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17 May 1974

ORIGINAL : ENGLISH

SOUTH PACIFIC COMMISSION

SEVENTH TECHNICAL MEETING ON FISHERIES
(Nuku'alofa, Tonga, 15 - 19 July 1974)

INDUCED SPAWNING AND LARVAL REARING OF THE RABBITFISH *SIGANUS CANALICULATUS*

by

Patrick G. Bryan
Sea Grant Consultant
Micronesian Mariculture
Demonstration Center
Koror, Palau, W.C.I. 96940

and

Robert C. May
Sea Grant Director of Aquaculture
Hawaii Institute of Marine Biology
Kaneohe, Hawaii, 96744

and

Beketaut Madraisau
Biologist
Micronesian Mariculture
Demonstration Center
Koror, Palau, W.C.I. 96940

and

James P. McVey
Chief
Micronesian Mariculture
Demonstration Center
Koror, Palau, W.C.I. 96940

Summary

Spawning of Rabbitfish Siganus canaliculatus has been successfully induced by injections of 500 units of Antuitrin "S" (Parke Davis). Antuitrin is a pituitary-like hormone.

Larvae have been successfully grown through to metamorphosis (23 to 30 days). They fed initially on blooms of local phytoplankton which had been stimulated in the rearing tanks before spawning occurred. Rotifers (Brachionus plicatilis) were added during the first week. One or more species of copepods had become established in the tanks. Artemia nauplii were offered after the first week.

The rearing tanks (3 of 500 litres and two of 5,500 litres) were roofed with translucent material to prevent overheating, keep out rain but still allow enough light for phytoplankton growth. The larger tanks gave better results than the smaller ones. Three weeks after hatching several hundred larvae remained and the larger ones were beginning to accept particles of trout chow. 23 days after hatching the larvae began to metamorphose and began to eat algae. After 30 days the majority had metamorphosed and the largest juveniles measured 35 mm.

Experiments with larger tanks and the increased use of copepods for food are now proposed. However, the present experiments have demonstrated that rabbitfish larvae can be reared on a mass scale. Further work is needed to determine optimum conditions for increased survival and growth.

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The Trust Territory of the Pacific is involved in a developmental program to initiate a hatchery for the commercially important rabbitfish, Siganus canaliculatus. The Marine Resources Division through its Micronesian Mariculture Demonstration Center in Palau has succeeded in inducing spawning in adult S. canaliculatus and rearing the larvae through to the juvenile stage. This work has been accomplished with financial aid from Sea Grant (Grant #) and in cooperation with the Sea Grant program at the University of Hawaii (HIMB) and the University of Guam. The project was a joint effort carried out by Dr. Robert C. May of HIMB, Dan Popper of F.A.O., and Dr. James P. McVey, Beketaut Madraisau and Patrick Bryan all of the M.M.D.C.

The genus Siganus is Indo-Pacific in distribution and representatives of this group of fishes are valued for their flavor. In Palau S. canaliculatus (meyas in Palauan) has formed a substantial portion of the Palauan diet and is favored over other reef fishes. Improved nets, outboard motors, use of dynamite and increased fishing pressure to supply the export market to Guam has led to a reduction in the standing crop of S. canaliculatus in recent years.

The Palauans have accumulated a substantial amount of biological information concerning the life history of this rabbitfish, and the original research was based on information obtained from the Palauan people. It was known that S. canaliculatus spawned at predictable times and locations around the Palau islands; that the fish was a herbivore; and that the juveniles were available in large numbers during the spawning season. All these qualities are desirable in fish selected for mariculture. Later work with S. canaliculatus showed that it adapted well to domestication, survived and grew on a range of diets and could obtain market size in one year. The next steps in an integrated siganid fish farming program were development of techniques for inducing spawning and rearing larvae to provide a stock of juveniles on a dependable basis. The present report outlines recent progress in this program.

