

Acid water tolerance in a New Zealand native fish, the banded kokopu, *Galaxias fasciatus* (Family Galaxiidae)

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Abstract

The effects of low pH water on sodium fluxes and swimming performance were compared in banded kokopu (*Galaxias fasciatus*) from East coast neutral water streams and West coast naturally acid streams of New Zealand. East coast kokopu showed a reduced sodium influx on the first day of exposure to pH 4 water, offset by a reduced efflux. After four days at pH 4, influx recovered. West coast fish had influx values in pH 4 water similar to those measured for East coast fish at pH 7, and showed no change in influx at pH 7, but efflux increased. Both groups of fish were in approximate sodium balance three days after transfer back to their "native" pH. For East coast fish, swimming performance was significantly impaired on the second swimming trial when pH was lowered from 7 to 4. On the third swim with the pH returned to 7, performance was similar to the initial value. West coast banded kokopu were unaffected by pH 7 water in their second trial and showed a training effect over the seven days, as did a control group of East coast fish.

Keywords: Galaxiidae - acid-tolerance - exercise - sodium flux.

Introduction

The banded kokopu, *Galaxias fasciatus* (Gray), is endemic to New Zealand and has been markedly reduced in numbers in the last 100 years. At the time of this study (1995) it was the only kokopu species still found in Canterbury, its distribution presently being restricted to a few streams on Banks Peninsula (NIWA Freshwater Fish Database). It is more abundant on the West Coast of the South Island. Populations on the West Coast

can potentially live in acidic or more neutral streams. Although the larval stages of kokopu (whitebait) enter both neutral and acidic water streams in South Westland in large numbers (McDowall & Eldon 1980), Main (1988) found that adult Westland kokopu species were usually found in waters of below neutral pH. He found them in streams of pH < 5.0 and often in very acidic water, as low as pH 4.2. As tolerance of acid waters implies physiological adaptations (noted below), we wished to determine whether