



## Marine finfish section

*The Grouper Section has taken on a new and broader name: It has become the Marine finfish Section to take account of other species. This Section is almost wholly based on the Grouper Electronic Network which is prepared by Sih Yang Sim (Editor), Michael Phillips (NACA Environment Specialist) and Mike Rimmer (Principal Fisheries Biologist of the Queensland Department of Primary Industries). Visit [www.enaca.org/grouper](http://www.enaca.org/grouper) for more information on the network.*

### Grouper Hatchery Production Training Course, Gondol Research Institute for Mariculture, Bali, Indonesia, 1 - 21 May, 2002

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The training course was organized and supported by the Ministry of Marine Affairs and Fisheries, Indonesia, the Network of Aquaculture Centres in Asia-Pacific (NACA), the Australian Centre for International Agricultural Research (ACIAR), the Asia-Pacific Economic Cooperation (APEC) and the Japan International Cooperation Agency (JICA). It is one of the activities of the Asia-Pacific Marine Finfish Aquaculture Network <http://www.enaca.org/grouper/>. The training course was conducted at the Gondol Research Institute for Mariculture (GRIM), northern Bali, Indonesia, which is equipped with good facilities for training and research activities and has excellent experience in breeding of groupers. This is the first time that GRIM offered a regional training course on grouper hatchery production in cooperation with NACA and the Asia-Pacific Marine Finfish Aquaculture Network, although it has provided training

for Indonesian scientists, technicians and farmers for some time.

The training course was attended by fourteen participants from eight economies in the Asia-Pacific region; Thailand, Indonesia, Hong Kong China, Singapore, Vietnam, Malaysia, the Philippines and Colombia. The training course attracted four people from private sector and ten from government research institutes around the region.

#### Opening and Institute Tour

The training course was started with a welcome speech by Gondol and NACA staff, and resident JICA marine fish breeding expert. After the official opening the participants were given opportunity to introduce themselves and toured the GRIM facilities with Dr Adi Hanafi, the director, and staff.

#### Theoretical Components

During the 21 days of training, participants were provided with a mix of practical, hands on training, supported by lectures and working discussions on various topics, broadly covering the following:

- Grouper Seed Production
- Live Food Production
- Broodstock and egg management
- Sex and maturation manipulation
- Parasitic diseases
- Bacterial diseases
- Viral diseases

- Transportation of eggs and seed
- Nutrition and feed development
- Floating net cage culture
- Mariculture development in Indonesia

#### Practical Components

One of the essential components of the training course was on the job training. The participants were divided into four groups, in which each group was assigned to handle and take care of one larvae tank. The responsibilities of the group members were to feed the larvae, clean tank bottom, counting rotifer in the larvae tanks, harvest rotifer in the live feed section, enrich live feed such as rotifer and *Artemia*.

The participants are also provided with other on the job training which include the following:

- Preparation of larval rearing tanks
- Larviculture
- Aeration control
- Management for prevention of surface tension death
- Rotifer density estimation
- Live feed culture
- Microalgae
- Rotifer
- *Artemia*
- Egg harvesting, handling, examine egg quality and estimation of hatching rate
- Broodstock, feeding, handling and post spawning handling
- Feed preparation and feeding
- Examine gut contain of early larvae
- Diseases



*Preparation of larvae culture tanks by participant from Thailand*



*Participant counting rotifer population under supervision of GRIM technician*

### PCR Test

After the theoretical section on diseases, particularly viruses, participants were provided a one day session on step-by-step PCR test procedures for grouper larvae to determine whether the larvae are infected with Viral Nervous Necrosis virus.

### Observe Activities

Participants were also provided chances to observe broodstock selection and examine eggs development stage for napoleon wrasse. Activities such as blood sampling and injecting microchips for broodstock of napoleon wrasse and mouse grouper were also observed by participants.



*Napoleon wrasse eggs development sampling*



*Lecturer explaining the microalgae pure culture in indoor system*

### Feed Preparation and Manufacturing

After the lecture on Nutrition and Feed Development, participants were given a hands-on practical lesson on feed preparation and manufacture. The group was brought to the feed production section at GRIM and shown how to prepare and produce artificial pelleted feed. The formula for the feed was provided by GRIM. The participants were provided step-by-step guideline for making the pellet feed, and explanation of the feed machineries. Some participants were given the opportunity to do work on pellet spreading on the drying tray.

