ASEAN/UNDP/FAO REGIONAL SMALL-SCALE COASTAL
FISHERIES DEVELOPMENT PROJECT
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ORGANIZATION OF THE AQUACULTURE INDUSTRY

by

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ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project
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Herminio R. Rabanal[2/] and Medina N. Delmendo[3/]

1. INTRODUCTION

The organization of the aquaculture can be viewed under two major aspects, namely: 1) the industry proper, consisting mainly of the private sector undertaking the process of production; and 2) the government sector, in charge of services, administration and management. A discussion of these two sectors, together with their implications and ramifications, will be dealt with in the following sections.

2. THE INDUSTRY

To provide a better understanding of how the production sector of the aquaculture industry (private sector) is organized, one should understand the purposes of the industry, the resources or species it uses, the systems or procedures it utilizes for production, and the environment under which productions is conducted.

2.1 Purpose of the industry

As presently constituted, the industry has the following purposes:

a) For food production. This is the major objective of the aquaculture industry;

b) For the market, either locally or for export;

c) For employment, either for full employment or as supplement;

d) For sport and recreation; and

e) For the production of industrial product such as carrageenan from seaweed, fish oils, medicals, pearls, etc.

2.2 Resource or species used

The major resource or species used in aquaculture consists of the following:

a) Finishes. This includes freshwater as well as saltwater species;

b) Crustaceans, including shrimps, prawns, crabs, etc.;

c) Molluscs, e.g., oysters, mussels, cockles, clams, etc.;

d) Aquatic plants (seaweeds); and

e) Miscellaneous - frogs, turtles, crocodiles, etc.

1/ Lecture contributed by the Senior author to the FAO/UNDP Network of Aquaculture Centers in Asia (NACA) Training Programme for Senior Aqua-culturists, SEAFDEC, Tigbauan, Iloilo, Philippines, 24 March 1988.

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2.3 The different systems used in aquaculture

This can be divided into the following:

a) Pond system;

b) Pen/cage system;

c) Open water system, e.g., oyster plots;

d) Integrated fish culture with plant crop or animal husbandry; and

e) Ranching.

2.4 The different environments where aquaculture is usually conducted

These are the following in:

a) Low-lying inland plains;

b) Coastal swamplands;

c) Lakes/reservoirs;

d) Along rivers and streams;

e) In the sea (coves and bays);

f) Along irrigation systems;

g) Excavation and natural depressions which are rain-fed; and

h) Especially-built raceways and recycling plants.

3. INDUSTRY ORGANIZATION

From its very diversified origin in the different focal areas where aquaculture has developed through long years of tradition, very varied systems of organization have evolved.

3.1 Organization in terms of scale of operation

Existing aquaculture industries can be classified into: a) small-scale; b) medium-scale; and c) corporate or large-scale operations. In general, worldwide, most aquaculture operations are of small-scale nature. This is particularly true in most developing countries where aquaculture is characterized by the use of small-land areas, perhaps varying from a fraction of hectare to at most 10 ha. The owner-operator or caretaker for this operation, handles the management alone or with the help of his family members, or at most, one or two casually-hired helpers. The management is crude and traditional resulting in relatively low production equivalent or equal to the natural fertility of the water and land of about 300 kg/ha/year or at most a fraction more or twice that of natural productivity but not much more. The operator is generally unschooled or attained limited schooling, and though with a large family, does not have ambition to progress economically. His standard of life is simple and his means of sending his children to school and improving his lot is limited.

The medium-scale aquaculture operation uses slightly bigger areas, say 10 to 50 ha. The. operator may have higher schooling than the former class and is more aggressive in initiating new innovations and modernizing his operations. Normally, his average production is higher, perhaps about 3 or 4 times natural productivity or about 1 ton/ha/year.

Large-scale or corporate aquaculture operators manage hectarage of 50 or more or even by the hundreds of hectares. Here, the operator usually adopts higher scale technology, skilled manpower and attains higher production or produces a specialized high value crop which brings in bigger profits. Production of from 5 to 20 tons/ha/year is not uncommon under this management. The economics of this set-up, however, should be assessed with cost of operation.

