Chapter 11
Preliminary breeding trials of wrasse in an intensive system

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Broodstock of goldsinny, rock cook and corkwing wrasse were captured, and maintained in through-flow holding tanks at 12°C. Fish were stripped, and fertilized eggs incubated at 18°C in 10 l containers. Larvae were held in similar containers and fed with algae and rotifers, and later *Artemia* sp. before weaning to dry feed. Best results were achieved for rock cook, where hatching occurred at approximately 90 degree-days, with considerable variation in survival beyond first-feeding. A high percentage of hatching was obtained with corkwing, although survival beyond day six was not as promising as that obtained for rock cook. High mortality was experienced at the egg stage of goldsinny with no survival beyond first-feeding. Based on experience from these trials, possible improvements for the holding of broodstock, and conditions for the different developmental stages are discussed. The experience gained during these trials indicates the requirement for further examination of holding conditions for broodstock and frequency of stripping.

11.1 Introduction

Infestation with sea lice, *Lepeophtheirus salmonis* Krøyer and *Caligus elongatus* Nordmann, is one of the major economic loss factors in commercial rearing of Atlantic salmon (*Salmo salar* L.) in the northern hemisphere. Lice eat mucus, skin and blood from the host, creating osmoregulatory problems and enhancing considerably the possibility of secondary infections (Brandal *et al.*, 1976; Pike, 1989; Johnson & Albright, 1992). Until recently, chemical treatment of whole farms was the only control for the lice problem (Brandal & Egidius, 1979; Boxaspen & Holm, 1991). The cleaning behaviour of wrasse has been used on a farming scale in Norway since 1991 following aquaria trials by Å. Bjordal (Bjordal, 1988; Costello & Bjordal, 1990; Skog, 1994). Farmers have based their practice of this method on wild wrasse caught in close proximity to farms. This has been recommended in order in minimize the risk of spreading diseases. In regions with few or no local populations of wrasse, stocks have been transported in from non-salmon farming areas. One problem with the use of wrasse is that they are difficult to catch before mid-June, towards the end of their spawning season. However, salmon farmers would ideally like to stock wrasse in the cages with the introduction of smolts in spring.

The problems of limited availability and health status could possibly be overcome by winter storage of fish in controlled systems (this volume, Chapter 22) or rearing of wrasse from broodstock. At Austevoll Aquaculture Research Station, intensive farming of halibut [*Hippoglossus hippoglossus* (L.)], turbot [*Scophthalmus maximus* (L.)] and (*Gadus morhua* L.) in semi-intensive and intensive systems has been carried out since 1985. These systems, and the knowledge required in their operation, have been used in a preliminary study into the rearing of wrasse.

11.2 Material and methods

Broodstock of rock cook [*Centrolabrus exoletus* (L.)], corkwing [*Crenilabrus melops* (L.)] and goldsinny [*Ctenolabrus rupestris* (L.)], were captured using fyke nets in June 1994 in the immediate area surrounding Austevoll Aquaculture Research Station, Norway. These were transferred to 75 l holding tanks supplied with sand-filtered sea water (6°C), from 50 m depth, at a rate of approximately 1.5 l per min. A constant room temperature of 23–25°C enabled the water temperature in the tanks to be maintained at 12°C. Numbers of females collected of each species were 35 corkwing, 40 rock cook and 35 goldsinny.

All fish were checked for ripe eggs upon first capture and subsequently at three to four-day intervals. Eggs were stripped manually, with rock cook and corkwing eggs being stripped onto small (20 × 10 × 0.3 cm) black polyethylene boards. Milt collected from males using a syringe, was added, and the eggs were left to stand with a covering of water for 5 min. to allow fertilization, and adhesion of the eggs to the boards. Opaque rock cook eggs were considered as overripe and were discarded. No such distinction was made with corkwing eggs. Goldsinny eggs were stripped into 75 ml containers and allowed to stand for 5 min. following the addition of milt and a small amount of water. Only floating eggs were incubated after this period as eggs that sank appeared opaque and were regarded as overripe.

Fertilized eggs were transferred to 10 l containers which were supplied with filtered seawater at 18°C at a rate of 75 ml per min. Each batch was placed in an individual container. Gentle aeration provided circulation in the containers. Eggs that died prior to hatching were removed from the containers by siphoning. Water temperature in each container was recorded daily.

After hatching, the polyethylene boards were removed from the containers and unhatched eggs removed. From day one, post-hatch, food was supplied to the tanks from a separate header tank system with a constant supply to each container of approximately 25 ml per min for up to 16 hours per day. Food consisted of a mixture of *Tetraselmis suecica* (Kylin) Butch and the portion of rotifers (*Brachionus plicatilis* Mueller) which passed through a 180 μm mesh sieve. Rotifers were gradually replaced by *Artemia* nauplii, enriched with Selco (Artemia Systems), from day 25 and *T. seucica* was discontinued.

