Larval Rearing

This leaflet addresses commercial-scale production of larvae of Ballan wrasse from the point of hatch to full weaning on dry feed. Little information is available in the literature about larval development of wrasse or of larval rearing. In wrasse, the weaning phase can be more extended than for other marine finfish species, so it may take between 8–12 weeks until the larvae are weaned and at an approximate wet weight of 0.5 grams. At this stage the juvenile fish would be graded into separate size grades.

PROJECT SUMMARY

EcoFish is a three-year transnational project financed by the European Regional Development Fund/Northern Periphery Program and national private and governmental grants. The project focuses on developing methods for culture and use of Ballan wrasse as cleaner fish.

EcoFish has produced this series of summary technical leaflets on all the relevant practices covering the entire life cycle for the rearing and the production of Ballan wrasse. Readers can access and download more detailed, full-text, pdf versions of these technical leaflets at www.eco-fish.org

Stock into Rearing Tanks

As in egg collection, the eggs are disinfected on the surface two days prior to larval hatch by immersion in a 4‰ Kickstart® solution (hydrogen peroxide and periacetic acid mix, CD Lines) for 30 seconds and rinsed in clean water, or 100ppm Pyceze (Novartis) for 30 minutes.

- Ballan wrasse eggs require more volume of water than pelagic marine finfish eggs. Ballan wrasse eggs are either allowed to hatch and larvae are decanted from the incubation units or the spawning substrate with eggs is placed directly in the tanks and the eggs allowed to hatch. Ballan wrasse larvae have been stocked at densities of 10–30 larvae per litre but higher densities may be used. The numbers of larvae that are stocked should be estimated volumetrically.
- Aeration and water inflow to the egg incubators are switched off. The larvae are decanted or removed using a jug and poured gently into a soft mesh net immersed in water.
- To estimate the total number of larvae prior to being decanted into the larval rearing tank, they are evenly distributed through the volume by stirring gently with a spatula. Once distributed, a 50ml sub-sample of water is taken with a beaker.
- Triplicate (3 x) 50ml samples of the 1–2 litres of water are taken and the larvae should be counted.
- The total number of larvae that are to be stocked in larval rearing tanks can be estimated by taking the average number of larvae in triplicate samples and back-calculating. When stocking a rearing tank with the appropriate number of larvae, a volume equivalent to the appropriate number of larvae is abstracted from the larval holding container by beaker and moved to the rearing tank.

Rearing Unit Design and Type of Tanks

Ballan wrasse rearing tanks come in a wide range of designs, shapes, volumes, depth and colour.

Tank volume

Rearing of larvae Ballan wrasse in commercial conditions when egg supply is abundant ranges from 12–18 weeks duration in units of up to 4m in diameter and approximately 15m^3 volume.

- Post larval and juvenile Ballan wrasse may remain in the initial rearing tanks until they are approximately 30 grams in weight and about one year old.
- The fish are then transferred to larger ongrowing tanks. Round fibreglass tanks are commonly used with volumes from up to 10m^{-3}.
- Tanks with seawater in flow through systems or semi-open recirculation systems can be used. Normal rearing temperatures are in the range 8–18°C and do not exceed 18°C, so that the development of abnormalities can be reduced.
- Water heating systems may be required with out-of-season stocks when temperatures are low.
- A lighting unit is located above the tanks at various heights (commonly around 50cm above the tank).
- Live feed can be introduced manually or using an automatic dosing system.
- Feeding systems are also fitted for weaning. Other equipment required is oil skimmers, cleaning equipment, and devices for recording and controlling environmental parameters.

Outlet mesh

Many tank systems have a fine mesh attached to a central standpipe to retain wrasse larvae. The mesh size is around 120um on stocking larvae and it is replaced with a 250um around 30 days post hatch. The standpipe mesh screen will have to be replaced by a screen with a larger meash size (300–500µm) by 35 days after hatch. This will prevent the build-up of debris.

The swim bladders of wrasse are inflated from the air/water interface during a critical developmental period. Air-powered surface skimmers are therefore fitted to the tanks on five days post hatch to clear the surface of oil layers associated with the live feed. Surface skimmers are rectangular floating polystyrene traps with an inlet through which an airline draws surface water into the trap. This process collects the detrimental oil layer, which should be disposed of each day.

