

# Environmental and genetic mechanisms underlying different muscle growth patterns in arctic charr (*Salvelinus alpinus*) morphs

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## Project summary:

It is proposed to investigate the patterns of muscle growth in the four morphs of arctic charr (*Salvelinus alpinus*) found in Lake Thingvallavatn, Iceland that show unusually high levels of ecological and morphological divergence. Hypotheses concerning the genetic mechanisms underlying differences in ultimate muscle mass between the morphs will be investigated in field studies. Arctic charr morphs show temporal and spatial separation of spawning, resulting in different environmental conditions during development. Laboratory experiments will be used to investigate the effects of egg incubation temperature on muscle satellite cell density and fibre recruitment patterns in the morphs. We wish to test the hypothesis that phenotypic plasticity in fibre recruitment is greatest in lakes where there is reduced morphological specialisation between morphs (Myvatn versus Thingvallavatn).



The four morphs of arctic charr (*Salvelinus alpinus*) found in Lake Thingvallavatn, Iceland are illustrated above (not to scale). From the top are the large benthic morph, the small benthic morph, the piscivorous morph and the planktonivorous morph.

## Specific Objectives

1. To extend the range of molecular tools available for investigating muscle growth in Arctic charr by cloning cDNA for myostatin, MyoD, myogenin, MNF-a and MNF-b using 3' and 5' RACE PCR. To prepare probes for expression studies.
2. To test the hypothesis that differences in growth rate and ultimate muscle mass between Arctic charr morphs in the wild will be reflected in different patterns of muscle fibre recruitment.
3. To investigate genetic and phenotypic mechanisms underlying different patterns of muscle growth in arctic charr morphs using a combination of field observations and laboratory experiments. These studies will focus on myostatin and the number and behaviour of the myogenic stem cell population. We will test the hypothesis that phenotypic plasticity of muscle satellite density in the morphs will be greater in a relatively unstable system (lake Vangsvatnet) than in a lake where resources and habitats are discrete and stable such as lake Thingvallavatn.

**Project started: April 2001**