WorldFish Center for research, training and other related activities; and 4) to strengthen the capabilities of AQD and the WorldFish Center in the field of sustainable aquaculture development and aquatic resources management through the cooperative use and exchange of materials and facilities.

Collaborating Partners for the ASEAN-SEAFDEC Conference

In addition to the aforementioned collaboration, SEAFDEC also established partnership arrangements with several organizations and institutions for the preparation and conduct of the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 “Fish for the People 2020: Adaptation to a Changing Environment”, scheduled in June 2011. Such arrangements and collaboration come mainly in providing technical inputs to the preparation of the Conference, providing expert(s) to serve as resource persons or deliver statements during the Conference, among others. The collaborating partners for the Conference as of December 2010 include:

- | Food and Agriculture Organization of the United Nations (FAO)
- | Mekong River Commission (MRC)
- | Asian Institute of Technology (AIT)
- | Network of Aquaculture Centres in Asia-Pacific (NACA)
- | WorldFish Center, based in Penang, Malaysia
- | Coastal Development Center (CDC), based at Kasetsart University, Bangkok, Thailand
- | Fisheries Research Agency (FRA), Japan
- | Hokkaido University, Japan
- | Japan International Research Center for Agricultural Sciences (JIRCAS)
- | National Fisheries University (NFU), Japan
- | Tokyo University of Marine Sciences and Technology (TUMSAT), Japan
- | Faculty of Fisheries, Kagoshima University, Japan
- | School of Marine Science and Technology, Tokai University (TUMST), Japan
- | Hiroshima University, Japan
- | Research Institute for Humanity and Nature (RIHN), Japan
- | Marine Institute of the Memorial University of Newfoundland (MI), Canada

SEAFDEC PROGRAMS IN THE YEAR 2011

In 2011, SEAFDEC would continue to implement activities that focus on the development of fisheries and aquaculture technologies to support sustainable development of the fisheries sector. Particular priority would be on responsible fisheries in line with the Code of Conduct for Responsible Fisheries; contribution of fisheries to food security; and poverty alleviation and livelihood. Emphasis would also be given to the linkages between fisheries and the environment, as well as the introduction and provision of fisheries-related technologies that are applicable for small-scale fishers and rural communities. In addition, SEAFDEC would continue to discuss various concerns which could include: global emerging issues and situation including the requirements for food safety and the region's compliance with the regulations imposed by major importing countries to ensure sustainability of fisheries; environmental-related issues and requirements for conservation and management of marine species, and adaptation of the impacts from climate change; and global economic situation that could impact the fisheries production sectors of the world including the fisheries sector of the Southeast Asian region.

The SEAFDEC programs of activities proposed for 2011 were scrutinized during the 33rd Meeting of SEAFDEC Program Committee (30 November - 2 December 2010, Thailand) for submission to the 43rd Meeting of the SEAFDEC Council in early 2011, for consideration and endorsement. The programs include:

Departmental Programs

1. Center-wide Information Network (Secretariat)
2. Information and Communications Technology (TD)
3. Tailor-made Training and Study Tour (TD)
4. Integrated Mollusk Program (AQD)
5. Mud Crab and Shrimp Domestication (AQD)
6. Marine Fish (AQD)
7. Small-holder Freshwater Aquaculture (AQD)
8. Seaweed Strain Improvement (AQD)
9. Aquatic Ecology (AQD)

Existing FCG/ASSP Programs

1. Assistance for Capacity Building in the Region to Address International Trade-related Issues (Secretariat)
2. Improvement of Fishery Statistics and Information for Planning and Management of Fisheries in the ASEAN Region (Secretariat)
3. Activities Related to Climate Change and Adaptation in Southeast Asia with Special Focus on the Andaman Sea (Secretariat)

4. ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 (Secretariat, in collaboration with all Departments)
5. Strengthening SEAFDEC Network for Sustainable Fisheries and IUU Fishing Related Countermeasures (Secretariat)
6. Responsible Fishing Technologies and Practices (Fishing in Harmony with Nature) (TD)
7. Sustainable Utilization of Potential Fisheries Resources and Reduction of Post-harvest Losses (TD)
8. Fisheries Resource Survey and Operational Plan for M.V. SEAFDEC 2 (TD)
9. Deep Sea Fisheries Resources Exploration in the Southeast Asia (TD)
10. Information Collection of Highly Migratory Species in Southeast Asia Waters (TD in collaboration with Secretariat)
11. Development of Regional Database for Fishery Management (TD)
12. Promotion of Rights-based Fisheries and Co-management Towards Institutional Building and Participatory Mechanism for Coastal Fisheries Management (TD)
13. Rehabilitation of Fisheries Resources and Habitats/Fishing Grounds through Resource Enhancement (TD)
14. Improvement of Information Gathering System for IUU Fishing Related Countermeasures in the Southeast Asia (TD)
15. Promotion on Fishing License, Boats Registration, and Port State Measures (TD in collaboration with MFRDMD)
16. Human Resource Development for Sustainable Fisheries (TD)
17. Chemical and Drug Residues in Fish and Fish Products in Southeast Asia: Biotoxins Monitoring in ASEAN (MFRD)
18. Traceability Systems for Aquaculture Products in Southeast Asian Region (MFRD)
19. Utilization of Freshwater Fish for Value-added Products (MFRD)
20. Promotion of Sustainable and Region-oriented Aquaculture (AQD)
21. Resource Enhancement of International Threatened and Over-exploited Species in Southeast Asia through Stock Release (AQD)
22. Accelerating Awareness and Capacity-building in Fish Health Management in Southeast Asia (AQD)
23. Food Safety of Aquaculture Products in Southeast Asia (AQD, in collaboration with MFRD)
24. Tagging Program for Economically-important Pelagic Species in the South China Sea and Andaman Sea (MFRDMD)
25. Research and Management of Sea Turtles in Foraging Habitats in the Southeast Asian Waters (MFRDMD in collaboration with TD)

Non-funded FCG/ASSP Programs

1. The Use of Indicators for Sustainable Development and Management of Capture Fisheries in the ASEAN Region (MFRDMD)
2. Development of Integrated Inland Fisheries Management in ASEAN Countries (MFRDMD)
3. Capacity Improvement of Fisheries Community for Fisheries Management and Alleviation of Poverty (TD)

Other Programs

1. Cetacean Research in Southeast Asian Waters: Cetacean Sighting Program
2. Promotion of Inland Small-scale Fisheries Management through Rights-based Fisheries and Co-management Towards Institutional Building and Participatory Approaches
3. Safety at Sea for Small Fishing Boats

ENHANCING SEAFDEC VISIBILITY

Since its establishment, SEAFDEC has undertaken various activities and regularly developed information materials to support the sustainable development of fisheries in Southeast Asia. Since 2007, the common policy framework used for the formulation and implementation of SEAFDEC information-related activities is the “Information Strategies for Enhancing SEAFDEC Visibility and Communication”, which envisions that: “SEAFDEC shall be a sustained and unified Center of Excellence for Tropical Fisheries Information, accessible to all committed to sustainable fisheries development and food security, working for the benefit of its Member Countries, in close collaboration with the ASEAN and fishery-related organizations regionally and globally”.

On 6-8 October 2010, SEAFDEC organized the Eleventh SEAFDEC Information Staff Exchange Program (ISEP) Meeting in Manila, Philippines, to review the implementation of the Information Strategies by SEAFDEC Secretariat and Departments during the past year. Ways and means to improve the future information-related activities to enhance the activities and visibility of SEAFDEC were also explored during the Meeting.