Environment for Larval Rearing

TEMPERATURE	PHOTO LIGHT PERIOD	LIGHT INTENSITY
The temperature of the rearing water should be as similar to that in the egg incubator temperature as possible. Initial rearing temperatures are between 8 and 18 degrees with temperature being raised as development progresses. The likelihood of inducing abnormalities during production increases at temperatures higher than this.	A continuous light photoperiod is provided to the end of the larval period and for much of the first year. However, some hatcheries use a day: night regime of 18:6 hours, or another day:night regime after around 4 months.	The initial light intensity on stocking in rearing systems is darker and in some hatcheries is around 100 lux, increasing to 200 lux on day four post-hatch and then 600 lux by day seven. In Bodø, 1100 lux is maintained during startfeeding and weaning.
SALINITY	**AERATION**	**WATER FLOW**
This should be maintained in the range 33 to 34ppt.	A gentle central aeration should be supplied to improve oxygenation and to mix live feeds thoroughly in the rearing tanks.	A low initial inflow should be set at 0.5–1 l/m^3/min to prevent wash out of algae and live feeds. Gentle aeration is administered from the base of a central standpipe.

Live Feeds

Ballan wrasse larvae have a small yolk sac and live feed should be offered around five days post hatch. Enriched rotifers should be added on the following day in addition to algae and given in two feeds in the morning and 12 hours later to give a density of five rotifers per ml. Rotifers may be reared in a batch culture system, with one batch for each day of the week, or cropped from a continuous culture. This gives a minimum of five days for a batch to grow to a harvestable density (500–1000 rotifers per ml in a 200l culture tank). A variety of commercial enrichments and algae for rotifer culture is available.

Tanks used for rearing Ballan wrasse larvae

A regime of monitoring algae/live food should be followed thereafter. Samples of at least 20ml of the rearing water should be taken and residual rotifer numbers assessed. This permits the correct number of rotifers to be added to the tank to make the total concentration up to five rotifers per ml.

Rotifers are offered for the first 25–30 days post hatch with Artemia or live feed substitute such as Skretting Gemma diet for the following 2–6 weeks.

Live feed concentrations

The density of rotifers should be in the region of 5–10 rotifers ml-1 and checked at regular times during the day to supplement numbers.

Live feed enrichments

A range of marine enrichment oils is available to provide the correct level of essential fatty acids.

Microalgae

Algae is added at the rate of 10 l/m3 on the first day, and five litres per day after that to give an approximate algal density of 125,000–250,000 cells/ml. *Nanochloropsis* or *Pavlova* algal species are commonly used, or a mixture of both. It is unknown why algae contributes to rearing success, but algae will continue the enrichment of uneaten live feed in the rearing tank, thus maintaining the nutritional value of live feed. Some hatcheries use inert particles for turbidity, such as kaolin, as an alternative to algae.

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Assessing live food abundance

Assessment is required to ensure that rotifers are not retained in the rearing tank for an excessive duration and to ensure that sufficient live prey is available. The alimentary tracts of larvae should be checked at regular intervals to ensure that they are feeding. The feeding information should be recorded to ensure that the history of the fish is known and to assess the cycle of feeding activity.

Feeding frequency

This varies with hatcheries with 2–3 feeds given throughout the day at regular intervals. However, some hatcheries use continuous infusion devices or a continuous robot feeder.

Weaning

Artemia should continue to be fed to the juveniles until day 55. Thereafter co-feeding with an inert commercial powdered diet should be carried out for at least a week before the juveniles are fed with inert diet alone (marine diets, size 00). From this stage onwards, Juvenile wrasse can be gently netted, graded and moved to clean tanks.

Dry feeding

A rapid transition to dry feed is required with wrasse, although experience has shown that this has been prolonged in Ballan wrasse. Care is taken in the initial transition to encourage the fish to accept dry diets. Dry feed should be introduced in the morning prior to offering live feed. Water flow should be increased at this time to maintain water quality and to remove debris.

Cleaning systems and hygiene

A low flow rate is initially used in tanks to reduce the wash out of live feed. The tanks are generally not cleaned early in rearing to minimise the disturbance of larvae. First siphoning is around 30 days post hatch. A rotating cleaning brush/rod can be fitted to the base of the tank and this is used to accumulate the debris in one area where it is removed by siphoning.

For further details on growth and development, see:
Ottesen OH, Dunaevskaya E, Arcy JD (2012) Development of Labrus Bergylta (Ascanius 1767) Larvae from Hatching to Metamorphosis. J Aquac Res Development 3:127 doi:10.4172/2155-9546.1000127.
Dunaevskaya E, Amin AB, Ottesen OH (2012) Organogenesis of Ballan Wrasse Labrus Bergylta (Ascanius 1767) Larvae. J Aquacult Res Dev 3:146 doi:10.4172/2155-9546.1000146.

The objectives of the EcoFish partnership project are:-

- To establish wrasse hatcheries with captive broodstocks in Ireland, Scotland and Norway
- To develop techniques for rearing wrasse at all life stages
- To produce eggs and larval wrasse
- To develop methods for culture and use of Ballan wrasse as cleaner fish

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