3.2 Integrated operation

In aquaculture, both horizontal as well as vertical integration of management or operation may be possible. Horizontal integration can be characterized by consolidation of all types of aquaculture belonging to one kind of operation, say, milkfish culture, or cage culture, etc.

Vertical integration means the bringing together under one management the operation of one type of the aquaculture industry starting from the selection and acquisition of site, the production of seeds, the rearing in the grow-out, the preparation of feeds, post-harvest processing and marketing of the crop. This is a system that has been starting to develop in corporate aquaculture operations specially for high-investment, high value and export product. This is also the major type of organization suited and adapted in aquaculture in many developed countries.

3.3 Ownership and tenure

The environment or sites for the establishment of aquaculture did not have the benefit of a clear legal basis at the start of their establishment. It is only when the industry expanded and became of economic consequence in the different countries that laws or statutes to recognize the legal status of aquaculture establishments were looked into. To start with, the sites for aquaculture were labelled as public domains for the common use of the population in the surrounding communities. When an individual in that community, however, develops an aquaculture industry in a specified site within this public domain, the government authority involved should provide a privilege right for the developer for such a site through laws, orders or special regulations. If this is not provided, there will be conflict or chaos. So far, three systems of granting sites for aquaculture purposes are presently adopted, each with their advantages as well as disadvantages. These are: a) government lease - short-term or annually, or long-term, say 10 to 25 years, and renewable; b) granting of title - this may be granted after the satisfaction of certain conditions and after a certain period; and c) government concession - this is granted for a specific privilege over a definite area for a given duration. Milkfish fry collecting concessions in designated coastal waters in the Philippines is a good example.

3.4 Specialization in production

Certain aquaculture industries, in the course of their develop-ment have evolved a specialization of functions contributing to its rapid progress. For example, the shrimp hatchery production in Taiwan, China has a specialized industry for: a) obtaining adequate and good quality brood-stock; b) hatchery production for nauplii; c) rearing of nauplii up to post-larvae (PL), PL10 and PL20; and d) nursery-rearing of PLs to juvenile.

3.5 Investment and intensification

To attain maximum production from aquaculture establishments, increased investments to implement intensification is resorted to. The levels of intensification can be classified into: a) traditional; b) extensive; c) semi-intensive; and d) intensive. The

organization in the traditional system is simple and can be managed by one entrepreneur. In the semi-intensive and intensive systems, the organization is more complex, more diversified and utilizes a large amount of inputs in performing different functions. Investment is also high, including expenditures for engineering and infrastructure improvements and purchase of varied equipments. Using penaeid shrimp culture as an example, a comparison of the different levels of intensification is shown in the following table.

Elements of different intensity levels of management of penaeid shrimp culture in Southeast Asia

Type	Development/equipment cost (P/ha)	Annual Operating cost (P/ha/crop)	Stocking rate (PL/ha/crop) (No. of crops/yr)	Production (kg/ha/yr)
Traditional	20 000-50 000	5 000-10 000	Variable, mixed species (variable)	100-400
Extensive	50 000-100 000	10 000-50 000	10 000-50 000 (2)	500-2 000
Semi—intensive	200-000-500 000	100 000-200 000	50 000-100 000 (2.5)	2 500-6 000
Intensive	500 000-1 000 000	200 000-500 000	100 000-300 000 or over (2.5)	7 000-20 000

Note: This table is taken from H.R. Rabanal. Development of the aquaculture industry in Southeast Asia: An overview. Contributed to the Seminar on Aquaculture Development in Southeast Asia sponsored by the South-east Asian Fisheries Development Center, Aquaculture Department (SEAFDEC/AQD), Iloilo City, Philippines, 8-13 September 1987 (Table 11).

