# Diversity, distribution patterns and recruitment of fish in the Lake Kohangatera catchment and the implications of breaching to sea.

**A thesis presented in partial fulfilment of the requirements for the degree of Masters of Science in Conservation at Massey University, Palmerston North.**

# Abstract

The fish fauna of a relatively unmodified coastal lake, Lake Kohangatera situated 11km south east of Wellington, was investigated as well as the impact of a large scale and prolonged breaching event that occurred in February 2004. A total of ten native species; inanga (*Galaxias maculatus*), giant kokopu (*Galaxias argentus*), banded kokopu (*Galaxias fasciatus*), koaro (*Galaxias brevipinnis*), longfin eel (*Anguilla dieffenbachii*) shortfin eel (*Anguilla australis*), common bully (*Gobiomorpus cotidianus*), redfin bully, (*Gobiomorphus huttoni*), smelt (*Retropinna retropinna*) and lamprey (*Geotria australis*) and one introduced species; brown trout *(Salmo trutta*) were found within the catchment. The majority of these fish are diadromous, spending part of their life cycle at sea. Some are able to form land locked populations while others are obligatory migrators. Lake Kohangatera occasionally breaches to sea during high flows. Historical records of the fish assemblage indicate that some of those species which depend on access to the sea periodically disappear from the fauna for periods of time, presumably when breachings do not coincide with their migratory phase. In February 2004 a severe storm caused the lake to breach for a prolonged period of time. Observed changes in the fish fauna following this breaching were the reappearance of redfin bully (*Gobiomorphus huttoni*) after an absence of several years, smelt (*Retropinna retropinna*) were recorded for the first time in the catchment, and recruitment of giant kokopu, (*Galaxias argentus*) banded kokopu (*Galaxias fasciatus*) and longfin eel (*Anguilla dieffenbachii*) improved. The diversity of fish species within Gollans Valley, the catchment of Lake Kohangatera, decreased with distance from the sea. Some species exhibited very defined distributions. Eight species were found in the lower catchment and just two or three in the headwaters. Some species were very low in abundance e.g. redfin bully or were restricted to a

particular stretch or tributary e.g. koaro and banded kokopu, while others were widespread throughout the catchment e.g. longfin eel.

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trying to kill him when I made him climb a mountain in the dark and then go night spotting in waders two sizes too big. He has also helped me a huge amount in the field especially in the lake surveys when the trusty seagull motor broke down and he ended up rowing me and my nets all over the lake! Thanks for always being there – encouraging and positive.

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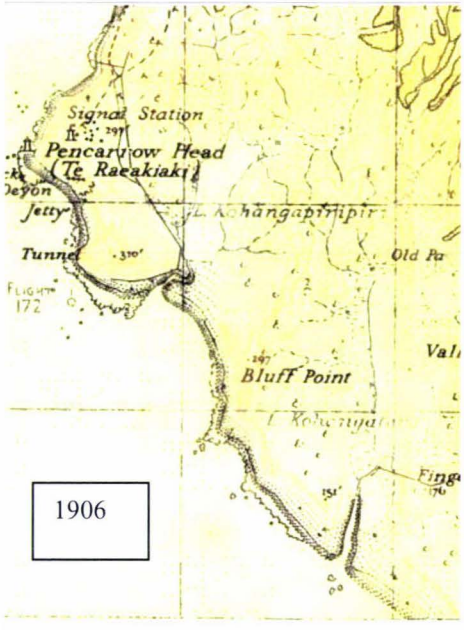
# General Introduction

