# 5. Larval production

## Layout of the larval rearing system

The first four to six weeks of the life of young seabass and gilthead seabream are spent in a specific larval rearing unit of the hatchery. The most common equipment consists in a number of round fibreglass tanks of an individual capacity of 6-10 $m^3$. Seawater is either recirculated through a biofilter in the case of a semi-open recirculation system, or is just pumped to the tank and discharged after use in the open systems.

**Fig.46.01-2 Old and modern tanks for larval rearing units (photo STM Aquatrade)**

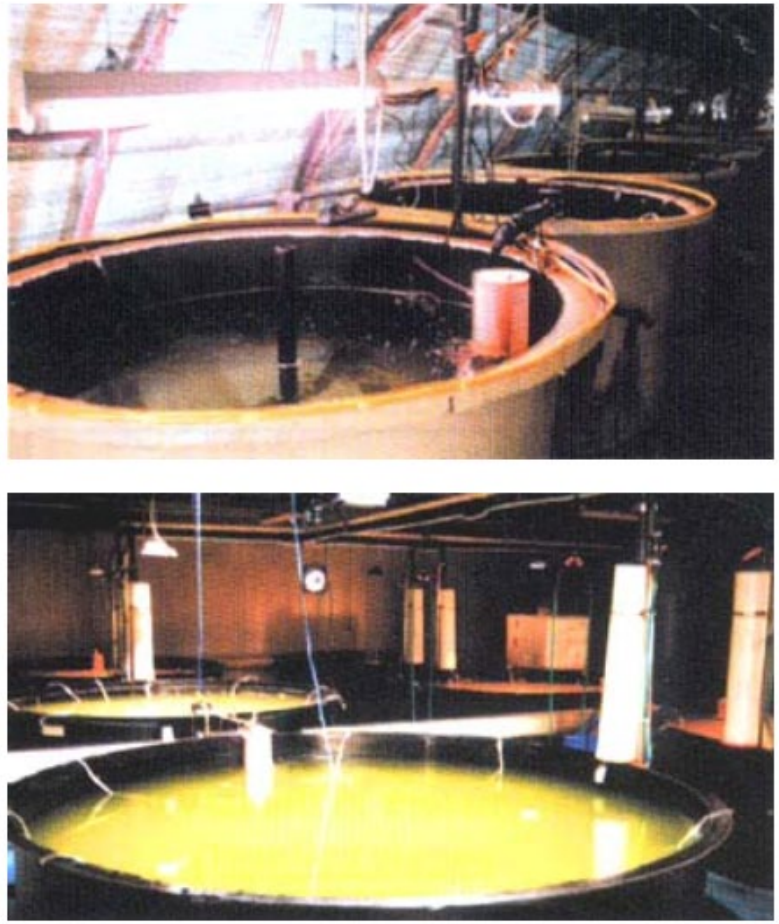

**Table 3.9 - Environmental parameters in the larval and post-larval rearing of seabass and gilthead seabream.**

| Gilthead seabream | Seabass |
|---|---|
| *Water temperature*<br><br>Same as spawning temperature at incubation up to yolk sac resorption (-2 to +6 days). Slowly increasing (0.5° C/day) to reach 18-20° C, the choice depending on management considerations and period of the year. Particular care has to be given to maintaining water temperature during the first 25 days, when water renewal is nil or very limited. Fluctuation should never exceed 0.5° C in 24 h. | *Water temperature*<br><br>Same as spawning temperature at incubation up to yolk sac resorption (-2 to+6 days). Slowly increasing (0.5° C/day) to reach 18° C within the complete swim- bladder inflation. Then increased to 20° C by the 15th day. Fluctuation should never exceed 0.5° C in 24 h. |
| *Air temperature*<br><br>Fluctuation within 1° C. That should preserve water temperature especially at night. Special attention should be paid when water renewal is nil or very limited. | *Air temperature*<br><br>Fluctuation within 1° C That should preserve water temperature especially at night. Special attention should be paid when water renewal is reduced. |
| *Salinity*<br><br>Usually the same salinity at spawning (35-38 ppt = full seawater). A lower salinity down to 25-30 ppt during first feeding may enhance survival rate, but at a cost:<br><br>- at least two separate hydraulic circuits are needed<br>- live food settling is increased<br>- a change in salinity can increase stress. | *Salinity*<br><br>Same. |
| *Photoperiod*<br><br>16 hours light, 8 hours dark when temperature remains below 21° C. Above 21°C increase to 20h L/4h D. | *Photoperiod*<br><br>16 hours light, 8 hours dark when temperature remains below 21° C. Above 21° C increase to 20h L/4h D. |