4. PUBLIC SECTOR OR GOVERNMENT ORGANIZATION

While the private sector takes care of the major function of production through aquaculture, the government sets the policies and provides the administrative and management arm for the industry. In general, this is done through the fisheries agency of the government which can consist all the way from a small fisheries section under a bureau or office, a bureau or office under a Department or a Ministry, or a Ministry or Department by itself. A typical organization is shown (Figure 1). If the fisheries office in a country is small, the staff for the management of fisheries may consist even of two men, while if this is adequately large such as in a department or ministry, aquaculture may be managed by an entire bureau or office under that department or ministry. The organization of such office depending on its size and capability can undertake policy formulation, administration including licensing and settling of legal conflicts, planning of development programs, promulgation of rules and regulations, training and extension, and research. If the government fisheries organization is small, it has to look upon other agencies for support. Using the Philippines as an example, existing as well as proposed fisheries/aquaculture organizations are shown (Figures 2, 3, 4 and 5).

Ancilliary agencies for specialized functions may be available in the country or in the region which may assist in such other public aqua-culture functions such as research, e.g., Southeast Asian Fisheries Development Center/Aquaculture Department (SEAFDEC/AQD); education and training, University of the Philippines in the Visayas (UPV); and extension. International organizations, bilateral and multilateral assistance programs, also assist in these vital functions, e.g., FAO, UNDP, International Center of Living Aquatic Resources and Management (ICLARM). World and regional development

banks specially in recent period have assisted in providing credit for the development of the aquaculture industry, e.g., World Bank, Asian Development Bank (ADB).

SELECTED REFERENCES

Delmendo, M.N., 1987 Institutional strengthening of fisheries administration in the Philippines. Paper read in the Seminar organized by the Society of

Aquaculture Engineering Practitioners of the Philippines, 5 December 1987, Manila, Philippines

Delmendo, M.N. and H.R. Rabanal, 1982 The organization and administration of aquaculture development in Asian countries. Agric. Admin. 9(1982) 61-75

Rabanal, H.R., 1987 Development of the aquaculture industry in Southeast Asia: An overview. Contributed to the Seminar on Aquaculture Development in Southeast Asia sponsored by the Southeast Asian Development Center, Aquaculture Department (SEAFDEC/AQD), Iloilo City, Philippines, 8-13 September 1987