Strategy 1: Production of relevant, timely, and useful information materials to meet the requirements of the target audience

- | Production and dissemination of 66 titles/issues of technical/scientific materials (with 14,975 copies produced and 6,917 copies distributed)
- | Production and dissemination of 57 titles of technical/scientific articles (with 11 titles published in SEAFDEC publications and 46 titles published in non-SEAFDEC publications)
- | Records of 482 queries for information through SEAFDEC libraries, and 323 sale materials

Strategy 2: Raising SEAFDEC image at national, regional and international levels

- | Production and dissemination of 46 titles/issues of promotional materials (with 42,191 copies produced and 38,114 copies distributed)
- | Websites and web blocks established and administered by SEAFDEC. For the main SEAFDEC Departmental websites, there were a total of 231,695 unique visitors, 209 links from other websites, and 34,751 annual download
- | Taking part in 21 exhibition events with the total 61,284 visitors visiting at SEAFDEC exhibition displays
- | Officially release of 18 press statements, and record of 135 SEAFDEC appearances in public medias and websites

Development of regional common/coordinated positions on international fisheries-related issues, covering issues on the proposed listing of commercially exploited aquatic species at the COP15-CITES, the Agreement on Port State Measures, Fisheries Subsidies, and the FAO Technical Guidelines on Aquaculture Certification, which had been used by Member Countries to reflect at the relevant regional/international fora

Strategy 3: Enhancing communication and information sharing both within SEAFDEC and with Member and non-Member Countries, other international/regional organizations, and public

Maintenance of SEAFDEC Secretariat and Department libraries and provision of library services

Acquiring a total of 897 issues of newsletter/serial publications, 460 titles of technical publication and 115 items of audio-visual materials in the SEAFDEC libraries

Cooperation and exchanging materials with 354 network libraries within and outside region

Dissemination of 61 titles (with 4,355 copies) of technical materials, and 41 titles (with 30,797 copies) of promotional materials to target group

Holding 552 downloadable materials and 16 databases accessible in the SEAFDEC websites

Enhancing the use of e-mail systems (including e-groups) to facilitate communications both among SEAFDEC staffs and with other people

Acquiring a total number of 14,649 visitors directly visited SEAFDEC Secretariat and Departments

Sending 185 SEAFDEC officials to participate in 85 events organized by other organizations (98 officials in the events at regional/international levels and 87 at national local levels)

Organization of SEAFDEC events, which include:

- Regional/International meetings, seminar, workshop (27 meetings with a total of 1,175 participants)
- National/local meeting, seminar, workshop, consultation, etc. (5 meetings with a total of 168 participants)
- International/regional training course (34 courses with a total of 348 trainees)
- National, On-site training courses (38 courses with a total of 972 trainees)
- Study tour (38 programs with a total of 208 trainees)
- Internship (48 groups with 48 persons)

- On-the-Job training (30 colleges with a total of 166 students)
- Internal meeting (7 meetings with a total of 254 participants)

Participation of officials from Member Countries to events organized by SEAFDEC:

- Regional/International meeting, seminar, workshop (526 participants)
- National/local meeting, seminar, workshop, consultation etc. (135 participants)
- International/regional training course (187 trainees)
- National, On-site training courses (1,080 trainees)

Establishment of collaborative agreement/implementation of collaborative activities with 26 fisheries-related organizations at national, regional and international levels

Receiving a total of USD 2,779,112 from non-regular sources for the implementation of programs/activities

Strategy 4: Strengthening SEAFDEC capability in information-related activities

Enhance staff capabilities that could contribute to information-related activities through provision of HRD activities in accordance with the scope and requirement of the staff, and during the annual ISEP Meeting

Enhancing financial sustainability of publication and information activities by selling of technical publications and souvenir items under a cost recovery basis

Strategy 5: Regular monitoring and evaluation of information activities

Organization of the Eleventh SEAFDEC Information Staff Exchange Program (ISEP) Meeting to monitor the implementation of information-related activities, in response to the Information Strategies for Enhance SEAFDEC Visibility and Communication

SEAFDEC INCOME AND EXPENDITURE IN 2010

Southeast Asian Fisheries Development Center

Un-Audited Abridged Consolidated Financial Statements (In US\$)

