

ADVISORY BOARD

M. S. Swaminathan . J. S. Kanwar
K. N. Singh . C. K. Krishna Rao
K. S. Virk . N. S. Maini . M. V.
Desai . J. C. Sharma . K. V.
Ramakrishnan . C. T. Peter . P. L.
Jaiswal

Editor: K. Balakrishnan Nair

Assistant Editor : J. B. Bali

Art : M. K. Bardhan and
A. Chakravarty

Production : Krishan Kumar

Business Manager : M. Prasad

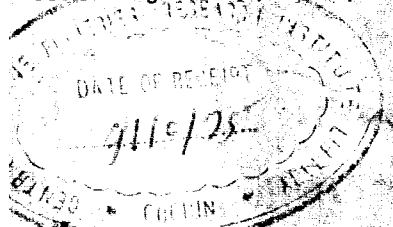
Single copy : Re 1 Annual : Rs 11

OUR COVER



An assortment of fish obtained from
composite culture

Cover Design : CIFRI, Barrackpore



EDITORIAL



Aquaculture

INDIAN FARMING

VOL. XXV No. 6 SEPTEMBER 1975
BHADRA-ASVINA 1897 SAKA

CONTENTS

Intensify Research to Solve Specific Problems <input type="checkbox"/> Jagjivan Ram	3
Aquaculture <input type="checkbox"/> R. Raghu Prasad	7
Scope and Role of Inland Aquaculture in India's Economy V.G. Jhingran	10
Fish Seed Production—A Pre-requisite to Intensive Freshwater Fish Culture H. Chaudhuri	13
Composite Fish Culture can Boost Fish Industry <input type="checkbox"/> V.R.P. Sinha	17
Derelict Waters for Air-breathing Fish Culture <input type="checkbox"/> Padmakar V. Dehadrai	19
Macrobrachium Culture in India <input type="checkbox"/> M. Subrahmanyam	21
Fish Farming in Man-made Lakes <input type="checkbox"/> A.V. Natarajan	24
Eel Culture <input type="checkbox"/> R.V. Nair and K. Dorairaj	25
Prawn and Fish Culture for Increased Yields <input type="checkbox"/> R.V. Nair, K.H. Mohamed and P. Bénsam	28
Production of Cultured Pearls <input type="checkbox"/> K. Alagarwami	34
Mussel Culture on Ropes <input type="checkbox"/> G.P. Kumaraswamy Achari	36
Sea-weed Culture <input type="checkbox"/> R.Y. Nair and N. Kaliaperumal	38

FISH is one of the fine items of food for man. Protein-rich and easily digestible, the role of fish in improving Indian diet and all in all augmenting the food resources of the country cannot be exaggerated. Its export potential also is enormous.

This issue is devoted to culture—the scope and possibilities in fresh, brackish and salt waters. It is estimated that nearly 70 million hectares of these waters are available, of which only 0.6 million hectares are under cultivation. From this, the possibilities of this great sector can be understood.

Faced with the challenges of dwindling food and energy sources, and the ever-worsening problem of pollution, the scientists and planners the world over are looking at earth's resources as an integrated whole where utilization and conservation go hand in hand. An over-intensified exploitation of land for food crops alone will cause suffering to, and progressive depletion of animal and fish resources. Thoughtless and ill-planned development of industries will bring within its wake pollution, particularly of the rivers and oceans. The fish will just vanish. Events in the nature of grave warning have already occurred. This means a totally integrated agriculture, animal husbandry and aquaculture, the whole operation being viewed as one ecological chain, meant for the healthy survival of men, animals and fishes.

In a humble way, this is also the philosophical and programmatic content of ICAR's own operational research projects.

There is also another noteworthy aspect about aquaculture in general. It is a labour-intensive programme. There is tremendous need for production and employment to go hand in hand. Production, without employment and the purchasing power that it creates, can cause its own problems. A close look at the rural areas will easily confirm this simple economic truism.

All in all, the subject deserves close study. The material that we present will help in this direction.