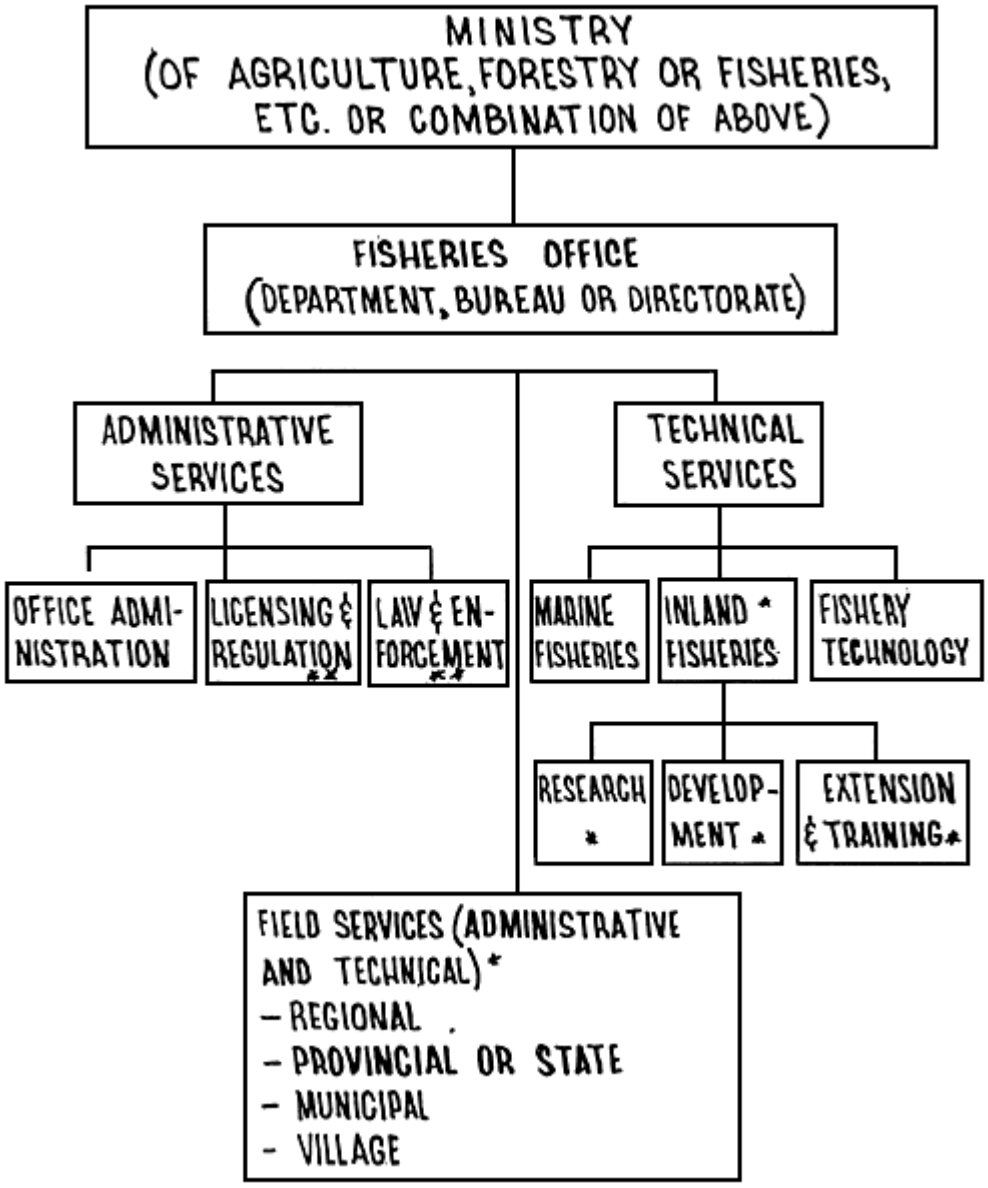

Figure 1, A typical government organization showing units that are involved in aquaculture administration and management

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* With involvement on aquaculture

** With service units for aquaculture

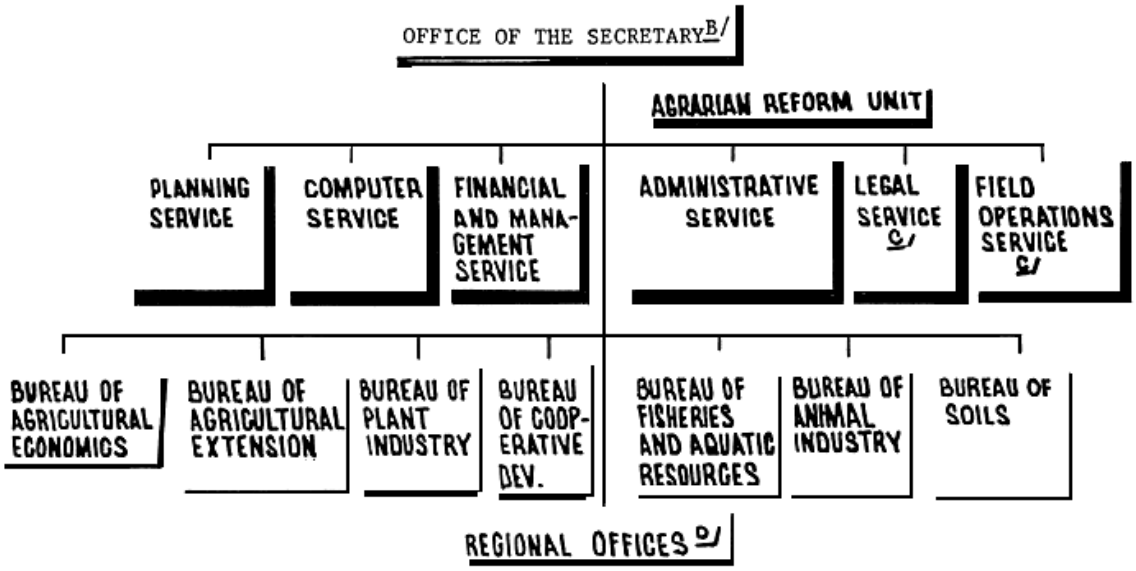

Figure 2, Proposed organizational structure of the Office of the Secretary and Department of Agriculture[A/]