Induced spawning of S. canaliculatus

In Palau, natural spawning of S. canaliculatus occurs from February through June, although deviations from this pattern may occur in the form of small spawning runs during other months. We have succeeded in eliciting spawning from December through August by injecting adult S. canaliculatus with a pituitary-like hormone, the chorionic gonadotropin, Antuitrin "S" (Parke Davis). A dosage of 500 units of Antuitrin "S" in isotonic NaCl was necessary to elicit spawning as lesser concentrations (250 units) were ineffective. The hormone was injected intramuscularly just below the dorsal fin. Injections were repeated (usually at weekly intervals) if no spawning occurred, and the injected fish were kept isolated from other breed stock in 500 liter tanks supplied with running sea water. No anaesthetics were used in early tests, but we later found it much easier to work with fish that had been anaesthetized with Quinaldine. Fish were usually chosen for hormone treatment on the basis of appearance. Well developed females look fatter than other fish.

Males were selected on the basis of milt being observable at the genital pore when the lower abdomen was gently compressed.

Thus far this year, we have had seven spawnings. In one experiment involving seven specimens (January 24, 1974) the three largest fish spawned (160 - 170mm SL). This was characteristic of other tests, where the larger specimens were usually first to spawn. One large female spawned on December 25 and again on January 28. The fish was naturally ripe and ready to spawn on March 18 when it was accidentally killed (186mm FL).

In all cases spawning occurred if specimens were given one or more treatments of 500 units per injection (Fig. I). Fish treated for the first time in November were induced to spawn in December, at least one month prior to the natural spawning season. It is not known if fish injected with lower dosages would eventually have spawned as experiments using low dosages were terminated prematurely to devote attention to rearing those larvae already produced.

These results show that S. canaliculatus can be induced to spawn using hormone injections of at least 500 units per treatment. Repetitive treatments may induce spawning on a year-round basis.

Rearing S. canaliculatus through the juvenile stage

Eggs of S. canaliculatus were obtained by hormone-induced spawning as just described. Three 500 liter tanks and two 5,500 liter tanks were stocked with five eggs or larvae per liter. Blooms of local phytoplankton had been stimulated in the tanks prior to the spawning. Rotifers (Brachionus plicatilis) were added to each 500 liter tank during the first week after hatching. Besides these specificially added food items, one or more species of copepods became established in all tanks and constitued the only food (other than phytoplankton) in the second 5,500 liter tank (Tank B).

Artemia nauplii were offered to the larvae on day eight after hatching. Water in the tanks was kept static until day nine, when a slow flow of filtered water was begun. Water temperature varied from 28°C to 32°C, and the salinity remained at approximately 33‰.

A transclucent roof was constructed over the rearing tanks to keep out rain and to prevent overheating, while letting through sufficient sunlight for phytoplankton growth. Samples of larvae were removed periodically to provide a series from which Dan Popper is preparing a description of larval development.

The large tanks proved better suited to rearing than the small tanks. Larvae in the small tank receiving rotifers and oyster trochophores survived better than larvae in the other two small tanks during the first two weeks of development, but mortality eventually increased until on day twenty only one larva remained in this tank.

Larvae in the large tank which had received rotifers grew faster than those in the other large tank, no doubt due to the more abundant food supply. At an age of one week, the larvae had begun to develop the large, pigmented dorsal spine which is a characteristic feature of larval rabbitfish and which seems to mark passage of the most sensitive stage of development. Three weeks after hatching several hundred larvae remained and some had achieved lengths of 22mm, which is approximately the size of fry when they first move inshore and invade the reefs of Palau. These fish had been showing schooling behavior for some time, and the larger ones were beginning to accept particles of trout chow. On day 23, two larvae metamorphosed into juveniles and began eating algae. Thirty days after hatching, the largest juveniles measured 35mm in length and the majority had metamorphosed into juveniles (Figs. II & III).

These results strongly indicate that further hatchery work should utilize rearing tanks of large volume. Tanks even larger than the 5,500 liter tanks used in this experiment are being constructed for future tests. Another useful finding is that local copepod species are relatively easy to rear in the same tanks used for rearing larval siganids. Larval siganids showed a preference for copepod nauplii, and this source of larval food should be further exploited. In addition, using copepods as food may increase survival, as we experienced significant larval mortality apparently attributable to extended periods of feeding with *Artemia*.