| | |
|---|---|
| *Light intensity*<br><br>1,000 to 3,000 lux at water surface till age 25 days, thereafter 500 to 1,000 lux until metamorphosis. During on/off operations use a 10-min twilight effect by means of a dimmer switch driven by a timer. Halogen lamps are advisable for light quality and cost effectiveness. | *Light intensity*<br><br>500 lux at water surface. The Alternative "French method" foresees complete darkness during a short initial period of 5-7 days. |
| *Bottom aeration*<br><br>A very slow fine bubbling of 0.1 l/min during first feeding. Gently, but constantly increased from 15th day on up to 0.6 l/min, related to larval activity, surface dirt and distribution of live feeds. If eggs are stocked directly into the larval tanks, a rather strong air flow keeps eggs suspended, and is reduced at hatching to be completely stopped at the end of hatching to allow debris settling and removal. | *Bottom aeration*<br><br>Same pattern, but twice as much flow due to the sturdy larval stage of bass. |
| *Water renewal*<br><br>None during first feeding light periods, moderate at dark (0.5 to 1 total tank renewal). Increasing steadily up to metamorphosis to 10 total tank renewals at night. Regular water quality monitoring should confirm or adjust renewal to the actual need. If eggs are stocked directly into the larval tanks, 1-2 renewals/day during incubation, and 3 to 6 during hatching (check water temperature). | *Water renewal*<br><br>Same. |
| *Dissolved oxygen (DO)*<br><br>DO saturation should remain between a minimum of80% and a maximum of 100%. Adjust aeration, water renewal, phytoplankton daily ration and bottom cleaning accordingly. | *Dissolved oxygen*<br><br>Same. |
| *Total Ammonia Nitrogen (TAN)*<br><br>It should not represent a major problem in the larval unit due to its scarce total biomass. In any case keep it below 0.5 ppm. | *Total Ammonia Nitrogen (TAN)*<br><br>Same. |

| | |
|---|---|
| *Screen mesh*<br><br>Use a 500 *m*m filter mesh when you want to discard uneaten rotifers and brine shrimp (as their nutritional value is lost if they remain there overnight). To keep them in the tank, if a water renewal is needed during feeding, replace with a 100 *m*m filter. If only artemia nauplii are fed, mesh size can be increased to 250 *m*m.<br><br>Change every time it is clogged or near to clogging, in particular just before dark. If eggs are stocked directly into the larval tanks, use a 400 $\mu$m filter during incubation and hatching. | *Screen mesh*<br><br>Same. |