	2010 (Un-audited)	2009 (Audited)
REVENUES		
Contributions from :-		
Member governments	7,519,233	7,194,564
Other sources	984,102	765,385
Other income	<u>644,012</u>	<u>661,083</u>
TOTAL REVENUES	<u>9,147,347</u>	<u>8,621,032</u>
EXPENDITURE		
Operating and Capital Expenditure		
Research	891,797	784,547
Training	687,377	608,385
Information	743,453	675,243
Collaborative	141,279	130,635
Others	86,317	243,068
Administrative	<u>5,810,680</u>	<u>6,450,250</u>
Total Expenditure	<u>8,360,903</u>	<u>8,892,128</u>
SURPLUS (DEFICIT), For the year	786,444	(271,096)
FUND BALANCE, Beginning of year	4,647,092 (1)	4,630,582
FUND ADJUSTMENT	-	(45,967)
FUND BALANCE, End of year	<u>5,433,536</u>	<u>4,313,519</u> (1)
REPRESENTED BY :		
Cash at Bank	4,965,467	4,270,697
Other Receivables	254,876	88,250
Advances and Deposits	208,393	455,243
Supplies Inventory	56,274	47,300
Fuel oil for vessels	332,383	103,040
Prepayments	<u>18,610</u>	<u>20,568</u>
Total Current assets	5,836,003	4,985,098

Reserved budget for vessel periodic maintenance	42,000	-
Termination indemnity fund	1,928,340	1,611,244
Other assets-Net	<u>17,551</u>	<u>184,178</u>
Total Assets	<u>7,823,894</u>	<u>6,780,520</u>
Less : Liabilities		
Accrued payable	462,018	678,700
Fund held in trust	-	177,057
Provision for termination indemnity	<u>1,928,340</u>	<u>1,611,244</u>
Total Liabilities	<u>2,390,358</u>	<u>2,467,001</u>
TOTAL NET ASSETS	<u>5,433,536</u>	<u>4,313,519</u>

⁽¹⁾ The difference of US\$ 333,573 (US\$ 4,647,092 – US\$ 4,313,519) results in the varying exchange rate of the US\$.

Un-audited contribution received by SEAFDEC from Member Countries and other sources of funds for the year 2010 (In US\$)

Sources	Secretariat	TD	MFRD	AQD	MFRDMD	Total	
						In US\$	%
Brunei Darussalam	7,000					7,000	0.1
Cambodia	6,000					6,000	0.1
Indonesia	26,000					26,000	0.3
Japan	280,000					280,000	3.0
Lao P.D.R.	4,000					4,000	0.1
Malaysia	10,000				1,227,718	1,237,718	13.5
Myanmar	10,000					10,000	0.1
Philippines	15,000			3,325,227		3,340,227	36.5
Singapore	8,000					8,000	0.1
Thailand	20,000	2,566,288				2,586,288	28.3
Vietnam	14,000					14,000	0.2
Sub-total	400,000	2,566,288		3,325,227	1,227,718	7,519,233	82.3
Other Sources ^{1/}	38,357	425,467		1,164,290		1,628,114	17.7
Total	438,357	2,991,755		4,489,517	1,227,718	9,147,347	100

Remarks:

^{1/} Contribution under Other Sources includes: bank interests; gain/loss due to varying exchange rate of the US\$; contributions from donors directly to Departments and miscellaneous incomes

Contribution under Other Sources received by SEAFDEC in 2010 (In US\$)

Sources	Amount in US\$ ^{1/}
Fisheries Agency of Japan (TF-II)	789,747
Fisheries Agency of Japan (TF-V)	779,447
ASEAN Foundation: ASEAN-SEAFDEC Conference (Partial)	15,620
Swedish International Development Cooperation Agency (Sida)	450,000
Total	2,034,814

Remarks:

^{1/} The figures of the Contribution under Other Sources are not reported in the SEAFDEC Financial Statement which is submitted to the SEAFDEC Council of Directors.