[A/] As embodied in the proposed Department of Agriculture staffing pattern submitted to the Office of Budget and Management (OBM), based on Executive Order 116, January 30, 1987.
[B/] Includes two Assistant Secretaries (career) and four Assistant Secretaries.
[C/] Proposed (new) staff services,
[D/] There are 13 Department-wide regional offices,

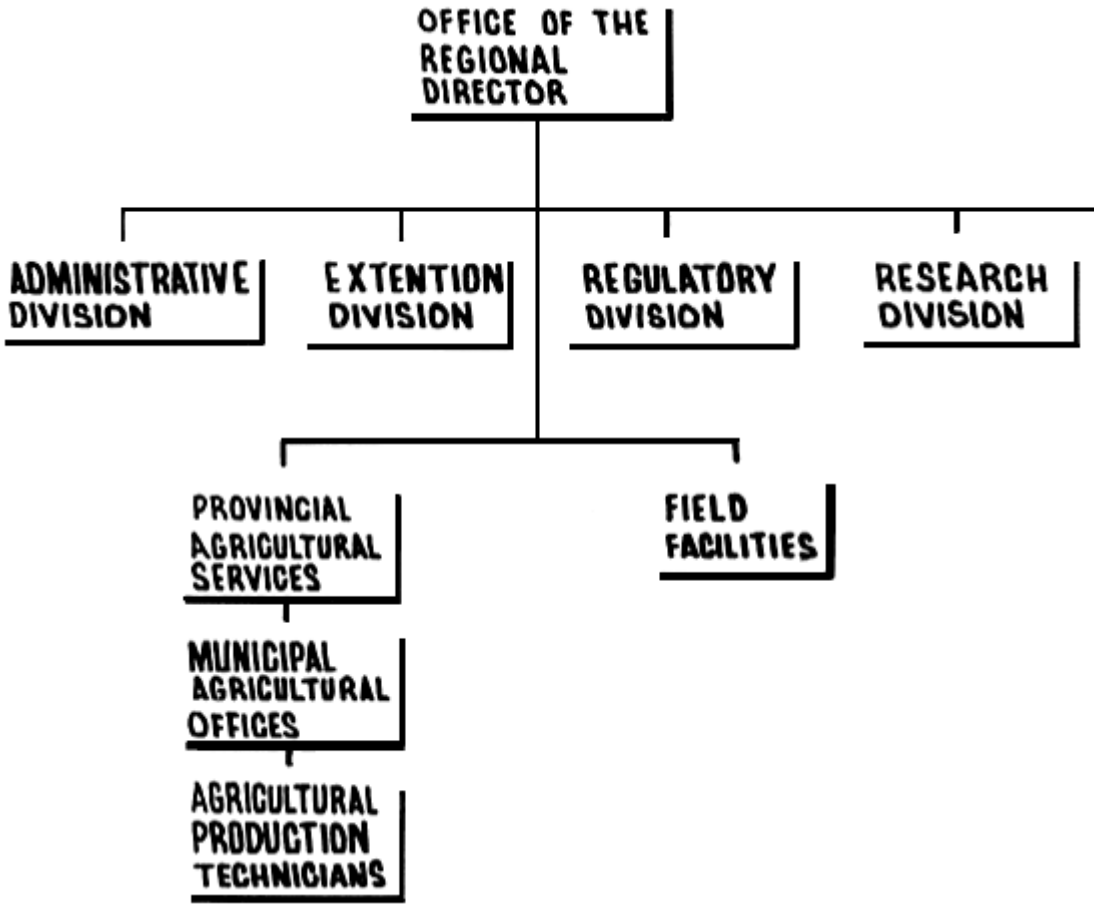

Figure 3. Proposed organizational structure of the Department of Agriculture Regional Offices[1/]

[1/] As embodied in the proposed Department of Agriculture staffing pattern submitted to the Office of Budget and Management (OBM), based on Executive Order 116, January 30, 1987, the proposed staffing pattern still does not include the fisheries function.

