

SOUTH PACIFIC COMMISSION

NINTH REGIONAL TECHNICAL MEETING ON FISHERIES
(Noumea, New Caledonia, 24 - 28 January, 1977)

A REPORT ON THE STATUS OF THE GRASS CARP PROJECT, FIJI

by

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SUMMARY

The Fisheries Division, M.A.F.F., Fiji, has initiated a project to study the grass carp (Ctenopharyngodon idella) as a biological agent to control the growth of noxious weeds (mainly Hydrilla verticillata) in the Rewa River system. The rationale behind this project is briefly reviewed.

The main achievements in 1976, which include the development of a fish farm, field laboratory and hatchery, and the raising of a stock of brood fish and pituitary donors, is described.

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1. INTRODUCTION1.1. Background Information

Fiji's largest river, the Rewa, is heavily infested with the noxious submerged weeds Hydrilla verticillata and Potamogeton crispus, which form extensive beds, particularly in the lower reaches. The presence of these weeds aggravates the siltation problem, inhibits the free flow of water and blocks water-ways regularly used by local Fijians in small craft for transportation. These infestations are also considered a potential threat to accentuate flooding.

In addition to Hydrilla verticillata and Potamogeton crispus, other submerged weeds (Ceratophyllum demersum, Chara sp. and Vallisneria gigantea, and floating weeds Eichhornia crassipes and Salvinia molesta) occur in significant quantities and form extensive nuisance beds in the Rewa. They are also likely to cause a problem in other water bodies.

Growth of Hydrilla in the river has increased due to the cessation of dredging and major river traffic in 1960. Following the floods of 1972, which washed away most of the weed-beds, renewed growth occurred before any effective control measures could be introduced, though small-scale trials were undertaken by the Department of Agriculture, MAFF. The Government has recently intensified its efforts in an attempt to keep the Rewa river system weed free. Its policy, based on a knowledge of the behaviour of the weeds, the ecology of the river and the availability of facilities, has been to adopt a weed control programme involving biological and chemical methods.

The Fisheries Division (MAFF), a member of working party of the weed control programme, has been making concerted efforts to propagate the Chinese grass carp (Ctenopharyngodon idella) for biological control of the submerged weeds.

1.2 Origin of the Project

The Department of Agriculture made detailed studies on the ecology and biology of the Rewa River system with particular reference to aquatic weeds. Mrs H.R. Hughes, Botanical Consultant for the Department of Agriculture, studied the weed growth between 1960 and the beginning of 1969, and also discussed possible means of control of the weeds, including the application of chemical weedicides, use of mechanical weed cutters and the introduction of grass carp. On the basis of observations on weed distribution and area of infestations, she came to the conclusion that long-term control of Hydrilla could only be achieved effectively and economically by the Chinese grass carp. This fish is known for its insatiable appetite and has gained world-wide popularity as a biological agent for the control of aquatic weeds.

Realizing the need to introduce grass carp to control Hydrilla in the Rewa, the Fisheries Division made several attempts to import the species from Malaysia (during 1968) Taiwan (during 1970 and 1973) and release them in the river.

Because of the urgent need to initiate a weed-control programme, and in view of the lack of success in building up a large stock of imported (?) grass carp, the Government of Fiji requested expertise and a supply of grass carp fry from the Indian Government in 1973. The Government of India indicated that it was highly expensive and risky to import such a large consignment of live fish, and suggested that production of the fish within Fiji itself may solve the problem. They also offered to provide the necessary technical help, which was readily accepted by the Government of Fiji.

A gift consignment of 2,000 grass carp fingerlings sent from the Central Inland Fisheries Research Substation, Cuttack, India, was received in Fiji in March 1974 with negligible mortality. The Government of India also deputed Dr H. Chaudhuri, Head of the Fish Culture Division, C.I.F.R. Substation, Cuttack, to study the status of the Grass Carp Project and to advise the Government of Fiji on the proper rearing of grass carp stock and also on the requirements of the project for successful implementation.

Dr Chaudhuri felt that, while the weed problem in the Rewa could be overcome by grass carp, releasing small fry directly into the predator infested river might prove ineffective since the fry would be subject to heavy predation. He suggested raising the fingerlings imported from India to breeder size, spawning them by injection of a gonadotropic hormone and releasing the offspring at about 25cm in length. In view of the limited pond space and field facilities available to maintain brood stock and raise fingerlings, Dr Chaudhuri recommended the establishment of a small self-contained fish farm about 4 ha. in area.

The Government of Fiji subsequently initiated a pilot scheme for the mass production of grass carp fry and fingerlings at Naduruloulou. The Government of India provided the necessary technical assistance by deputing a grass carp expert in March 1976.

1.3 Objectives

The main objective of the project is to control the growth of Hydrilla in the Rewa river system by using the grass carp as a biological control agent. To achieve this objective it was decided to produce grass carp fry on a commercial scale by injection with (hypophyseal) (Pituitary) extract technique, raise the fry to advanced fingerling size under controlled condition and release them in the open water in large numbers over a period of five years.

2. EXPERIMENTAL CENTRES

Facilities are presently available at the Fisheries Division Headquarters, Lami, and at the main centre of the project at Naduruloulou.

