1992

Grouper studies at the SEAFDEC Aquaculture Department

Aquaculture Department, Southeast Asian Fisheries Development Center

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Recent reviews of grouper aquaculture in the Philippines like that made by SEAFDEC researchers Gerald Quinitio and Joebert Toledo had noted these constraints in the industry's expansion: (1) inadequate knowledge of biology and ecology of the species, (2) insufficient supply of fry, (3) absence of appropriate techniques for culture, (4) lack of trained personnel, and (5) inadequate support from financing institutions.

The researchers noted that the present culture techniques used in the grouper industry have mostly evolved from experiences of operators with little support from research institutions. Available fast-growing species with high market value should be identified and the appropriate culture techniques for. these species developed.

Also, grouper production in the country is hampered by inadequate supply of fry for stocking. This shortage is aggravated by the absence of appropriate techniques in handling, transport, and storage of fingerlings collected from the wild. Local farmers have to compete for the available supply with those engaged in the foreign market. Research on seed production should, therefore, be intensified.

There is also lack of appropriate techniques for efficient culture of the fish. Optimum stocking density and feeding regime in ponds and cages should be determined. To minimize dependence on trash fish for feeding, a low-cost practical diet for culture should be developed and the polyculture system with tilapia actively pursued.

To date, lack of skilled manpower for hatchery and grow-out culture plagues the industry. Government and other institutions should consider sponsoring training programs or undertaking intensive information campaigns to disseminate available techniques.

At the SEAFDEC Aquaculture Department's Tigbauan Main Station, little research on grouper* was conducted prior to 1987. In this year, grouper was officially included as a priority species for research. Since then, rapid progress has been made.

1984. The Aquaculture Department first studied grouper in 1984. However, this lone study on the induced spawning of grouper using human chorionic gonadotropin (hCG) and Chinese carp pituitary achieved very limited success. Little milt was obtained from males, hence only 4% of the eggs were fertilized. Subsequently, only 50% of the eggs hatched.

1986. A follow-up study in 1986 using hCG + pituitary gland and luteinizing hormone-releasing hormone-analogue (LHRHa) succeeded in spawning grouper. Lower dosages of the hormones, however, only allowed artificial fertilization by stripping. Larval rearing

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*It has been clarified that grouper studied by AQD is of the species *Epinephelus suillus* and not *E. malabaricus, E. salmoides,* or *E. tauvina* as previously reported.

trials gave 9% survival until day 30 of larvae reared on the plankton *Isochrysis,* sea urchin eggs, and the rotifer *Brachionus.*

1987. Work on the taxonomy and identification of epinepheline fishes in the Philippine archipelago was published by Hiroshi Kohno, a visiting JICA expert on finfish aquaculture. In the same year, ADSEA I *(Seminar-Workshop on Aquaculture Development in Southeast Asia;* 8-12 Sept. 1987; Iloilo City) included grouper among the finfish prioritized for research. Specific areas for study included:

- development of breeding techniques;
- development or adaptation of nursery and grow-out techniques;
- development of practical diets;
- investigation of disease agents in grouper culture systems.

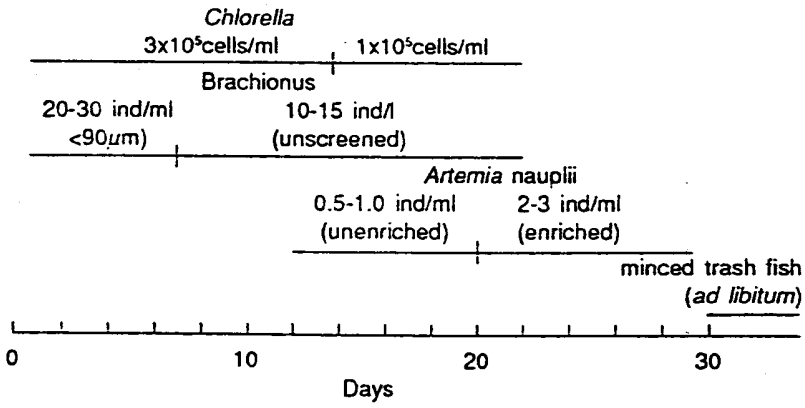
1988. As a result of ADSEA I priorities, a lone study, again on induced spawning and larval rearing was implemented in 1988. This study ran through 1989 and particularly focused on sex inversion of females to males, the number of male grouper being a constraint in spawning trials. The use of 17 α-methyltestosterone (MT), however, did not induce adult female spawners (3-9 kg body weight) to invert sex. A single implantation of LHRHa also did not trigger spawning.