Larvae of all species were filmed using a Wild M5 binocular microscope, without anaesthetic, and prints were made from a video sequence of the fish.

11.3 Results and discussion

11.3.1 *Goldsinny*

Goldsinny was the earliest of the three species to strip at the beginning of the season. The eggs were of a very variable quality both within and between batches. The percentage of overripe eggs at each stripping increased throughout the season to a situation where all eggs stripped were overripe. This problem could probably be solved by increasing the frequency of stripping.

Fertilized eggs developed satisfactorily through half the incubation time when large mortalities were observed and only a small fraction of the eggs reached hatching. The cause of the mortality at this stage in the incubation is not clear. Possible explanations could be the incubation system, the physical environment, bacterial infection, initial egg quality, or a combination of some or all of these. Of a total of nine groups, three gave hatching at about 67–73 day-degrees. Most larvae died after three days with only one group surviving to day six, post-hatch.

11.3.2 *Corkwing*

Corkwing produced the largest and best quality egg groups at the start of the experiment; quality was a subjective visual judgement of transparency and symmetry. The eggs were yellow and attached themselves within minutes to a surface. Overripe eggs were the possible cause of total mortality before hatching, as contact with dead eggs appeared to result in further mortality in the eggs surrounding them during the incubation period. Hatching in darkness gave better results than hatching in light suggesting that corkwing eggs hatch during darkness in the wild.

In the first part of the experiment, plates of white hard plastic were used as an attachment surface for the eggs. Even with good hatching, the larvae died within one day of hatching. They were observed to be strongly phototactic from the time of hatching and used a lot of energy constantly swimming against the white surface. Larvae hatched on grey-black surfaces distributed themselves evenly in the total water column of the incubators. Evenly distributed light was of vital importance as larvae were attracted to any source of light. Corkwing larvae were observed to graze on algal growth on the walls of the first-feeding tank. Of the 16 groups incubated, five groups hatched at 125 to 130 day-degrees. Most fish died five to seven days, post-hatch, with only one surviving past first-feeding.

11.3.3 *Rock cook*

Rock cook produced egg batches later in the year than corkwing and goldsinny, and also had a tendency to produce more overripe eggs. The fertilized eggs took longer to attach themselves than corkwing eggs. However, the time to attach seemed to be correlated to the quality of the eggs, with good quality eggs attaching faster, though this was not studied in detail. The newly hatched larvae were evenly distributed in the tank and did not seem to have the same strong positive phototactic response as corkwing. Out of 35 groups, eleven hatched and four gave larvae that survived past first-feeding. Hatching occurred at 85–95 day-degrees with most of the larvae dying five to seven days later. A total of 25–30 fish survived.

11.3.4 *Larvae appearance before first-feeding*

Larvae of corkwing show a distinct pattern of brown rings and blackish spots (Fig. 11.1) while rock cook only have the blackish spots in a very regular pattern on both sides of the body (Fig. 11.2a, dorsal view, 11.2b lateral view). The goldsinny however, has colouration only on the tail, gut and stomach areas (Fig. 11.3).

11.4 **Concluding remarks**

This preliminary experiment was conducted in order to obtain practical knowledge in stripping, egg incubation and handling of broodstock and larvae. The following conclusions can be made from our own experiment and which are supported by Stone (*pers. comm.*).

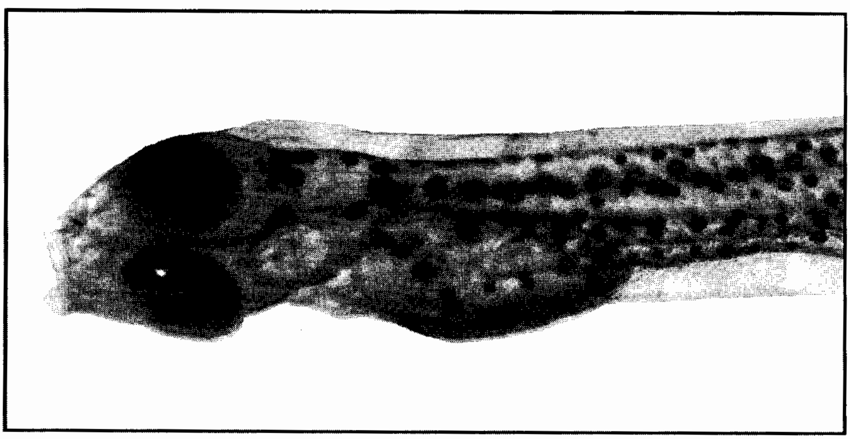

Fig. 11.1 Corkwing larvae before first-feeding. The pigmentation is a combination of brown-black rings and smaller spots.