### Field Trips

Field trips were organized to visit grouper backyard hatcheries, grouper nursery, live fish traders and exporter, fish market and also floating cages. Participants were also



*Hand pressure to check spawned broodstock*



*Harvesting enriched rotifers for feeding larvae*

provided opportunity to visit some milkfish hatcheries nearby.

### Grouper backyard hatcheries

Three commercial backyard hatcheries were visited, this provide an opportunity for the participants to see for themselves how the system actually operates and works.

### Grouper nursery

One big commercial nursery was visited. The nursery cultured mouse grouper and tiger grouper, this nursery bought fry at 2 cm in length and grow them to juveniles.

### Live fish traders and exporters, and fish market

A one-day trip was organized for participants to visit live fish traders and exporters. Two live fish exporters were visited. One was dealing on coral trout and



*Observing packing of eggs for distribution*

## ACIAR Grouper Project – Six Monthly Report (July – December 2001)

The ACIAR project Improved hatchery and grow-out technology for grouper aquaculture in the Asia-Pacific region is now into its second year. There have been several breakthroughs for grouper breeding and larviculture during the past two years of research. Promising results have also been obtained for the grow-out diet development component. The following summarizes the research outcomes:

### Larval rearing

Research at SEAFDEC has shown that a range of environmental factors affect the survival of newly hatched grouper larvae. Significantly higher survival rates ( $P < 0.05$ ) were observed at aeration levels of 0.62 and 1.25 ml/min/l, at salinity levels of 16 and 24 ppt and at light intensity of 500 and 700 lux than at the other conditions tested.

Analyses of live prey at SEAFDEC have provided baseline data on the nutritional composition of the live prey diets used for larval rearing. Analyses of early larval stages has shown some interesting patterns of fatty acid utilization, including a high level of conservation of docosahexaenoic acid (DHA) in the polar lipid fraction of Day 4 larvae. In Day 8, 18 and 28 larvae arachidonic acid (ARA), eicosapentaenoic acid (EPA) and DHA were more highly conserved in the polar lipid fraction than in the neutral lipid fraction.

Morphological and histological descriptions of *Epinephelus coioides* larval stages are largely completed. Ongoing histochemical and biochemical analyses of grouper (*E. coioides* and *Cromileptes altivelis*) larvae are being undertaken at SEAFDEC and at NFC and an accurate profile of the ontogeny of digestive enzymes is being developed from these studies.

A new component has recently been added to the project: selective breeding of super small (SS-) strain rotifers *Brachionus rotundiformis*. Experimental work undertaken at Gondol demonstrated that development of rotifers is dependent



Some coral reef fish species selling in the local fish market



GRIM technician shows participants on how to make pelleted feed from small machine

the other is mixed of grouper species, but mainly on *Epinephelus* spp., such as tiger grouper. After the live fish section the group was brought to visit the local fish market, which is the main fish market in Denpasar area.



Field trip visit to GRIM nursery floating net cages for grouper species

### Floating net cages

The participants were provided a chance to visit the broodstock holding cages nearby GRIM and also visited GRIM's floating net cages for grouper nursery from 2 inches to stocking grow-out cage size. The group also went to visit a floating net cage farm which mainly culture milkfish, and also beginning to do grouper culture, particularly for mouse grouper.

### Private Sectors Interaction and Discussion Session

Additional activities such as informal meetings with the private hatchery operators were also arranged so that participants could hear the success stories and problems that were facing by the private sector in Indonesia for grouper seed production. Discussion sessions with technicians and lecturers were also being organized as needed.

### Certificate and Closing

Overall the training course was a successful one, participants experiencing a lot of activities and also provided some commercial interaction that provides opportunity for participants as well as the local hatchery operators, traders and exporters and products suppliers.

Future similar training course may be run, anyone interested please contact [grouper@enaca.org](mailto:grouper@enaca.org).