SEAWEEEDS constitute one of the most important marine resources of our country. They grow mostly on rocks or other plants as epiphytes in the inter-tidal and subtidal environments of the sea. The seaweed resources are abundant on the south-east coast of Tamil Nadu, Gujarat coast and around Lakshadweep and Andaman and Nicobar islands. There is a luxuriant growth of seaweeds of commercial value in the vicinity of Visakhapatnam, Bombay, Ratnagiri, Karwar, Varkala, Kovalam, Vizhinjam and some other places like Chilka and Pulicat lakes. Seaweeds are of great

harvest of alga in uncontaminated form can be obtained and the alga will also be of uniform quality. By adopting culture practices it will be possible not only to transplant the commercially important species to other suitable localities of our country but also introduce seaweeds which do not occur in our waters.

Methods of Seaweed Culture

There are two methods of culture of seaweeds, one by means of reproductive spores and the other by means of vegetative propagation using plant fragments. The number of spores produced by an alga is enormous and in nature, only a small number of these grow to mature plants since viability, settlement and development of spores are controlled by many ecological factors such as

SEAWEED CULTURE

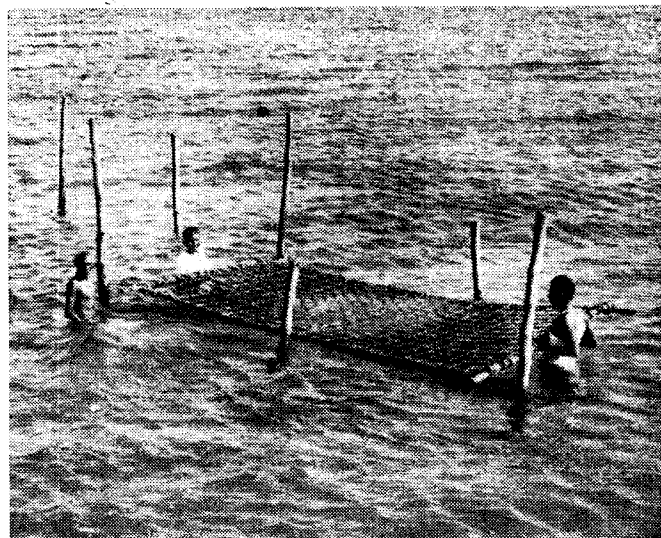
R.V. NAIR and N. KALIAPERUMAL

Central Marine Fisheries Research Institute, Cochin

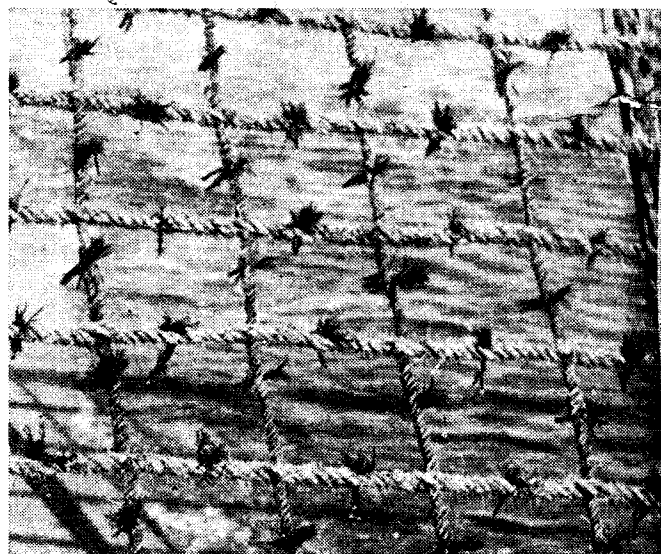
commercial importance as they yield valuable polysaccharides like agar-agar and algin which are widely employed in food, confectionary, pharmaceuticals, cosmetics, textile, rubber, liquor, canning, water paint and varnish industries mostly as gelling, stabilising and thickening agents. Agar also is used as a culture medium in bacteriology and mycology. A number of species are useful as food, fodder and manure. Medicinal products are also obtained from some seaweeds.

