

Farming Marine Fishes and Shrimps

P. Korringa



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Farming Marine Fishes and Shrimps

A Multidisciplinary Treatise

P. KORRINGA

*Rijksinstituut voor Visserijonderzoek,
Ijmuiden (The netherlands)*

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PREFACE

If one broaches the topic "farming the sea" it is not only the industrial production of molluscan shellfish one has in mind, however important that may be. One rather thinks in terms of switching over from reaping the harvest from the sea, usually consisting of a variety of species, of which only few fetch a high price on the market, to growing a crop of valuable fish or shrimps under controlled conditions and in monoculture: in short, animal husbandry under water. By preference one should grow the fish in dense cultures, as a bio-industry, comparable with modern-style farming of chickens and pigs.

It is possible to grow fish, at least certain species of fish, in rather dense culture, and to produce an impressive quantity of valuable animal protein on a rather modest acreage. The greatest efficiency can be expected when one succeeds in raising a species of high market value to consumer size within one single season. This can only be expected under tropical or subtropical conditions, where one is not hampered by a prolonged growth stagnation in winter.

From an economic point of view, it is not only the overhead expenses for the construction and maintenance of ponds or enclosures, for personnel and electricity, one has to take into account, but also the costs for food – often the decisive factor. If one knows the price one can expect to make for the end product, and takes into account all the overhead expenses plus a reasonable figure for the "normal" mortality rate, one can figure out how much one can afford for food during the entire growth period. If one has reliable information on the conversion rate for a given food item to fish flesh, one can decide how much one could pay at the utmost for that food. Here one often finds constraints which make it economically unattractive to farm a given species of fish. If one wishes to farm a fish which is also brought to the market by fishermen, one can hardly hope to make a higher price for the farmed product than the fisherman gets for the same species. From this alone, one can easily see why farming cannot possibly be remunerative for the majority of fish species.

The best chances exist where it concerns a valuable fish which grows fast and can thrive on cheap food. These are in the first place the herbivorous fishes, living on plants big and small, or remains thereof. It takes only some manuring to stimulate the growth of such plants and hence the food bill can be kept low. Therefore farming of herbivorous marine fishes represents a category of special interest, also for developing countries, since one can produce a fair tonnage of valuable animal protein on very cheap vegetable food.

Unfortunately there are only a few species of marine fish which fall under this category. Two types are farmed on a large scale: the milkfish (*Chanos chanos*) and the mullets (*Mugil* species). Therefore, considerable attention is paid to the farming of these herbivorous fishes, both under tropical and subtropical conditions, respectively in Indonesia, and in Israel and Italy. The farming of these herbivorous fishes should not be seen as an industry to replace the ancient free fishery, for milkfish and mullets are hardly caught at all by fleets operating on the high seas. It is therefore an industry which supplements the existing fishery, and does not compete with it.

The carnivorous fishes and shrimps (which also have carnivorous habits) form quite a different category. For good growth they need a fair amount of animal protein in their food, and animal protein is almost everywhere quite expensive, even if one thinks in terms of fish meal. Experience has shown that some valuable species of carnivorous fish are quite fussy in their food preference and require high quality food, often fresh or deep frozen fish, to grow fast and to develop the special flavour appreciated by the consumer. Therefore farming of carnivorous fish has much in common with farming of chickens in a modern bio-industry. One needs a certain acreage of fish ponds in a good climate for rapid growth to marketable size. One can bring a lot of fish together in one single pond, but then good flushing and aeration becomes a necessity. The carnivorous fishes will never grow on the small amount of animal food produced in the pond on basis of the carbon dioxide assimilation by the green plants, big and small. One has to bring in food from a far greater acreage than the pond itself. If this food is trash fish, not suitable for human consumption, but caught in fair quantities together with more valuable fish species, one has a good chance to make the farming remunerative. If one has to buy deep frozen trash fish or high grade fish meal for this purpose, things may be more difficult. Pelleted feed may be used to farm carnivorous fish, but it is often the required dose of animal protein in the pellets which leads to a high, often too high, price for the food.

