Mariculture development in Israel: Present and future

Gordin H.

Aquaculture planning in Mediterranean countries

Zaragoza : CIHEAM
Cahiers Options Méditerranéennes; n. 43

1999
pages 69-71

Mariculture development in Israel: Present and future

H. Gordin
Mariculture Department, Fisheries and Aquaculture Department
Ministry of Agriculture and Rural Development
National Center for Mariculture (NCM), Israel Oceanographic and Limnological Research (IOLR)
P.O. Box 1212, Eilat 88112, Israel

SUMMARY - Israeli aquaculture started in the mid 1930s with the introduction of European fish (common carp) and technology. Followed by the introduction of tilapia in the 1960s, most of the production was done in extensive fishponds with average yields of under 5 t per ha. Much of the fresh water culture (17,000 t in 1996) is done, at present, in water reservoirs, which hold rainwater for summer irrigation. However, due to the shortage of fresh water, mariculture development is a natural and welcome development. The Ministry of Agriculture policy is to achieve production surpassing 10,000 t annually within the next decade. Mariculture activities started in the early 1970s, as R&D in the Eilat area, on the shores of the Red Sea, with the active participation of the National Center for Mariculture (NCM). Most of the marine aquaculture R&D is done in this Center, situated in the City of Eilat. Its interdisciplinary structure and mode of operation is discussed briefly. The commercial development commenced in the late 1980s, and has reached a production of 1,802 t in 1998, of which 1300 t were gilthead seabream. Mariculture started, and is mainly carried out, in Gulf of Aqaba/Eilat with the active participation of the NCM, but some activities have commenced lately in the Mediterranean region.

Key words: Mariculture, Israel, research and development.

RESUME *- "Développement de la mariculture en Israël : Présent et futur". L'aquaculture israélienne a démarré vers le milieu des années 1930 avec l'introduction de poissons (carpe commune) et de technologie d'Europe. Suite à l'introduction du tilapia dans les années 1960, la plupart de la production a été menée en bassins piscicoles extensifs avec des rendements moyens de moins de 5 t par ha. Une grande partie de l'aquaculture d'eau douce (17 000 t en 1996) se fait actuellement dans des lacs de barrage retenant l'eau de pluie pour l'irrigation d'été. Cependant, en raison de la faible disponibilité en eau douce, le développement de la mariculture a été un fait logique et bienvenu. La politique du Ministère de l'Agriculture vise à obtenir une production dépassant 10 000 t par an pour la prochaine décennie. Les activités de mariculture ont commencé au début des années 1970 en tant que R&D dans la zone de Eilat, sur le littoral de la mer Rouge, avec la participation active du Centre National de Mariculture (NCM). La plupart de la R&D dans le domaine de l'aquaculture marine est menée dans ce Centre, situé dans la ville de Eilat. Sa structure interdisciplinaire et son mode de fonctionnement sont brièvement présentés. Le développement commercial de la mariculture a commencé à la fin des années 1980, et a atteint une production de 1 802 t en 1998, parmi lesquelles 1 300 t de daurade. La mariculture a commencé dans le golfe d'Aqaba/Eilat où elle continue d'être principalement menée avec la participation active du NCM, mais certaines activités ont été implantées récemment dans la région méditerranéenne.*

Mots-clés *: Mariculture, Israël, recherche et développement.*

Introduction

Israeli aquaculture started in the mid 1930s with the introduction of European fish (common carp) and Central Europe technology. In the 1960s tilapia species and hybrids were introduced. Most of the production was done in extensive, stagnant water, fishponds with annual average yields less than 5 t/ha. At present, much of the fresh water fish culture is done in water reservoirs which hold rainwater for summer irrigation. Fish are cultured in these reservoirs and are harvested towards the end of summer and fall. Almost 50% of the total fresh-water fish-production in Israel is carried out in the reservoirs (over 8,000 metric tons). Some of the reservoirs are serving as a "green lung" for intensive-satellite-fish-ponds; water is circulated between the reservoirs and the intensive ponds, thus being cleaned time and again.

Chronic water shortage characterizes the State of Israel. The water situation is not going to improve in the future due to increase in population size and the ensuing Peace Agreements with its neighbours, of which yielding some of its water to our past rivals and future friends. The reflection of

this situation on fresh water Aquaculture is to intensify fish farming. The motto is to raise fish with as little water as possible. Closed systems are designed with different modes of bio-filtration. New species have been introduced to the Israeli fish farming in recent years such as the grey mullet, rainbow trout, hybrid bass and lately the red drum and the Australian silver perch.

Mariculture development

However, due to the constraints stemming from the shortage of fresh water, mariculture development is a natural and welcome development. It took more than 20 years for the government to recognize the potential embedded in sea water to produce food; fish, molluscs, crustaceans and algae (micro and macro). At present the Ministry of Agriculture and Rural Development's official policy is to increase mariculture production surpassing 10,000 t annually, within the next decade.

