SHORT COMMUNICATION

Movers and Stayers: Genetic Analysis of Mobility and Positioning in Hybrids of Lake Charr, Salvelinus namaycush, and Brook Charr, S. fontinalis (Pisces, Salmonidae)

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The inheritance of mobility and positioning characteristics of $F_1$ and backcross hybrids of lake charr (Salvelinus namaycush) and brook charr (S. fontinalis) was investigated. Hybrids showed a closer affinity to brook charr for mobility measurements in that they spent more total time stationary in periods of longer duration than did the lake charr. This suggests either a directional dominance or a response to water flow. Lake, brook, and reciprocal hybrid charr held mean positions within the central section of the water column and did not vary significantly from each other in their mean vertical positions. However, there were significant differences in mean horizontal coordinates across charr types in that lake charr and $F_1$ hybrids occupied positions midway along a laboratory stream channel, while brook charr occupied downstream positions. Even though there

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were no significant differences between the parental species in either means or standard errors of vertical and horizontal positioning, hybrid phenotypes varied significantly from both parents. Reciprocal effects were observed for variability of horizontal positions. A bivariate ANOVA revealed that horizontal measures were of greater importance than vertical measures in discriminating between charr types. It is likely that both genetic and environmental factors are responsible for the characteristic differences in mobility and positioning between brook and lake charr.

KEY WORDS: behavior genetics; mobility; positioning; inheritance; fish.

INTRODUCTION

In many fish species, characteristic differences in movement and positioning are correlated adaptively with ecology and life history. For example, lake charr (Salvelinus namaycush) and brook charr (S. fontinalis) differ markedly in their social behavior and mobility characteristics (Noakes, 1980; Ferguson et al., 1982). Generally, brook charr are territorial and show higher levels of agonistic behavior than do lake charr, which rarely show territoriality. These striking differences in behavior are best explained in terms of the ecological constraints placed on these species, particularly by differences in the predictability of food in their native habitats. Lake charr must actively forage on relatively dispersed food, as lacustrine conditions lack the high predictability of food in time and space provided by water flow in fluvial conditions (Dill, 1978; Krebs, 1978). Since brook charr usually face the prevailing effects of water flow and the provision of food as stream drift, they are more likely to defend territories than lake charr and spend more total time stationary in fewer periods of longer duration than do lake charr (Noakes, 1980; Ferguson et al., 1982).

It is likely that these distinct differences in positioning and mobility characteristics have some genetic basis comparable to that demonstrated for certain differences in the social behavior between these species (Ferguson and Noakes, 1982). Genetic studies of some other fishes have revealed that movement characteristics of Macropodus opercularis and M. opercularis concolor (Vadász et al., 1978) and Salmo gairdneri (Kelso et al., 1981) are determined by an interplay of genetic and environmental factors. This paper documents the inheritance of differences in mobility and variability in vertical and horizontal positioning between brook and lake charr by examining these characteristics in F1 and backcross hybrids.