Farming carnivorous fish on a diet of species of fish which are also suitable for direct human consumption (herring, pilchard, mackerel, horse-mackerel, saury) is practised in some countries. One should realize that this means conversion of a large tonnage of low grade fish into a much smaller tonnage of high grade fish. Only rich countries, and those which can export their end-product for a high price, can afford such a procedure. It should be emphasized that such a type of sea farming should not be considered as an industry producing food to appease the hunger of the millions whose diet is too poor in animal protein, since it leads in reality to a reduction of the tonnage of edible animal protein on the market.

The same holds good for intensive shrimp farming. Where one practises extensive farming, at least partly based on natural food, and where one can find or compose rather cheap food, not withdrawn from the market of human food, to administer to the shrimps as supplementary feed, shrimp farm-

ing can become an interesting industry, especially for developing countries. Where one feeds the shrimps, however, a high grade food, one makes a luxury product at a high price, which is only acceptable for rich countries which are not short in animal protein.

To facilitate comparison with the cases of mussel farming and oyster farming I have decided to adopt the same subdivisions for each chapter as have been used in the three previous volumes, dealing respectively with mussel farming, with the farming of cupped oysters, and with the farming of flat oysters. Again, the section dealing with all the work involved in farming forms the bulk of the description:

A. BACKGROUND

A. 1. General principles

A.2. Biology of the species

A.3. Geographical situation

A.4. Hydrographic pattern

A. 5. Legal aspects

B. SEQUENCE OF OPERATIONS

B.1-Bx. This section forms the body of the descriptions, giving from the early developmental phases till the market, step by step, all the operations required, with indications of techniques used and of the amount of labour involved.

C. FARMING RISKS

C.1. Hydrographic conditions

C.2. Predators

C.3. Parasites and diseases

C.4. Competitors

D. ECONOMIC ASPECTS

D. 1. Rents

D.2. Inventory items

D.3. Expendable items

D.4. Purchase of seed stock

D.5. Labour

D.6. Sales

E. GOVERNMENT ASSISTANCE

F. GENERAL IMPRESSION

G. BIBLIOGRAPHY

Where necessary, a section describing the technical details is added after the General Impression.

Again, the economic aspects are, as far as is feasible, rather expressed in quantitative units, such as the magnitude of the personnel, gallons of diesel oil

used per year, tonnages sold, etc., than in monetary units. This will prevent the material presented in this book from becoming out of date. Still, some information is expressed in monetary units, and with the exception of Israel, where U.S. dollars are used (at the time of observation the U.S. dollar equaled 4.20 Israeli pounds), always in the money of the country concerned. A conversion table may serve to compare the local units with the American dollar. The figures are given for November 6th, 1972, a date representing more or less the middle of the period in which the data were collected, but to show how rapidly these figures may change a list of conversion rates for a more recent date (viz. March 20th, 1975) is added.

Currency	Abbreviation	Conversion rate	Conversion rate
		6-11-1972	20-3-1975
American Dollar	US \$	1.0	1.0
Indonesian Rupiah	Rp.	404.125	415.19
Italian Lire	L.It.	584.5	626.51
Japanese Yen	Y	301.0	285.23
Norwegian Crown	N.Kr	6.625	5.39

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Again, I feel first of all impelled to express my sincere gratitude to the leaders and proprietors of the enterprises selected as examples of regional fish or shrimp farming industries for enabling me to make use of their experience of many years standing, and for giving me a truly detailed insight into the labour involved in farming valuable species of fish or shrimps, and into the hazards and economics of their enterprises. Their names, noted in the heading of each chapter, need not be repeated here.

Further, I thank my colleagues who so kindly provided me with additional scientific information on the local hydrographic and biological conditions. For the case of mullet farming in Israel I have to express my heartfelt gratitude to Mr. S. Sarig of the Laboratory for Research of Fish Diseases at Nir-David for the painstaking way he formulated replies on my long questionnaire. Mr. Sarig was so kind as to collect a lot of information of a biological, technical and economic nature on fish farming in Israel for me, and replied extensively in several additional letters. He further kindly consented to discuss these matters orally on the occasion of his participation in the 1972 EIFAC meeting held in Amsterdam. Further, Dr. Y. Chervinsky and Mr. O.H. Oren provided me with useful information.

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