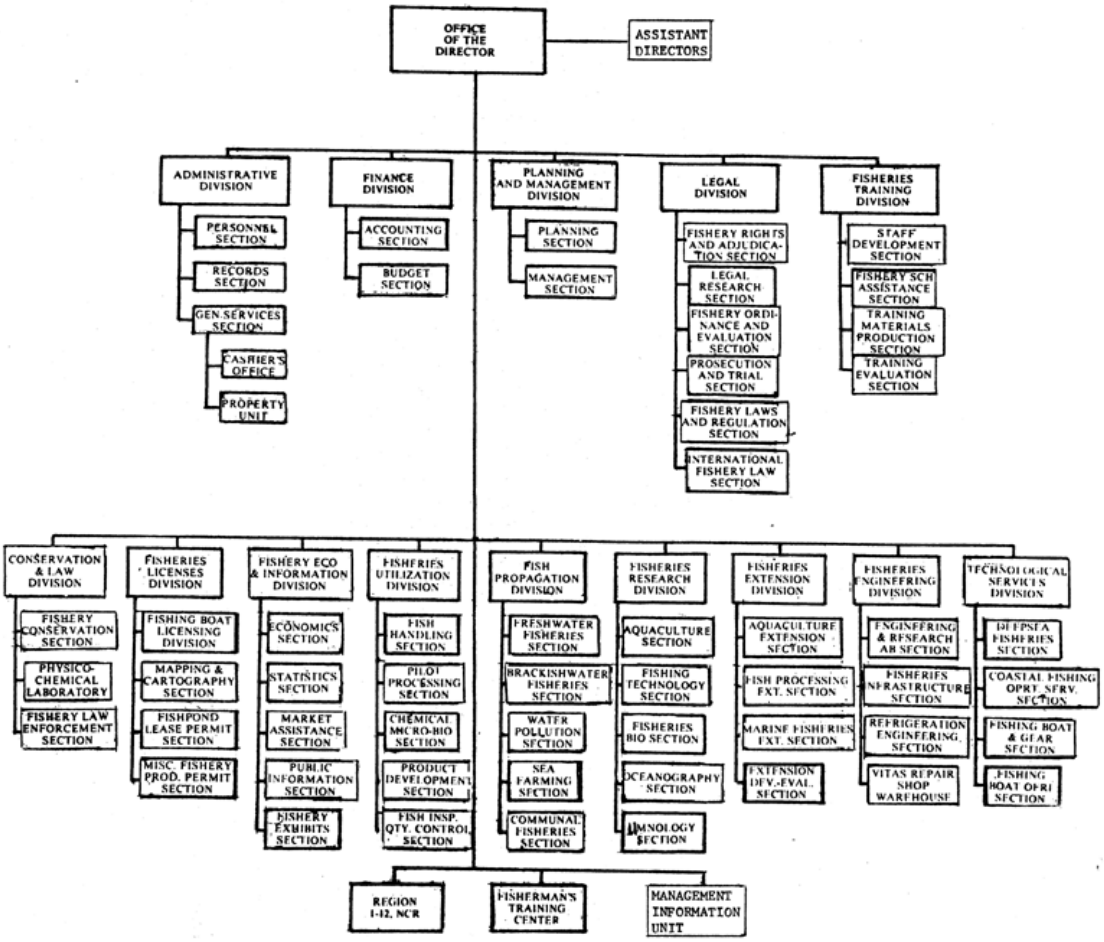

Figure 4. Former organization of the Bureau of Fisheries and Aquatic Resources

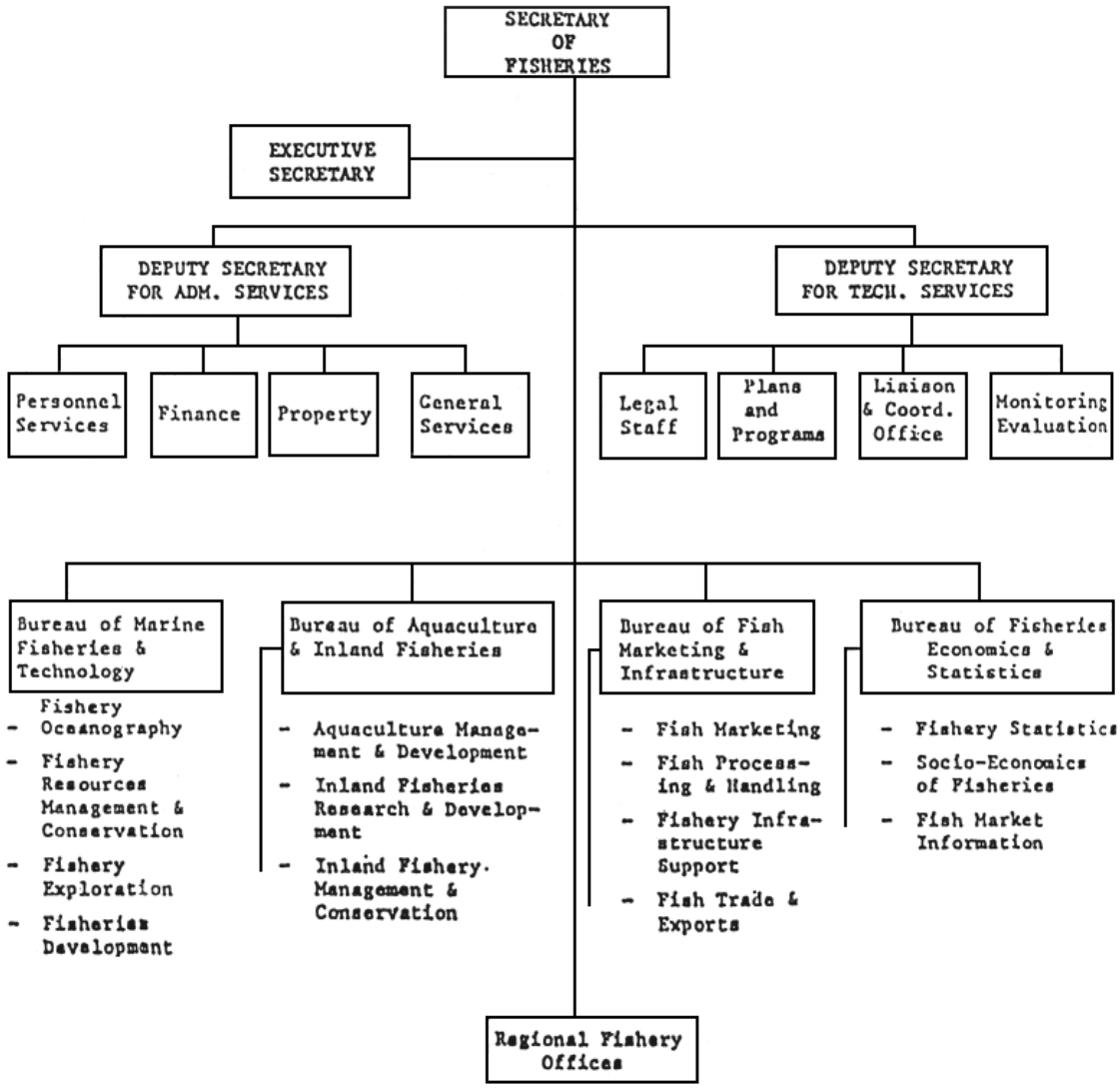

Figure 5, Proposed structure of a new Department of Fisheries*

* After Delmendo, M.N., Institutional Strengthening of Fisheries Administration in the Philippines, Paper read in the Seminar organized by the Society of Aquaculture Engineering Practitioners of the Philippines, 5 December 1987, Manila, Philippines.

PUBLICATIONS AND DOCUMENTS OF THE ASEAN/UNDP/FAO REGIONAL SMALL-SCALE COASTAL FISHERIES DEVELOPMENT PROJECT

(RAS/84/016)

Working Papers

ASEAN/SF/86/WP/1 Rabanal, H. R. Seafarming as alternative to small-scale fishing in ASEAN region. Manila ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 1986. 55p.

ASEAN/SF/86/WP/2 Soeyanto, T. The status of Bali Strait fisheries with special reference to Muncar, Kedonganan and Jimbaran coastal villages. Manila, ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 1986. 36p.