**Fig.49.01-2 Gilthead seabream larvae: before first feeding and with functional digestive tract (photo STM Aquatrade)**

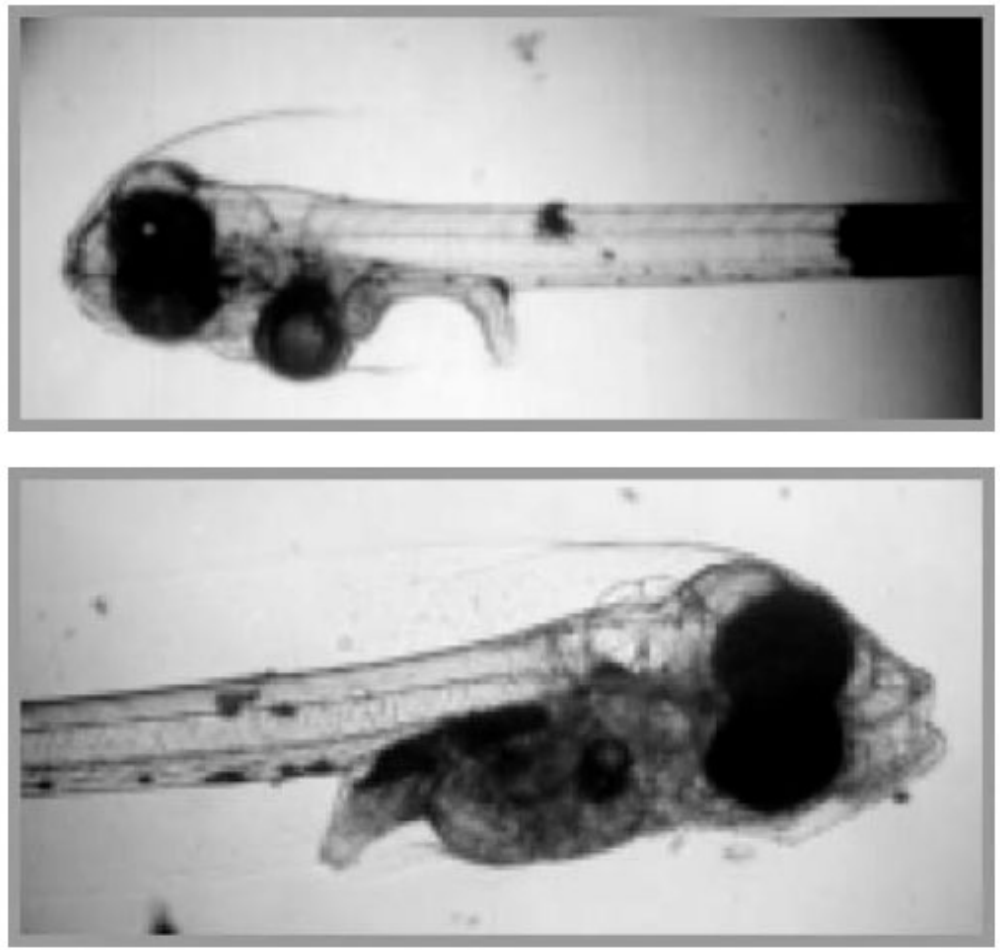

**Table 3.10 - Repletion rate and number of ingested preys per larva at first feeding of gilthead seabream and seabass larvae.**

| Age | Repletition rate | Actual ingested rotifer/ARTEMIA | |
|---|---|---|---|
| | % | Gilthead seabream | Seabass |
| 3rd day | 20-40 | 2-3 | 2-4 |
| 4th-5th day | 70-90 | 4-8 | 7-12 |
| 6th-8th day | 100 | 10-15 | 15-20 |
| 9th day | 100 | up to 50 | up to 100 |
| onwards | | | |

The feeding protocols for gilthead seabream and seabass are given in Annexes 17 and 18 respectively. In both cases, the protocol is based on the following assumptions:

- initial density of 150-200 post-larvae/litre;
- water temperature of 18°C;
- salinity of 35-37 ppt;
- photoperiod of 16 h light and 8 h darkness;
- all quantities mentioned are referred to a culture volume of 1 000 liters in order to adjust easily the feeding ration to tanks of different capacity;
- the feed quantities at different ages are only indicative as the actual rearing conditions change continuously from tank to tank.

## Daily distribution of live feed

Rotifers and brine shrimp are distributed by hand into the areas of the tank surface where larval density is lower. Feed is distributed three times per day, starting as soon as the lights have been switched on in the morning until four hours before the artificial sunset, in late evening. A quick distribution of the first ration in the morning is recommended to stop the forced starvation, which takes place during darkness.

The daily ration should be distributed every 6 hours in the following way (time is indicative):

- 50% at 08.00 h;
- 25% at 14.00 h;
- 25% at 20.00 h.

A prey density check is highly recommended before the second and the third distributions to adjust the concentration and thus avoid situations of over or under feeding. Use a 1-ml pipette to take two to three samples at different places in the tank and count the number of rotifers or artemia nauplii at naked eye or with the help of a portable lens.

**Table 3.11- Daily schedule of controls**

| Hour | Feeding | Water control [1/] | System Control [2/] | Biological control | Various works |
|---|---|---|---|---|---|
| 08.00 | 1 | T | WAF | Rotifer/Artemia quality | Light switched on, Change screens |
| 09.00 | | | | Larval behaviour | Clean make-up cartridges [3/] Clean UV/by-pass Siphon tank bottom |
| 09.30 | | T-DO | | | |
| 11.00 | | | | Larval behaviour | |
| 11.30 | | | | Rotifer/Artemia quality | |
| 12.00 | | T-DO | | | |
| 12.30 | | | WAF | | |
| 14.00 | 2 | T-DO | WAF | Rotifer/Artemia quality | Siphon tank bottom |
| 15.00 | | | | Feeding | |
| 17.00 | | | | Rotifer/Artemia quality | |
| 17.30 | | T-DO | WAF | | |
| 18.00 | | | | Larval behaviour | |
| 20.00 | 3 | T-DO | WAF | Larval behaviour | Change screens |
| 24.00 | | | | | Switch off light |

[1/] T-DO = Temperature + Dissolved Oxygen measurements
[2/] WAF = Water renewal + Aeration + Filters overall controls
[3/] In case a semi-closed system is present

The procedure for swim bladder inflation control in each tank is as follows:

1. Sample 30 to 50 larvae per tank or use the sample taken for checking first feeding;

2. Pipette the larvae on a slide with as less water as possible. Group them together.

3. Cover with the glass lid, remove excess water with filter paper and observe them at 20 and 40 magnifications

4. Look for the presence of the swim bladder.

5. Record all findings on a dedicated form (Annex 19).