The commercial development commenced in the late 80's around the Gulf of Aqaba/Eilat with the active participation of the National Center for Mariculture (NCM). In 1997 total production was 1,550 t (Table 1), of which 1,300 t were gilthead seabream and the rest are stripe bass, red drum, seabass and tilapia. Most of the production is carried out in the Gulf of Aqaba/Eilat (1,220 t). However, the farms in the Gulf are under pressure, exerted by different environmental agencies in the country, to halt their development due to the sensitive oligotrophic and coral reef marine system.

Table 1. Mariculture production in Israel 1996-1998

Farm name	1996	1997	Increase (%)	1998	Increase (%)
Ardag [R]	513	780	52	930	19
Dagsuf[R]	300	456	51	600	32
Ashdod[M]	35	125	257	160	28
Shikma[P]	15	25	66	30	20
M. Michael[P]		60		80	33
PGP[P]				2	
Total	863	1541	79	1802	17

R = Red Sea cage farm; M = Mediterranean cage farm (inside a harbour); P = Land based sea water ponds

Mariculture activity has started lately in the Mediterranean region; in land-base seawater ponds and in offshore fish cages. The Eastern Mediterranean is a cruel sea; winter storms generate waves of 7-10 m significant height. However, going offshore will free the farmers from environmental impact problems due to the large dispersion factors. The state of the sea, especially the winter storms, calls for specially designed systems which will withstand/avoid the high-energy events. A proto-type, which descends and ascends by surface control upon approaching storm or a fading one (respectively), was tried at sea for three winters with great success. Most of the effort goes into establishing offshore cage farms, however, with not much success to date.

There are two commercial hatcheries in Israel; one with production capacity of 5-7 million fry, the other produces 2-3 million fry per annum. A third one is in planning. Most of the fry production is of gilthead seabream.

Mariculture activities started in the early 1970s as R&D in the Eilat area that is situated at the southern tip of the State on the shores of the Red Sea. Most of the marine aquaculture R&D is done at the National Center for Mariculture, situated in the City of Eilat.

The Center is built as an interdisciplinary institute operating 11 inter-related departments: fish reproduction physiology, fish larval physiology and mass production, live food chain, fish nursery and physiology, molluscs reproduction - nutrition and culturing, fish nutrition, patho-biology, fish genetics, water quality and macro-algae, mariculture environmental impact, mariculture engineering.

Research and development

The NCM operates according to the following concepts:

(i) Mariculture is an interdisciplinary field, a fact that dictates the interaction and integration of many expertises to solve a problem.

(ii) Though by definition mariculture is an applied scientific field, there is no escape from going into basic research in order to understand and solve practical matters (such as reproduction control of fish).

(iii) Since mariculture is a relatively new field and a budding industry, the Research and Development work at the NCM has to cover all technological development from the test tube to the commercial scale (whenever possible).

(iv) Mariculture interacts, very strongly, with the environment. At the NCM, minimal environmental impact technologies are developed.

(v) Integration, in research, of graduate students from all universities in Israel.

NCM Objectives

(i) Development of food production technologies based on seawater.
(ii) Development and adaptation of mariculture technologies.
(iii) Development of mariculture technologies which are friendly to the environment.
(iv) Development of the R&D infrastructure for mariculture in the State of Israel.

Research and Development Goals 1998-2002

(i) Domestication of new marine species for mariculture.
(ii) Preventive and curing treatments for fish and molluscs diseases.
(iii) Preparing the integrated culture system for commercial practice.
(iv) Genetic selection and genetic engineering for the development of fish strains that perform better under culture conditions.
(v) Development of efficient fish feeds for mariculture with emphasis on fishmeal substitutes.

A land based, integrated ponds system (IPS) was developed in which fish are reared in intensive seawater ponds (25 kg of fish per m^2 per year). The fishponds' effluent is directed into a sedimentation pond in which solid particles are settled. Micro-algae blooms are developed in this pond and bivalves are grown in it at very high densities (yields of clams 5-10 kg per m^2 per year). From the sedimentation pond the water is pumped into a macro-algae (Ulva sp. and Gracillaria sp.) ponds. Yields of Ulva reach 50 kg per m^2 per year. The macro-algae strip the dissolved nutrients from the water, thus cleaning it to a degree that allows sending it back to sea, without the danger of polluting it, or back to the fish pond. The IPS can be implemented at any place where the ocean meets the desert (plentiful solar energy), around the world.

The employment of molecular biology-based technologies is crucial to the advancement of mariculture, if it is to fulfil its destination; production of about 60 million tons of fish in the year 2020. The following are a few examples which were done at the NCM in recent years: (i) a slow hormone release implant for reproductive control of fish (the Repro-Boost); (ii) diagnosis of viral and bacterial diseases; and (iii) fingerprinting of genetic strains using the genomic DNA.

It is our intention, in the foreseeable future, to employ genetic engineering for improving the performance of cultured fish, macro-algae (to produce valuable compounds), to commercially protect genetically improved organisms and the like. It is also our intention to develop fermentation technologies, which will convert mariculture wastes to valuable, recycled protein.

Last, but not least, we intend to participate in an international effort to domesticate large pelagic fish such as the blue fin tuna for farming purposes as well as for the preservation of the species.