Rare kōaro populations are disappearing from isolated lakes

Nationwide, less than 30 isolated lakes have trout-free populations of kōaro, but between 10-22% of these populations may already be lost. More consistent monitoring and targeted management actions for these isolated populations will ensure these irreplaceable taonga persist long-term.

What we know

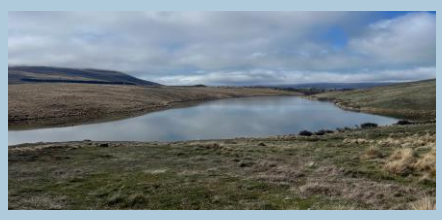
Trout-free lakes are rare, but they are an important baseline for understanding how lakes function and how native species like kōaro live and behave when introduced species are not present. Kōaro in these lakes have unique lifestyles and face threats that require a different conservation strategy than their whitebait cousins.

What we found

Lakes with isolated kōaro populations have not been studied in 19 years or more on average, and we found several localised extinctions in the years (or decades!) since the last monitoring visit. Some kōaro populations have likely disappeared because other fish were introduced, but some losses are still unexplained. Extrapolating from our survey of 9 lakes, we predict 10-22% of known trout-free lake populations of kōaro may have been lost!

Thriving kōaro population

No kōaro observed since 2005, unknown cause



Kōaro eliminated by trout in early 2024

Historic smelt introduction, no kōaro observed

These lakes are:

- Small
- Shallow
- Inland
- Far from roads
- Hydrologically disconnected
- So far, found almost exclusively on Te Waipounamu (South Island)

Background


Kōaro (*Galaxias brevipinnis*)

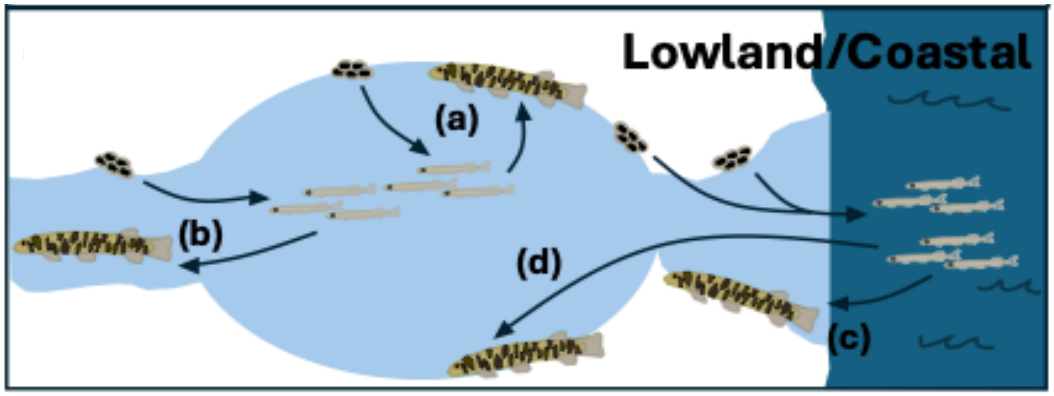
Kōaro are one of the native fish in the whitebait catch. They were likely widespread in Aotearoa lakes before non-native species were introduced. Although kōaro can coexist with introduced species in some cases, we know very little about kōaro in natural-state lakes.

Kōaro are highly adaptable, so it's possible that their biology and behaviour are different in trout lakes versus natural-state lakes.

Why are isolated lake kōaro different from coastal whitebait kōaro?

Coastal whitebait kōaro migrate to and from the sea:

- Adults lay eggs in rivers
- Newly-hatched fry flush out to sea on the river current
- Juveniles live in the sea for 3-4 months
- Juveniles return to rivers to grow into adults.

