Broodstock conditioning, stimulation of maturation and successful reproduction of European eels in Wageningen

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In nature, European eels (*Anguilla anguilla*) sexually mature during and/or after the ~6000 km semelparous reproductive migration from their freshwater habitats to the spawning grounds in the Sargasso Sea. In captivity, eels have been stimulated to mature with the purpose to artificially reproduce by injecting gonadotropins, either through hypophysation or, more recently, with recombinant FSH and LH. As the use of wild migrant silver eels as broodstock for artificial reproduction trials has become difficult due to management protection measures, conditioning methods should be developed to use farmed eels as broodstock. One such method was developed for Japanese eels and concerns the feminisation of glass eels through feeding estradiol-17β for 5-6 months which accelerates the previtellogenic oocyte development. Recently, we showed that early sexual maturation of farmed European eel can be enhanced by a simulated migration under mimicked photothermal conditions (Mes et al., 2016). With this method to make farmed eels silver we have developed another important tool for the conditioning of farmed broodstock eels.

In collaboration with ZFscreens BV (Leiden, the Netherlands), we have also combined both methods (Böhm et al., 2016): 1) For the first time European eels were feminised; 2) Feminised eels were then subjected to simulated migration to assess the effects on maturation, and 3) Feminised migrant eels were subsequently stimulated to fully mature by hypophysation. Correlations between the individual maturation responses to simulated migration and to hormonal injections were analysed to identify potential predictors for the selection of farmed broodstock. Results showed that the feminisation procedure for European eels had been successful. All eels were stimulated in their early maturation by simulated migration as indicated by an increase of the eye index. Fourteen out of the eighteen feminised migrants could be fully matured by hypophysation after 11-17 weekly injections. The eye indices after simulated migration correlated positively with the weight increase after injection 11 as a result of the hydration response of the oocytes (0.9-13.6%) and indicating the speed of the maturation response. The eels that ovulated were those that had the higher eye indices after simulated migration. Therefore we can conclude that simulated migration can be applied for both conditioning and selection of feminised broodstock eels.

In the currently running project, facilities have been expanded from a large swim-gutter to experimental freshwater and seawater RAS set-ups and a larval hatchery system. The aims are: 1) Optimal conditioning of the broodstock eels by feminisation, optimal feeding and simulated migration; 2) Subsequent artificial reproduction in order to optimise and newly develop larval rearing systems and diets. Simulated migration has been applied to condition batches of farmed and wild eels. These eels were then matured by hypophysation and ultrasonography was explored for a potential role to assist with timing of spawning (Jéhannet et al., this abstract book). Four batches of larvae were produced from wild and farmed eels thus far and they were kept alive up to eight days post hatching. Early development was studied as well as hatching capacity, active behaviour and occurence of morphological abnormalities. Now, together with Glasaal Volendam, further development up to the moment of first exogenous feeding is studied. Also a new batch of feminised eels has been produced. Together with a batch of farmed eels they are now being fed with a newly developed broodstock diet with the purpose to use them in near future reproduction trials.

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