SEAFDEC/AQD's R&D on grouper

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By M. Castaños

Aquaculture in the long term can not really depend on seed supply from the wild because this supply is highly seasonal and erratic; hence, the efforts being made to establish hatchery techniques.

For the grouper *Epinephelus coioides*, SEAFDEC / AQD has made significant strides in R&D in the last ten years. It has established a working technology for grouper hatchery although there are still a few kinks to be ironed out. AQD researcher Marietta Duray has worked out the feeding and water management protocol in rearing grouper larvae as shown below.

**Water Management**

- **Siphoning of tank bottom (every other day)**
- **Water volume change**
  - 20-30%: 58.76% Flow-through

**Feeding Scheme:**

- *Brachionus plicatilis*
  - 20 g/ml: 20 larvae/liter
- *Chlorella vulgaris*
  - (3x10^5 cells/ml)
- *Artemia salina*
  - (milling trash-flake)

**Growth Period (day)**

<table>
<thead>
<tr>
<th>Day</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (mm)</td>
<td>1.6</td>
<td>11</td>
<td>51-65</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Survival Rate</td>
<td>20%</td>
<td>16%</td>
<td></td>
<td></td>
<td></td>
<td></td>
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A stocking density of 20 larvae per liter of seawater is recommended. In trials (6-8 runs), survival rate using this scheme was about 20% on Days 0-24, and 16% on Days 25-60. Day 0 larvae measured 1.6 mm, Day 24 about 11 mm and Day 60 between 51-65 mm.

Ms. Duray noted that it is better to use large tanks (>3 tons) and water salinity of 24 ppt. It is also better to feed small-sized *Brachionus* (a screen may be used to select only less than 90 μm rotifers) during the first feeding period because the mouth of newly hatched grouper is small and grouper can not yet go after bigger prey.

**SEAFDEC/AQD's research milestones for the grouper *Epinephelus coioides***

<table>
<thead>
<tr>
<th>YEAR</th>
<th>RESEARCH ACCOMPLISHMENT</th>
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<tbody>
<tr>
<td>1988</td>
<td>broodstocks raised in floating cages and concrete tanks</td>
</tr>
<tr>
<td>1989</td>
<td>hormonal sex inversion of females to males</td>
</tr>
<tr>
<td>1990</td>
<td>maturation and year-round spawning and larval rearing</td>
</tr>
<tr>
<td>1994</td>
<td>completion of the grouper life cycle in captivity, intensive hatchery techniques, fry production</td>
</tr>
<tr>
<td>1995</td>
<td>sex-inversed males in natural spawning</td>
</tr>
<tr>
<td>1996</td>
<td>improved larval survival by use of copepod nauplii</td>
</tr>
<tr>
<td>1997</td>
<td>larval metamorphosis advanced by thyroid hormones</td>
</tr>
</tbody>
</table>

Grouper juveniles produced from AQD's fish hatcheries

The Integrated Fish Broodstock - Hatchery Demonstration Complex where grouper are held. At present, the complex and the netcages at AQD's station in Igang hold more than 100 grouper broodstock.
After the hatchery protocol has been worked out, AQD researchers are studying ways to refine it and increase grouper survival so that entrepreneurs can get into the hatchery business.

The source of eggs or newly hatched larvae reared in the hatchery is usually captive broodstock. AQD has around 100 grouper breeders sourced from the wild in 1988 to early 1990.

According to AQD researcher Joebert Toledo, the grouper spontaneously spawn year-round (except in May) in concrete tanks and from July to October in floating netcages. A 5-kg female grouper can produce between 2.3-3.9 million eggs per month.

Mr. Toledo noted that of the eggs produced, 72-89% were fertilized; and of the fertilized eggs, 67-88% hatched into larvae. These figures can still be improved. For one, AQD researchers are studying broodstock nutrition as it relates to reproductive performance. Several other studies are on-going.

RECENTLY PUBLISHED WORK ON GROUPER BY SEADEC / AQD

- de Jesus EGT, JD Toledo and MS Simpas. 1998. Thyroid hormones promote early metamorphosis in grouper (Epinephelus coioides) larvae. General and Comparative Endocrinology 112: 10-16
- Quinitio GF, NB Cabero and DM Reyes Jr. 1997. Induction of sex change in female Epinephelus coioides by social control. The
In general, Cambodia does not have mangrove management/conservation activities such as inventory and reforestation. But there are already many efforts and attempts by non-government organizations and international organizations to collaborate with the government to improve environmental protection.

Myanmar

UTinWin

Department of Fisheries

Myanmar has extensive mangrove forests, 382,032 ha, distributed in Ayeyarwady (46.4%), Tanintharyi (36.7%) and Rakhine (16.9%). But there has been substantial reduction of forest cover in all areas over the years mainly attributed to the demand for fuelwood/charcoal production.

Neither intensive nor semi-intensive shrimp farming has developed, and Myanmar is fortunate to have learned from the mistakes of shrimp producing countries like Thailand and the Philippines. But there are plans to develop 40,000 ha of ponds for semi-intensive shrimp culture because the government considers shrimp a potentially large generator of foreign exchange (US$400-500 million).

As yet, shrimp farmers still practice the traditional, extensive method. About 12,000 ha are operated in Rakhine state, near the border of Bangladesh. The yields are very low, about 100 kg per ha per year. Fish culture of seabass, grouper, milkfish and mullet is still in pilot-scale.

At present, there is no well-developed arrangement for managing the country’s coastal and marine zone. Much of Myanmar’s coastline is sparsely populated and features natural ecosystems which have suffered relatively little exploitation except in Ayeyarwady Delta.

In the future, integrated coastal zone management approaches will be considered in establishing the policy, planning and regulatory framework to ensure that the coastal zone is managed sustainably.

Any final, encouraging note on mangroves?

I do think if we replant mangroves and conserve our mangrove forests, we’ll find enough fish in our oceans to feed the increasing populations. If we properly manage our fishing techniques, and help preserve and get back the ocean’s health, the ocean will be the best place to raise fish for the future. And aquaculture will be used as a supplement, not as a replacement for ocean production of fish products for the future.

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