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Water quality or disease stress? Or just feeding?

Stock management strategies to optimise growth potential in on-growing of marine fish



In January 2007, a three-year SARF (Scottish Aquaculture Research Forum) studentship was awarded to Dr Herve Migaud, Dr Andrew Davie and Dr David Penman, Reproduction and Genetics Group, for a PhD project titled "Research and development of stock management strategies to optimise growth potential in on-growing of marine fish". The project is being conducted by Mairi Cowan, a former MSc student at the Institute of Aquaculture.

A major problem in the on-growing stage of marine aquaculture is sexual maturation where fish direct energy into gonadal development resulting in commercial loss (reduced growth and flesh quality) and potential genetic interaction with native stocks through broadcast spawning or spawning interaction by escapees.

The PhD project aims to investigate, develop and refine two of the main management strategies used to address problems of maturation in the on-growing industry: 1) photoperiodic regulation of maturation and 2) production of monosex populations. Research is based on the two most commercially important marine species in the UK, Atlantic cod and Atlantic halibut.

Regarding photoperiod manipulation, during the first year, work has focussed on photoperiod management in Atlantic cod by looking at the feasibility of new lighting technology (i.e. cathode lighting), more specifically its effects on cod light sensitivity and stress response. Results indicate no severe adverse welfare effects from such lighting technologies and as a follow up it is planned to provide guidelines as to the appropriate deployment of these systems in large scale on-growing cages. The next two years of the project will involve the development and validation of a novel molecular assay to measure the expression of kisspeptin related genes. Expression analyses

of these genes in cod will help characterise the onset of sexual maturation as well as define the initiation of the reproductive cycle during the decreasing winter photoperiod. Ultimately this is intended to provide a more accurate indication of the onset of sexual maturation in Atlantic cod.

In terms of monosex production, the project involves the development of monosex populations of Atlantic halibut, with the attainment of all-female stocks as the primary production goal. Female Atlantic halibut grow faster than males and can be harvested well in advance of maturation. During the first project year preliminary work has been conducted to establish sex-reversed halibut broodstocks which will generate, in the long-term, a basis for traditional monosex population generation. In the next two years, for the first time in fish, the potential for generating monosex populations using a novel semen sexing technique proven in terrestrial agriculture (i.e. cattle) will be investigated.

Overall this project aims to improve the competitiveness and sustainability of the marine aquaculture industry within the UK by developing and/or refining potential remediation techniques of sexual maturation as well as developing new tools to further our understanding of puberty in two of the main commercially important farmed marine species, cod and halibut.