This cooperative effort has demonstrated that larval rabbitfish can be reared on a mass scale. Future trials will no doubt be needed to improve survival rates with emphasis on increased food production, but the basic outline of a larval siganid rearing technique is clear. It now appears that a siganid hatchery at the M.M.D.C. could supply fry to Palauan fish ponds. This would be an important step toward a viable siganid mariculture industry that may reduce pressure on the natural stocks of siganids in Palau and provide expanded fishery potential for other Pacific Islands.

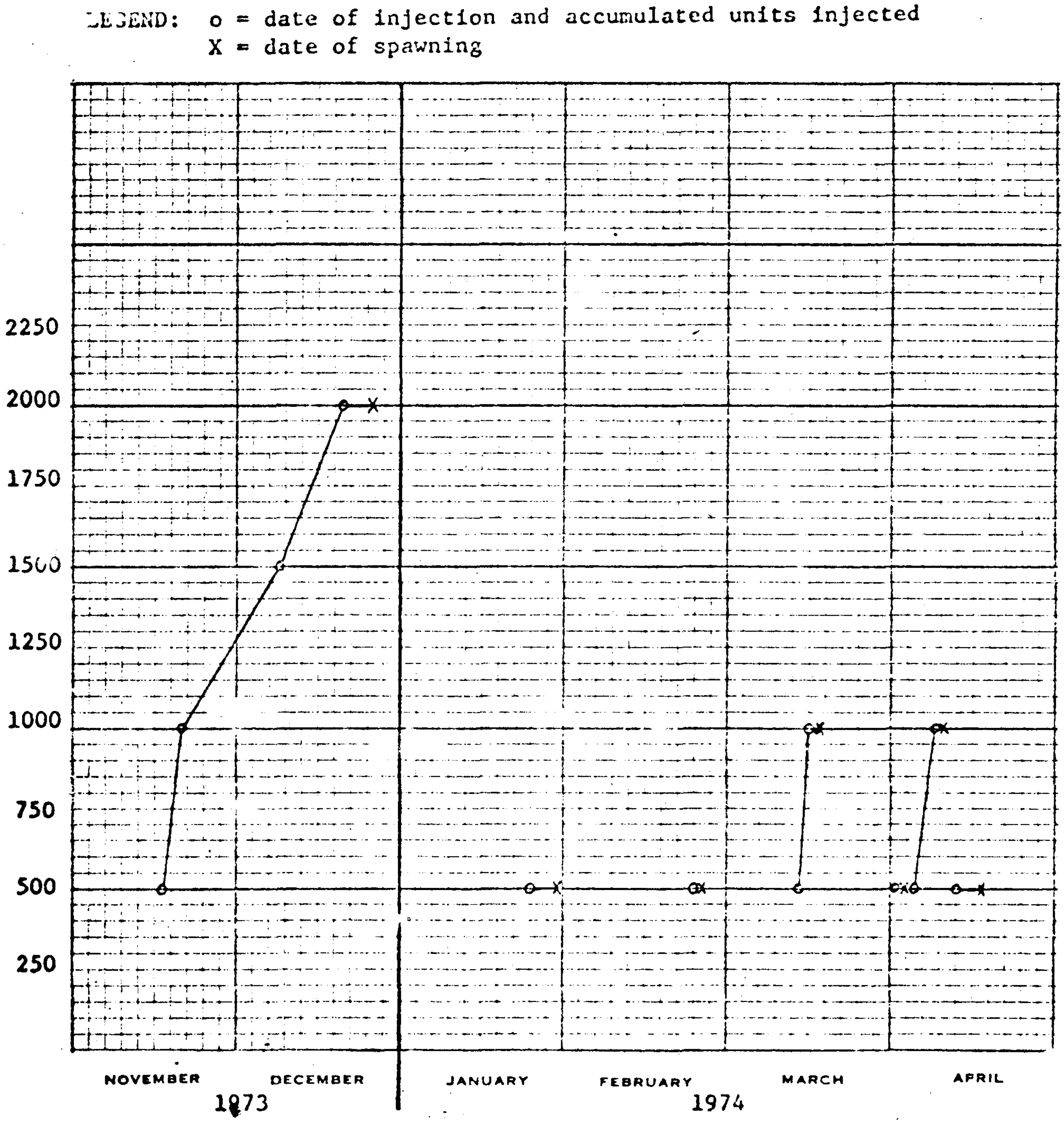

FIGURE I. Dates of treatments and accumulative units of chorionic gonadotropin injected in specimens of *S. canaliculatus* to induce spawning. Each circle represents a 500 unit intramuscular injection.