1987. Two studies on sex inversion showed promising results. In the first study, female grouper showed signs of sex inversion three months after biweekly injections of 0.5-5 mg MT/kg fish weight. Only fish weighing 1.2 kg underwent spermatogenesis; milt was expressed after six months, or less for higher hormone doses. In the second study (continued in 1990), preliminary histological observations of gonads indicated no differences between fish fed diets with or without the hormone mibolerone.

It was in 1989 that a study on feed development for grouper fry was initiated. This baseline study showed that practical diets with 30% soybean meal, 25% squid meal, and 25% squid liver meal produced fry with the highest survival rate and maximum increase in body weight.

Another study implemented was identification of bacterial disease affecting grouper. *Vibrio* was isolated in cage and tank-held grouper broodstock. Infected fish responded well to oxytetracycline-hydrochloric acid treatment.

1990. A landmark AQD achievement in research was the first spontaneous spawning of tank-held grouper broodstock, yielding close to a million eggs of which 97% hatched. The spawners were six females (3-5 kg) and four males (7-12 kg). Spawnings occurred for 12-21 consecutive days every month from July to December. Indeed, grouper broodstock technology advanced by quite a distance, and hopes are high that soon to follow is hatchery technology that would solve the problem of grouper fry supply. More significantly, the spawning success would in the long run establish grouper culture as another alternative to shrimp culture. This study on broodstock development for seed production which is continued to the present has consistently given 6-15 spawnings per month from Jan to Dec. Daily egg collection hit the 2 million mark and fertilization and hatching rates rose to 87-94%. Hundreds of metamor-



Feeding scheme for larval rearing of Epinephelus suillus presently employed at SEAFDEC/AQD.

phosed larvae are now being reared at the Tigbauan Main Station. The feeding scheme is shown above.

Other studies in 1990 which also showed promising results were: (1) induction of sex change in juvenile grouper by intraspecific interaction - 4% of juveniles possessed ovotestes 11 wk after different-sized fish were stocked in communal tanks; and (2) development of a dry diet for grouper fry - among the dry diets, that with fermented soybean meal as attractant showed the best result; fish fed minced fresh fish gave close to 100% survival.

1991. A survey of grouper fry in the northeastern coast of Panay Island is ongoing and this noted that fry started to appear in July until Nov. Other studies still in progress include:

- Grouper culture in ponds given artificial diets; started 1990
- Egg quality evaluation; 1991
- Development of larval rearing techniques: food and feeding; 1991
- Biological studies on seed production: (1) effect of light intensity and food coloration on growth and survival and (2) comparison and importance of dietary value of live and artificial food; 1991

1992. Approved studies are as follows:

- Reproduction of hump-back grouper (*Cromileptes altivelis*)
- Effect of salinity on survival of *Epinephelus suillus* fry
- Development of larval rearing techniques for *E. suillus:* food and feeding
- Biological studies on seed production of *E. suillus.* II. Comparison and improvement of dietary value of live and artificial food
- Metabolic energy requirements of selected finfish larvae
- Survey of finfish fry in the coastal areas of Capiz.