ASEAN/SF/86/WP/3 Boongerd, S. and S. Chitrapong. Small-scale fishing for squids and related species in Thailand. Manila, ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 1986. 44p.

Workshop Reports/Other General Reports

ASEAN/SF/86/GEN/l Report of national consultative meeting on aquaculture engineering held in Tigbauan Research Station, SEAFDEC Aquaculture Department, Iloilo City, Philippines, 2-5 October Manila, ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 186p.

ASEAN/SF/86/GEN/2 Zabala, P. T. (Comp.) Preliminary annotated bibliography on small-scale fisheries in the ASEAN Region. Manila, ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 1986. 41p.

ASEAN/SF/87/GEN/3 Report on the training course on shrimp culture held in Jepara, Indonesia, 2-22 December 1987. Manila, ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 1987. (In preparation).

ASEAN Fisheries Manuals

ASEAN/SF/86/Manual No. 1 Suprayitno, H. Manual of running water fish culture. Manila, ASEAN/UNDP/ FAO Regional Small-Scale Coastal Fisheries Development Project, 1986. 34p.

ASEAN/SF/88/Manual No. 2 Godardo L. Juanich. Manual on seaweed farming: 1. Eucheuma spp. Manila, ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 1988. 25p.

Periodic Progress Reports

ASEAN/SF/86/PR-1 Soesanto, V. Project progress report of the ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 5 October 1985-5 April 1986. Manila, ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 1986. 9p.

ASEAN/SF/86/PR-2 Soesanto, V. Project progress report of the ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 6 April-6 October 1986. Manila, ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 1986. l1p.

Technical Reports Contributed to Symposia/Meetings, etc.

ASEAN/SF/85/Tech. 1 Rabanal, H. R. and V. Soesanto. The world fishery and culture of Macrobrachium and related prawn species. Contributed to the National Conference on Prawn Technology, sponsored by the Philippine Fishfarmer's Technical Assistance Foundation, Inc., Manila, Philippines, 27-28 November 1985. 16p.

ASEAN/SF/86/Tech. 2 Rabanal, H. R. and V. Soesanto. Commercial species of shrimps and prawns, their sources and export markets. Contributed to the Seminar on Quality Control in the Production, Processing and Marketing of Frozen Shrimps for Export, sponsored by Food Research Department, Food Terminal Incorporated, Taguig, Metro Manila, Philippines, 29-31 July 1986. 64p.

ASEAN/SF/86/Tech. 3 Rabanal, H. R. Status and prospects of shrimp farming in the Philippines. Contributed to the Monthly Seminar Series on Timely and Related Fisheries Issues, sponsored by the Philippine Council for Agriculture and Resources Research and Development, (PCARRD), Los Banos, Laguna, Philippines, 5 November 1986. 24p.

ASEAN/SF/87/Tech. 4 Delmendo, M. N. Fishery administration and policy in the Philippines: Past and present. Contributed to the National Conference on Fisheries Policy and Planning, Baguio City, Philippines, 16-20 March 1987. 35p.

ASEAN/SF/86/Tech. 5 Delmendo, M. N. Milkfish culture in pens: An assessment of its contribution to overall fishery production of Laguna de Bay. Paper read in the Seminar on the occasion of the Fish Conservation Week, BFAR, October 1987. 17p.

ASEAN/SF/87/Tech. 6 Delmendo, M. N. and B. H. Delmendo. Small-scale aquaculture operations in the ASEAN countries. Manila, ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 1987. 49p.

ASEAN/SF/88/Tech. 7 Rabanal, H. R. History of aquaculture. Manila, ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 1988. 13p.

ASEAN/SF/88/Tech. 8 Rabanal, H. R. and M. N. Delmendo. Organization of the aquaculture industry. Manila, ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 1988. 10p.

ASEAN/SF/88/Tech. 9 Rabanal, H. R. Report on the World Aquaculture Society, 19th Annual Conference and Exposition, Honolulu, Hawaii, U.S.A., 4-10 January 1988. Manila, ASEAN/UNDP/FAO Regional Small-Scale Coastal Fisheries Development Project, 1988. 99p.