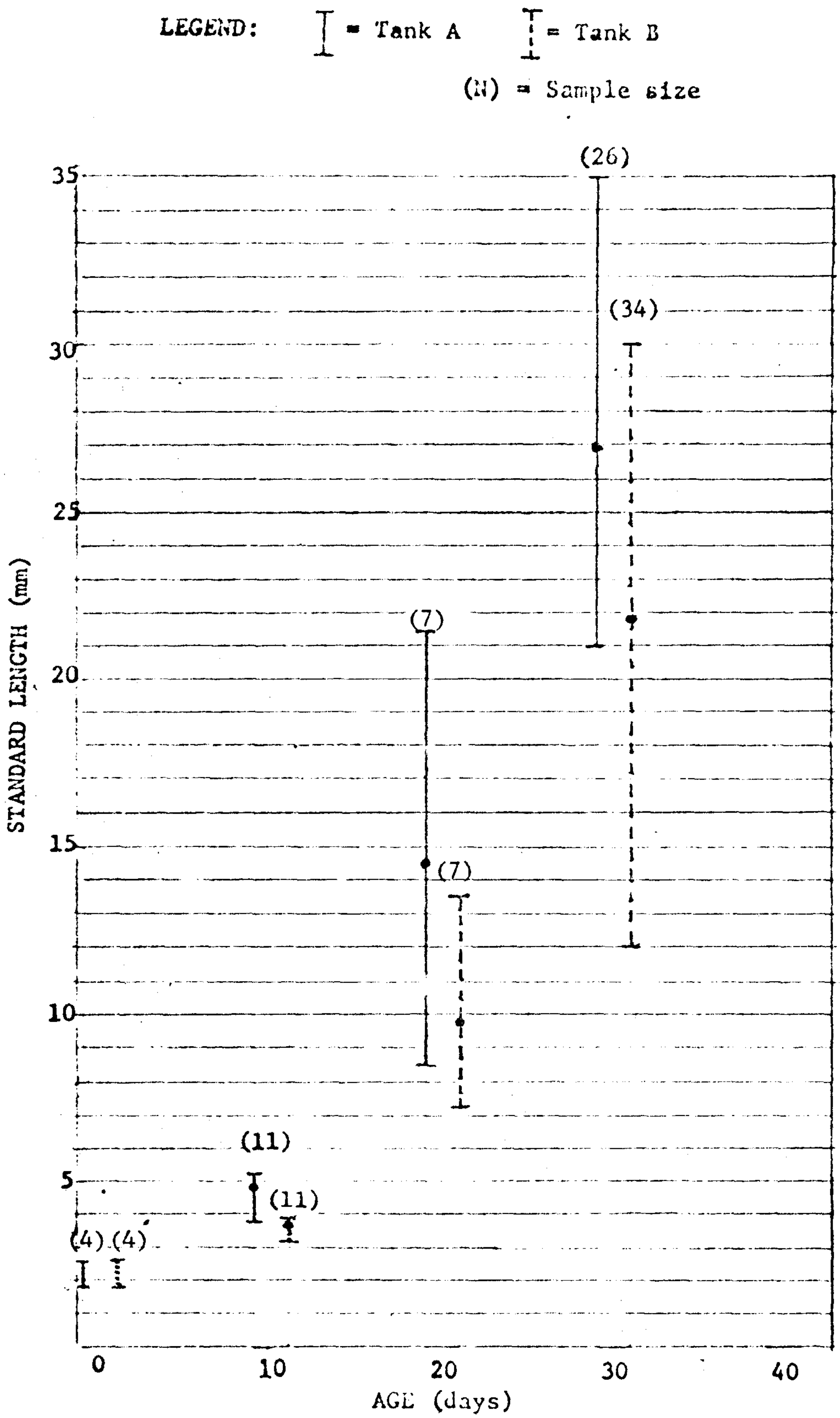

FIGURE II. Increase of length of S. canaliculatus with age in Tanks "A" and "B". Means and ranges are plotted for each sample.