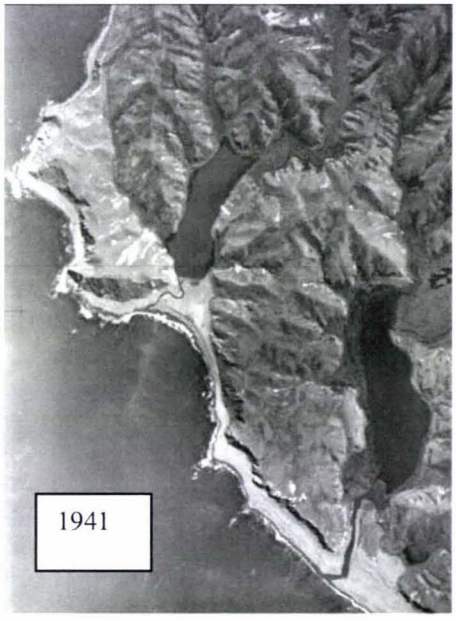
# Introduction

Lake Kohangatera situated in East Harbour Regional Park, Wellington, along with its smaller sister lake, Lake Kohangapiripiri, occupying an adjacent valley, represents one of the few surviving lowland coastal lakes/catchments that has remained relatively undisturbed since the colonisation of New Zealand. As such it presents a valuable opportunity for the study of native fish populations and distributions in natural habitat. Situated at Pencarrow, 11kms south east of Wellington and only accessible to the public by foot, Lake Kohangatera has an open water area of about 17ha. The lake drains around 1700ha via Gollans Stream, which passes through an extensive area of undisturbed beech forest, a farm and 150 hectares of wetlands (Gibbs 2002).

The make up of New Zealand freshwater fish communities has been found to be strongly influenced by the fact that a large proportion of its fish fauna are diadromous spending part of their life cycle at sea (McDowall1998, Joy *et al* 2000, Joy & Death 2001). Consequently elevation, distance to the sea and the presence or absence of migratory barriers have a large influence on fish distribution (Joy & Death 2004, Jowett & Richardson 2003, David *et al* 2002). Lake Kohangatera and Lake Kohangapiripiri are separated from the sea by a beach barrier. While Lake Kohangapiripiri rarely breaches to sea, Lake Kohangatera has been known to breach its 420m wide beach barrier periodically during flood events. In view of the migratory habits of most of New Zealands native fish, with different species migrating at different times, the timing and frequency of these events would be expected to have huge implications on the fish assemblage of the catchment.

Historically the lakes were open to the sea allowing free access to migratory fish (Fig 1). The chart published in 1951 clearly shows both lakes with open passage to the sea. Since then the beaches have aggraded strongly (Matthews 1980) and the lakes have



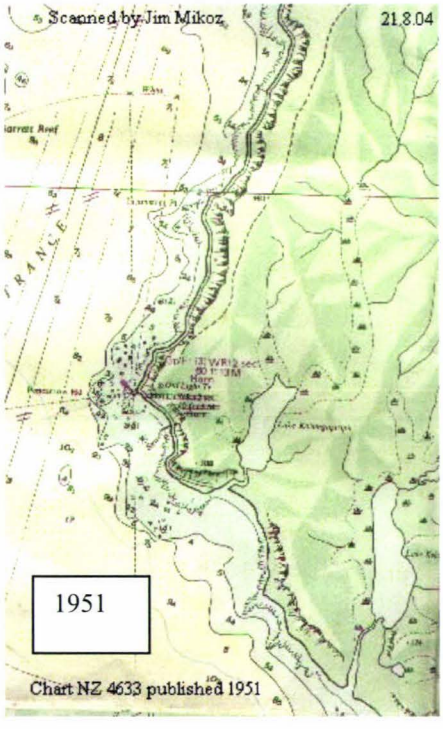





**Fig 1.** Historical pictures of Lake Kohangatera and Lake Kohanagapiripiri showing the outlets receding and becoming closed off to the sea. Note the road in the 1969 photo dissecting both outlets.

become closed off from the sea. Although the historical pictures (Fig 1) indicate that the lakes outlets were receding naturally, the building of a coastal road in the early 1960s with round concrete culverts used to bridge the lake outlets, along with sand quarrying operations in the area, are thought to have interfered with the normal erosion cycle of the beach barriers and may well have contributed to the lakes becoming blocked off from the sea (Gibbs 2002). Certainly in the present day the road and culverts impede the flow of water from the lake, limiting breaching events and arguably posing a velocity barrier to fish migration when breachings do occur. Fish migrating in from the sea must swim through water channelled through the culverts at artificially high velocities.

This study focuses on describing the fish fauna of Lake Kohangatera and its catchment, including the distribution patterns of species and the impacts of a large scale breaching event that occurred in February 2004 on the fish assemblage

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