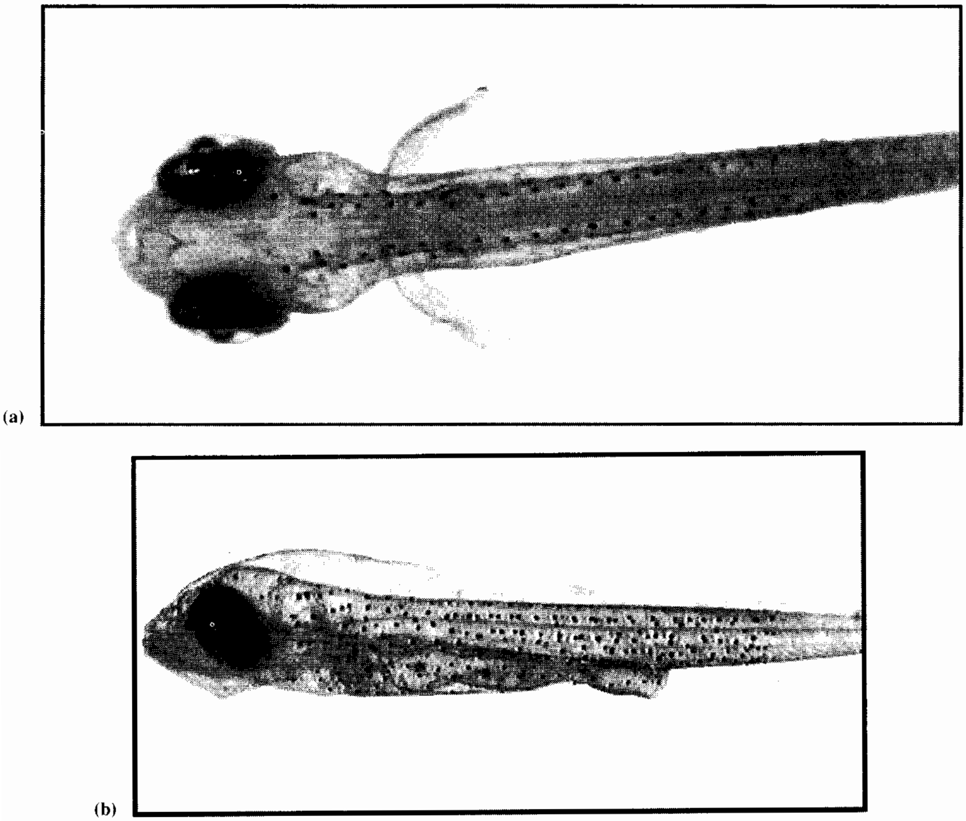

Fig. 11.2 (a) Dorsal view of rock cook before first-feeding. The pigmentation is a regular pattern of small black spots. (b) Lateral view of rock cook larvae where the regular distribution of spots can be seen along the body.

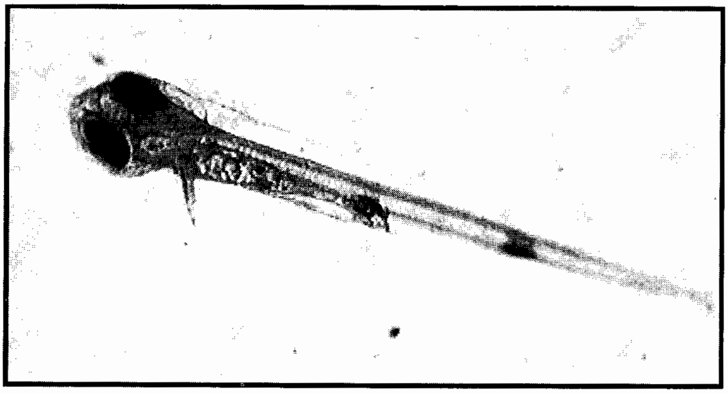

Fig. 11.3 Goldsinny larvae with distinct areas of pigmentation on the tail, gut and stomach.

The reduction of organic load in incubators is important in order to enhance survival. Thus, eggs should be washed after fertilization and before incubation. To reduce the bacterial load in the egg incubation period, the proportion of water volume to egg number should be higher for the goldsinny, which have pelagic eggs, and the flow increased for the corkwing and the rock cook which attach their eggs. This was not feasible in the present study because the supply of water of optimal temperature was limited. However stagnant water and, also darkness for corkwing, can be favourable just before and during the actual hatching process. Newly hatched larvae should be transferred to new containers in order to reduce bacterial load.

The broodstock of goldsinny should be stripped more frequently (probably every day) and the period of acclimation should be investigated. It is possible that egg quality was unstable for the year of capture. These conclusions are similar to those presented in Chapter 12 of this volume.

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