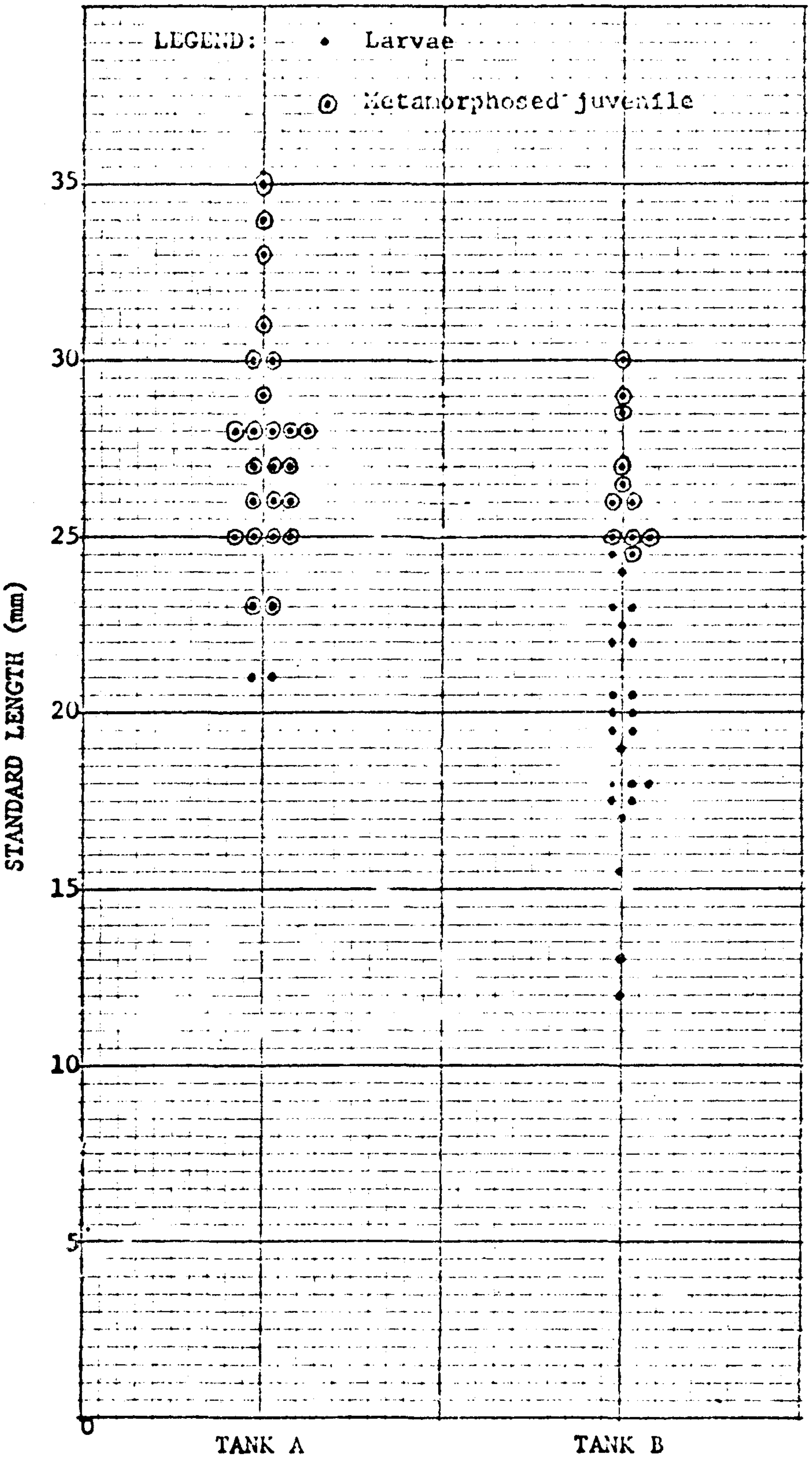

FIGURE III. Size distribution in relation to metamorphosis for *S. canaliculatus* at day 30 in Tanks "A" and "B".