Seaweed Industries in India

In India seaweeds are at present used for the production of agar-agar and alginates. Agar-agar is extracted from *Gelidiella acerosa* and *Gracilaria edulis* and alginates from species of *Sargassum* and *Turbinaria*. Seaweed industries are functioning in places like Kappalur, Kovilpatti, Tiruchirapalli and Madras in Tamil Nadu and in Ahmedabad in Gujarat. The seaweeds are collected from natural beds and the seaweed industries require more raw material than what is available in natural habitats. Further, in recent years indiscriminate harvesting of seaweeds has resulted in denudation of seaweed beds especially in the coastal areas of Ramanathapuram District, Tamil Nadu. If such harvesting is carried out in other parts of the Indian coasts, similar denudation of the seaweeds is likely to happen. In view of these facts it is necessary to culture the commercially important seaweeds in our country to cope up with the requirements of the industry. There are several advantages in resorting to the culture of seaweeds. A pure



Culture frame with seedling materials of *Gracilaria edulis*



A portion of the same enlarged



A part of the frame showing luxuriant growth of seaweed after 80 days

water movement, tidal exposure, water temperature, competition for space and predators or grazing organisms. But when these spores are raised into germlings by providing suitable substrata in the laboratory under controlled conditions and they are then transplanted in the near shore area of the sea, cent per cent germlings grow to harvestable size. Culture by means of vegetative propagation is the easier method and gives quicker results although a large number of mother plants are required.

Experimental Culture of Seaweeds

The agarophytes exploited from natural seaweeds are insufficient to meet the large demand of the industries in our country. Therefore, experimental culture of *Gracilaria edulis* and *Gelidiella acerosa* is being carried out by the Central Marine Fisheries Research Institute in the near shore areas of the Gulf of Mannar and Palk Bay during calm seasons to determine the possibilities of culturing them by using different-sized culture frames fabricated with coir ropes. About 4 cm fragments of plants were used as seed material and they were inserted in the twists of the coir ropes. *Gracilaria edulis* showed quick regeneration and rapid growth both in Palk Bay and the Gulf of Mannar. Many new shoots also developed from cut ends of the plant bits and in eighty days the plants reached harvestable size. Harvesting was done by cutting the plants with knives. 1.25 kg of seed material introduced initially in 8 square metre frame yielded a harvest of 43.22 kg (fresh weight) and an average of 5.4 kg fresh weed was obtained per square metre area of the culture frame. In the natural environment this alga takes 4 to 5 months time to grow to maximum length but on the culture frames it grew to

September 1975

harvestable size within 3 months. It has been observed that *Gelidiella acerosa* does not show easy adaptation to culture conditions and the rate of growth is also slow.

General Remarks

In view of the potential for regeneration and rapid growth of plant fragments to harvestable size within three months, it is evident that *Gracilaria edulis* is suitable for culture and the production of commercial quantities of the agarophyte is economically feasible in our country. The near shore areas of the Gulf of Mannar and Palk Bay in the vicinity of Mandapam are highly suitable for culture of *Gracilaria edulis* during the months of October to March and April to September, respectively, when the sea is calm. The cost of cultured seaweed could be brought down substantially by culturing the seaweed on a very large scale and extending the duration of culture period. The laver *Porphyra vietnamensis* occurring on Visakhapatnam coast could also be cultured commercially and exported as there is good demand for these in Japan. Conducting of seaweed culture on a large scale in all available coastal waters of India will lead to increased production of agarophytes, alginophytes and edible seaweed and also offer profitable employment to a large number of persons living in the coastal regions.

DR S.S. BAINS MEMORIAL AWARD FOR SIGNIFICANT RESEARCH CONTRIBUTION IN AGRONOMY

The Indian Agricultural Research Institute, New Delhi, has instituted an award in the form of a medal and a certificate to commemorate the memory of the late Dr Sher Singh Bains, former Head of the Division of Agronomy, IARI, New Delhi. The award is meant to give encouragement to younger agricultural scientists of the level of Research Assistants and Senior Research Assistants or equivalent, working in the agricultural universities and the research institutes coming under the purview of the Indian Council of Agricultural Research, New Delhi. The applicant should have made significant research contribution in the field of Agronomy. The last date of application is November 1 1975. Kindly contact the Member-Secretary, Dr S. S. Bains Memorial Award, P.G. School, IARI, New Delhi-110012, for details of the rules and regulations and the prescribed form.