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## Marine finfish section

The vitamin C requirements of *C. altivelis* are currently being examined at RICF Maros. Preliminary results indicate that fish weight tends to increase with increase levels of L-ascorbyl 2-polyphosphate (APP) in the diet. The highest weight was observed in fish fed diet with APP 150 mg/kg diet.

For the full report visit the Marine Finfish Network website [www.enaca.org/grouper/](http://www.enaca.org/grouper/) or contact:

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## Country Status Overview 2001 on Reef Fisheries Exploitation and Trade in Indonesia

*International Marinelife Alliance (IMA) Indonesia, Ministry of Marine Affairs and Fisheries, and Telapak Indonesia Foundation*

This report cover reef fisheries exploitation and trade dynamics in Indonesia, describes the type of commodities, fishing ground and trading centers in Indonesia for ornamental fish, live coral and reef food fish. This report also covers the price structure for both ornamental and food fish in Indonesia. Destructive fishing methods used such as cyanide, blasting, coral extraction etc are also being described. External natural threats such as red tide, coral bleaching are also briefly included. The report also describes the intervention methods that are implemented for controlling the destructive fishing activities such as fishing ground and catching season management models, technical intervention on fishing methods by introducing sustainable methods such as hook & line, bubu, barrier net, and also introduce mariculture.

Country Status Overview (CSO) 2001 is the first part of a series which will be developed and published annually. CSO is an open document that can be, and is expected to be, written by as many parties as possible with interest in the Exploitation and Trading of Reef Fisheries in Indonesia. Data for the compilation of CSO will be collected/gathered from all involved players in the exploitation and trading of reef fisheries, including parties which cause the decrease in the quality of the habitat. And of the life of the community, indirectly or directly.

Most of the data collected is secondary data, varied from export tables issued by several government institutions, to the observation reports made by export and science agencies. A series of interviews have been conducted to support specific data. CSO 2001 decided on three monitoring sites (Jakarta, Denpasar and Makasar, which are the main export gates) as the first points in information and collection, and observations in several fishing areas (Nias, Lampung, Ujungkulon, Thousand Islands, Karimun Jawa, Sumenep, Maluku Tenggara, and Biak).

For full report please visit International Marinelife Alliance website at <http://www.imamarinelife.org/>

on salinity and that measuring egg-bearing females older (post hatch) than 12 h at 5 ‰ salinity, 15 h at 20 ‰ salinity and 18 h at 30 ‰ salinity provides an accurate indication of any change in the average body size of the initial rotifer population. A second experiment to evaluate the effect of diet particle size on rotifer body size indicated that the *Sticchococcus* diet resulted in a significantly smaller rotifer population and that this difference was detectable after 5 days.

### Grow-out diet development

Diet development work to examine a range of ingredients to develop practical compounded diets for groupers using (where practical) locally available ingredients.

Experimental work at SEAFDEC comparing several diets showed that fishmeal can be substituted with high-quality terrestrial meals. Specific growth rate (SGR) of fish fed control (3.1%), meat and bone meal (3.0%), gluten meal (2.8%) and tuna fish meal (3.1%)-based diets were comparable, and significantly higher than that of fish fed blood meal-based diet (2.4%).

Diet trials at Gondol and at RICF Maros have demonstrated that:

- the minimum dietary carbohydrate requirement of *C. altivelis* is 7%;
- dietary carbohydrate affected the growth, feed efficiency, growth, protein and lipid retention as well as the digestibility nutrient of *C. altivelis*;
- glucose is the appropriate carbohydrate source of juvenile *C. altivelis* diet.

## Proceedings of The Live Reef Fish Trade Workshop April 23, 2001

International Marinelife Alliance

This report includes summaries of the papers presented at the Live Reef Fish Trade workshop in Hanoi, Vietnam on April 23, 2001 and it also provides a record of the discussions and recommendations from the workshop. The following are the list of presentations given in the above workshop:

- Overview of the Worldwide Live Reef Fish Trade, IMA's Indo-Pacific Destructive Fishing Reform Initiative
- Overview of Live Reef Fish Trade in Vietnam
- The impact of cyanide fishing on coral resources in Vietnam
- Activities for coral reef conservation in Vietnam
- Legal issues concerning the management of fisheries resources including the Live reef Fish Trade
- Marine culture strategies in Vietnam, the concept of coastal resources co-management

The full report can be obtained from International Marinelife Alliance – Vietnam website at <http://www.ima-vietnam.b2vn.com/>.