Grouper research priority for 1992-1994

(1) inventory and taxonomy
(2) identification of suitable species for culture
(3) development of breeding techniques
(4) broodstock development
(5) development of rearing techniques for hatchery and nursery
(6) development of artificial feeds for nursery and grow-out
(7) induction of sex inversion

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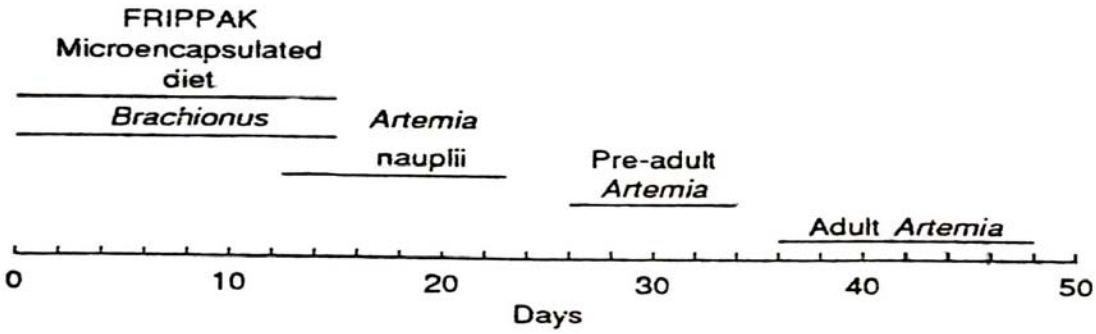

Feeding scheme for larval rearing of Epinephelus malabaricus followed by a private hatchery.

vival rate of about 14% was obtained on Day 50 using this feeding protocol.

Feeding scheme for larval rearing of *E. suillus* followed by the SEAFDEC Aquaculture Department is noted on p.6.

Source: GF Quinitio and JD Toledo. 1990. *Mariculture Techniques for Epinephelus sp. in the Philippines. In:* RD Guerrero III and MP Garcia Jr (eds). 1991. **Advances in Finfish and Shellfish Mariculture; Proceedings of the 1st Phil.-French Technical Workshop on Advances in Finfish and Shellfish Mariculture;** 24-26 Oct. 1990; Los Baños, Laguna.

SEAFDEC/ AQD's *1991 Report* is available

The 1991 Report of SEAFDEC Aquaculture Department, *Better life through aquaculture,* is available in July. The Report notes achievement in research, training, and information; it also contains AQD's program for the next three years (1992-1994).

Write to: Sales/Circulation, Training and Information Division, SEAFDEC/AQD, Tigbauan, Iloilo 5021.

GROUPER STUDIES AT SEAFDEC... FROM P.6

(8) fish health control, and
(9) international market.

The AQD research team for sea bass - grouper - snapper that will closely follow the above priorities are:

Marietta Duray, team leader, with team members: Arnil Emata, Josefa Fermin, Luis Ma. Garcia, Joebert Toledo, Gerald Quinitio, Ruby Bombeo, Demetrio Estenor, Armando Fermin, Fe Estepa, Junji Imayoshi, Antonio Castillo, Mae Catacutan, Relicardo Coloso, Renato Agbayani, Eduard Rodriguez, Noel Solis, Norio Yasunaga, Soichiro Shirahata.

It is hoped that within the decade, grouper technology will be developed.

Sources: (1) GF Quinitio and JD Toledo. 1990. *Mariculture Technique for Epinephelus sp. in the Philippines.* In: RD Guerrero III and MP Garcia Jr (eds). 1991. **Advances in Finfish and Shellfish Mariculture; Proceedings of the 1st Phil.-French Technical Workshop on Advances in Finfish and Shellfish Mariculture;** 24-26 Oct. 1990; Los Baños, Laguna. (2) **1987-1991 SEAFDEC/AQD Annual Reports.** (3) Brackishwater Aquaculture Information System. 1987. **Grouper Abstracts**. SEAFDEC/AQD, Tigbauan, Iloilo.