2.1 Lami Fish Farm

The Lami Fish Farm was built in 1968, and consists of three ponds - 0.2 ha ($\frac{1}{2}$ acre), 0.057 ($\frac{1}{7}$ acre) and 0.04 ha ($\frac{1}{10}$ acre) in area. The main source of water is run-off from the surrounding hills, and on several occasions the ponds became polluted and caused considerable/total (?) mortality of the stock. Little progress was made in raising adequate numbers of grass carp imported from Malaysia and Taiwan (1968 to 1973 respectively) to suitable size for their propagation because of unfavourable pond-water conditions. The gift consignment of grass carp received from India had also to be maintained in these ponds until they were transferred to the newly-constructed ponds at Naduruloulou early in September, 1976.

2.2. Freshwater Fish Culture Station at Naduruloulou

Because of the limited space for expansion of the Farm at Lami, a suitable site for the construction of a fish farm was selected at the Agriculture Department's Research Station at Naduruloulou. Building of the fish farm, with two 0.4 ha (1 acre) ponds, six 0.08 ha ($\frac{1}{5}$ acre) ponds, two 0.04 ha ($\frac{1}{10}$ acre) ponds and two 0.02 ha ($\frac{1}{20}$ acre) ponds, together with water supply and drainage structures, was completed at the end of August 1976.

Construction of a small building commenced in October 1976 to provide accommodation for the office, laboratory and a hatchery for incubating the fertilized eggs of grass carp. With its completion the fish farm will become a self-contained unit for the successful implementation of the Project.

The newly excavated ponds in the Farm have fairly retentive soil and the water is slightly alkaline, both of which characteristics are favourable for optimum management of the farm.

3. PROGRESS

3.1 Rearing of Grass Carp Breeders

On completion, the ponds at Naduruloulou Station were stocked with 600 grass carp fingerlings transferred from Lami early in September, 1976.

The fingerlings were stocked at densities ranging from 625 to 750 per hectare (250-300/acre). During the first two months after stocking, the fish were fed with Hydrilla and Paragrass supplied at almost equivalent to their body weight per day for five days a week. The stock was also fed with a mixture of rice bran and copra meal (in 1:1 ratio by weight) at 2 per cent of their

body weight per day, except on weekends. Fingerlings with an initial average weight of 200 g weighed about 1,000g after two months and 1,500g after three months. As some of the grass carp were observed to grow fat, (a condition that inhibits gonad development), the supply of weed and supplementary feed was limited to three and two times respectively each week from the third month onwards.

None of the present grass carp has been observed to mature or even display secondary sexual characters so far, in spite of their large size and healthy growth. Grass carp are known to mature at about 1kg in weight. Under local conditions a few of the grass carp received from Malacca during 1968 matured and showed secondary sexual characteristics from September (1971)?? through January (1972)?? when they were about three years old. However the majority did not mature until the following year. The present lot of grass carp were three years old in July/August 1976. The probable reason for their lack of necessary maturity is their youth and small size in September 1976 when the gonads normally or should have started to develop.

3.2 Raising of Donors for Pituitary Glands

The availability of adequate numbers of suitable donor fish to supply pituitary glands is one pre-requisite for successful induced-breeding operations. The Fisheries Division therefore imported tawes (Puntius gonionatus) from Malaysia. This carp is easy to rear and breeds readily in impounded waters, it thus satisfied the conditions required for a donor fish.

Along with grass carp fingerlings, 20 adult tawes were transferred from Lami to Naduruloulou and were induced to spawn within a month of their introduction into the new ponds. A small stock of about 300 fingerlings, initially weighing an average 200 g, is being built-up to ensure that the unit has a constant^{and} adequate supply of pituitary material.

4. TRAINING OF PERSONNEL

Apart from inadequate pond space, the lack of specialized technical know-how in induced breeding of grass carp was the main handicap to implementing the Grass Carp Project successfully in Fiji. With the arrival of a Grass Carp Expert from India, an opportunity arose to train local fishery workers in different aspects of fish farm management, including hypophysation techniques, with special reference to the grass carp.

Mr S. Tui Cavuilati, Fisheries Officer (Aquaculture) has been nominated to work as a counterpart to the Indian Expert, and two more Senior Fisheries Assistants joined the team early in January, 1977. In addition, a group of 12 final-year students of the Diploma Course in Tropical Fisheries, University of the South Pacific, and two junior staff of the Fisheries Division were given a three-month course in Aquaculture during July-November 1976 by the Grass Carp Expert. These people are thus basically equipped to assist in any aquaculture project (including the Grass Carp Project).

5. CONCLUSION

After a few years of initial uncertainties, the Grass Carp Project appears to be progressing satisfactorily. Adequate brood stocks of grass carp and pituitary-donor fish are well established in the Fish Farm at Naduruloulou. The involvement of an overseas expert has allowed a flow of technological expertise to the aquaculture team of local Fisheries personnel.

It is hoped that the next stage of the programme, involving hypophysation of grass carp, raising of fry and fingerlings, and their release into the Rewa river for biological control of weeds will be possible during the next fish breeding season (December 1977 - January 1978).
