Arctic Charr

The aquaculture potential of indigenous Welsh Arctic charr, Salvelinus alpinus

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The biology of Arctic charr

Arctic charr are a fascinating salmonid species in terms of developmental biology and life history. With a circumpolar distribution which includes much of northern Europe and the Alps of central Europe, charr are typically restricted to cold water bodies, representing the most northerly of all freshwater fish species. Although many populations are landlocked, typically in deep lakes, many northern stocks exhibit brief migrations to sea. These anadromous stocks generally migrate during the summer months for up to 8 weeks, during which they are able to double their weight in preparation for reproduction during winter.

Arctic charr display considerable variations in body form, which is directly related to the food source on which they feed. This trophic polymorphism has been found to be most variable in northern populations, in which up to 4 morphs have been found. Generally, morphs may include planktivorous, piscivorous as well as large and small benthivorous forms (Jonsson and Jonsson, 2001).

Charr in the UK

All documented UK populations of Arctic charr are landlocked. Populations have been identified throughout Scotland, within the Lake District of northern England and in the lakes of northern Wales. Within these UK lakes, most populations are believed to be monomorphic, with polymorphic populations generally containing two forms, although in Loch Rannoch, Scotland, a population containing three morphs has been identified (Adams et al., 1998).

By far the majority of research has focused on a small number of Scottish (Rannoch, Ericht and Tay) and English (Windermere) populations, with very limited information present for the Welsh strains. At present only three natural stocks (Padarn, Cwellyn and Bodlyn), one further native stock, which is now extinct (Peris), and seven other translocated populations have been found. However, like all native UK populations of Arctic charr, the genetics of the indigenous Welsh strains are considered to be pristine. Consequently they are very important from a conservation viewpoint.

Aquaculture

With the decline of the UK Atlantic salmon farming industry investors have looked towards other species with aquaculture potential. Arctic charr have been successfully reared for many years in northern Scandinavia and Canada and may provide a suitable species for farming in the UK. In particular Arctic charr are recognised as having a high flesh quality and combined with their limited production, they are able to command a high market price.

However, several problems complicate the successful production of charr in the UK (Jobling et al., 1998). Firstly, there is at present only one UK hatchery providing juveniles for on-growing and it is clear that importing fish presents many serious problems. Secondly, their need for low rearing temperatures, in particular during very early development, means that production is only possible in specific locations where lake temperatures are low or where suitable bore water is available. Furthermore, due to the pristine nature of the UK stocks, there is environmental pressure to avoid genetic contamination. Finally, there is still a limited amount of research present regarding the biology of UK strains of Arctic charr. The influence of environmental parameters on the growth and developmental biology of rainbow trout and Atlantic salmon is well researched, but for Arctic charr a lack of research regarding productivity may lead to reluctance for investment.

The proposed project

Our group at the University of Wales, Bangor has recently gained European Interreg III funding, which will aid investigations into the aquaculture potential of Welsh strains of Arctic charr (Anon, 2004). The north Wales region is near to the upper thermal limit for Arctic charr survival, although the production of a suitable broodstock from local strains may lead to regional investment and a nationally marketable product.

In the first instance the project will aim to remove eggs from local native and translocated populations. These will then be grown alongside commercial strains of Scottish and Scandinavian origin. Over successive years it is envisaged that broodstock from a range of Welsh strains can be developed. These can then be used to develop research protocols aimed at selection and environmental manipulation, in order to generate commercially competitive fish.

The absence of information regarding Welsh charr provides incredible scope for scientific research, with studies focusing on growth, maturation, smoltification and population ecology planned. Although in its infancy, in the coming years the AAAG plan to provide vital aquaculture research for the local region.

References and useful reading

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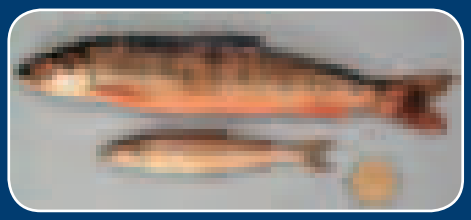

Fig. 1. Native adult and juvenile Welsh Arctic charr.

Fig. 2. Two Welsh charr lakes: Padarn (foreground) which contains a healthy population of Arctic charr and Peris, where the charr population is now extinct.

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