### New aquarium species database

Dr Edmund Green

The UNEP–World Conservation Monitoring Centre (UNEP–WCMC) is pleased to announce a new database on the trade in aquarium species, the Global Marine Aquarium Database (GMAD), which is available at <http://www.unep-wcmc.org/marine/gmad>.

Users of the database will have access to approximately 50,000 records of trade in live aquarium species and may query these geographically and taxonomically.

Further data collection is ongoing and the database is continuously being updated, with the release of the next version scheduled for April.

Reprinted from the SPC Live Reef Fish Information Bulletin # 10.

# What's New in Aquaculture

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### From sandwiches to sashimi - the success story of Australia's southern bluefin tuna industry

In the early 1980's Australia's Southern Bluefin Tuna (SBT) industry was in a precarious position.

SBT was regarded generally as suitable only for the low-value canned fish market, destined for use on Australia's lunchtime sandwiches. As a result, fishers needed to catch high tonnages of the species to earn a living. The Australian SBT catch peaked in 1982 at 21,500 tonnes.

Concerned over the sustainability of the species, fisheries managers and the industry established quotas in 1984 to limit the tonnage of fish caught to 14500 tonnes. It was reduced to 6,250 tonnes in 1988 and 5,265 tonnes in 1989.

These days, things are different. The wild-catch tonnage caught has stabilized at that set in 1989 and a Convention for the Conservation of SBT has been established between Australia, New Zealand and Japan.

Fish are produced by a combination of wild-catch and aquaculture (farming).

The product's destination is no longer canned tuna but the high value Japanese sashimi market with prices averaging \$1200 per fish. By adding value through tuna farming, operators have increased the value of their catch from \$12.5 million to \$252 million in 2000.

Fisheries Research and Development Corporation (FRDC) Programs Manager Dr Patrick Hone said this remarkable transformation has been achieved through systematic improvement in the knowledge of the species, husbandry processes, technology and marketing.

"This has been led by innovative companies and an industry association that are focused on sustainable development; and establishing partnerships within the industry and with customers and research investors such as the FRDC," he said.

These partnerships began in 1991, when the FRDC collaborated with the Tuna Boat Owners Association of Australia, the South Australian Government and the Japanese Government, in funding the world's first

research and development project associated with farming SBT.

"Farming offered a potential mechanism for improving fish quality, increasing the weight of fish and optimizing the time that fish were marketed," said Dr Hone.

"An experimental farm was established as the focus for developing technology in Port Lincoln. Initially it began with two pontoons, fifteen tonnes of captured SBT and full participation of Japanese farm experts and Australian fishers. The rest, as they say, is history."

However, the industry and FRDC are continuing to look forward, already working on the challenge of breeding SBT in captivity-the success of which could have enormous environmental, economic and social benefits.

The industry and FRDC has ensured that this innovative momentum will not be lost with the recent signing of a Memorandum of Understanding between the Tuna Boat Owners Association of Australia and FRDC that will see an increased investment in R&D by the industry.

"It is partnerships such as these that will ensure the sustainability of the industry and the natural resources on which it depends," said Dr Hone.

For further information contact: Dr Patrick Hone, FRDC Program Manager, Ph: +612 6285 0412 or Mr Brian Jeffries, Tuna Boat Owners Association of Australia CEO, Ph: +61 0419 840 299

### Seafood retains healthy oils after cooking: CSIRO

There's more good news on the 'good oils' in seafood. Cooking doesn't diminish the high level of beneficial oils found in seafood, according to research released today by the Australian CSIRO.

The research, funded by the Fisheries Research and Development Corporation, shows that seafood – cooked, uncooked or processed, wild or farm-raised – is the best source of nutritionally-important omega-3 polyunsaturated fatty acids.

These fatty acids are needed to help prevent and treat heart disease and other disorders, but the human body only produces them in small amounts, so they must be obtained from the diet.