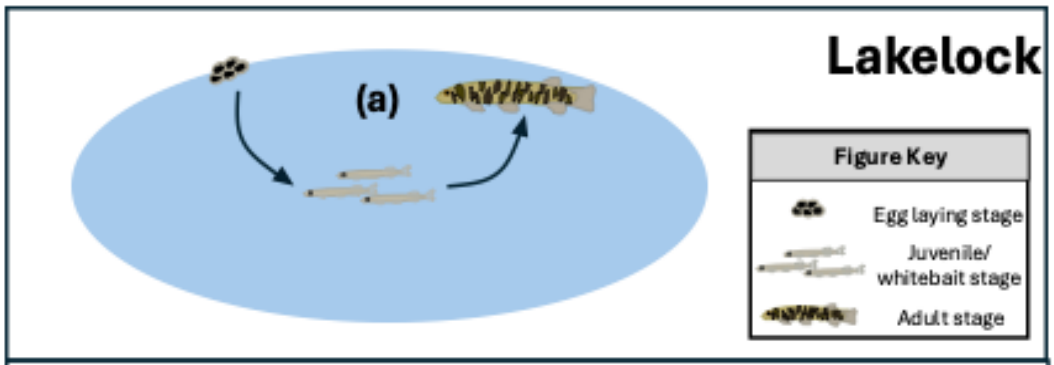


They have **lots of options for how they use habitats** and migrate through rivers, lakes, estuaries, and the ocean (options a-d).

Isolated lake kōaro have **fewer habitat options.** They are also more vulnerable to threats.

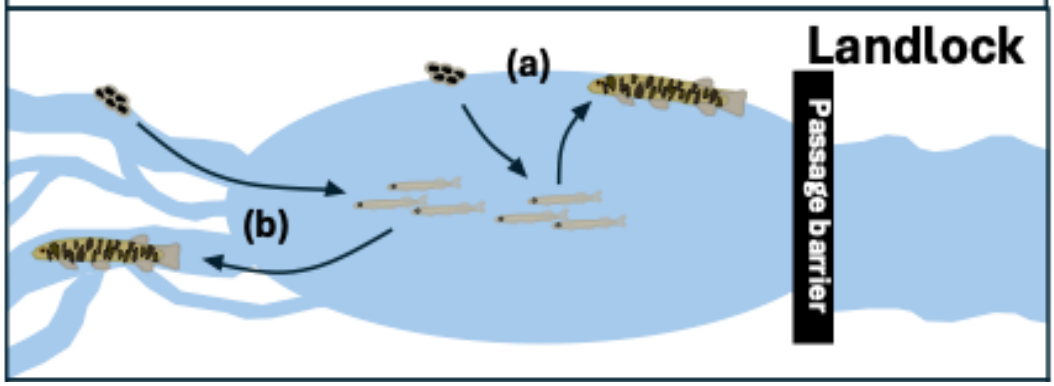
If the lake does not have an exit

- The kōaro are lakelocked
- **Lakelocked kōaro do not migrate at all (a)**



If the exit is blocked (landlocked)

- **Landlocked kōaro can choose** to either not migrate at all (a) OR migrate within the river and lake habitat they can access (b).



Known threats include: **introduced species**, **diseases**, and hot conditions **drying up shallow lakes** in summer.

What we did

We searched a national database (NZFFD) and found less than 30 lakes nationwide that have kōaro but not trout. We visited nine of these lakes and determined if kōaro were present by setting out traps to catch them and study their populations and traits. We used geographic data to describe the lakes that support these kōaro populations and their remote, difficult-to-access nature.

Urgent conservation actions needed for isolated kōaro in lakes

- Consistent, frequent monitoring with additional monitoring during hot & dry summers
- Further evaluate when populations are threatened and how to mitigate the threat
- Better safeguard lakes from pests and introduced species
- Develop remediation actions for invaded lakes, like building up shoreline wetlands as refuges
- Co-design guidelines for kōaro in lakes that recognize the cultural roles of kōaro as a traditional mahinga kai fishery
- Promote public awareness of these unique taonga

Research conducted by PhD student Lauren G. Hitt (in the packraft) with assistance from Angus McIntosh (University of Canterbury), Simon Stewart (Cawthron Institute), and Nixie Boddy (Department of Conservation, standing left).

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This research and the data supporting it are currently in peer review for publication. Meanwhile, please send any questions about this mahi to Lauren Hitt (lauren.hitt@pg.canterbury.ac.nz).

Photos by Angus McIntosh and Lauren G. Hitt.

To download a digital copy of this report, scan the QR code or visit this link: https://doi.org/10.6084/m9.figshare.30251953

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