NIWA
Taihoro Nukurangi

Te Wai Māori

MODERATE
VULNERABILITY

Assessing the vulnerability of taonga freshwater species to climate change – species summary:

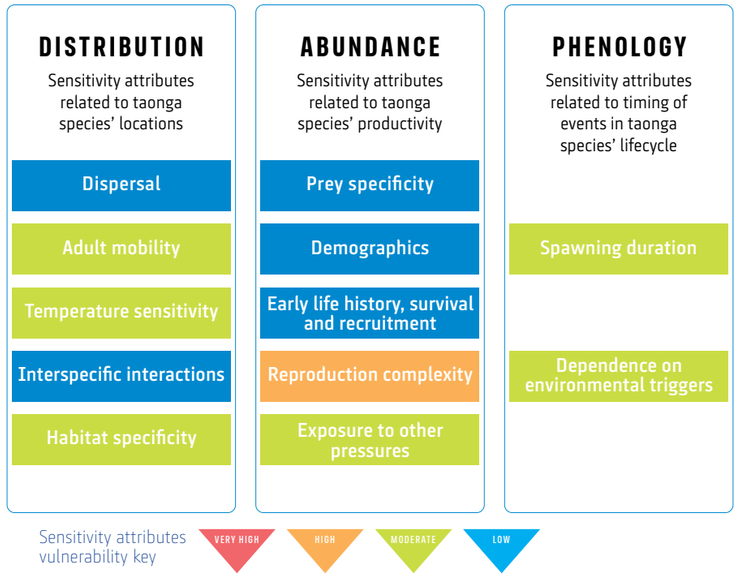
Giant kōkopu (Whitebait)

Galaxias argenteus

MODERATE VULNERABILITY

SENSITIVITY

Giant kōkopu migrate between freshwater and the sea to complete their lifecycle but can also form land–locked populations in lakes. Spawning is known to occur from late April to late June, but it possibly extends later to July and August. Average age at maturity is 10 years.



Subset of the sensitivity attributes that contributed to giant kōkopu CCVA scores

Complexity in reproduction

Giant kōkopu are on average 10 years at sexual maturity. Medium-large aggregations of males and females are needed for reproduction. This species repeatedly spawns in the same location within and among years although spawning has only been recorded from two sites in New Zealand, an urban stream in Hamilton and the Awaawaroa Wetland on Waiheke Island.

Spawning occurs adjacent to adult habitat on low–gradient banks amongst riparian vegetation inundated when water flows are elevated. Eggs develop terrestrially before hatching 3–6 weeks later when re–inundated by high flows. Reproductive success requires the use of vulnerable habitats (freshwater, estuaries) for spawning and rearing of young (i.e., riparian spawning habitats).

Habitat specificity

Giant kōkopu are found in three different habitat types over their life cycle. They are primarily a coastal species that does not usually penetrate very far inland. Giant kōkopu are mainly found in low altitude areas close to the south and west coasts of both main islands. Preferred habitat includes small-medium size, slow-flowing streams, although it can also occur in non-flowing aquatic habitats such as wetlands, ponds and lake margins. Their preferred microhabitats are associated with good cover from overhanging vegetation, undercut banks, logs or debris clusters. Because giant kōkopu have more specific adult habitat requirements, this increases their vulnerability to climate change.

What is a CCVA?

Climate Change Vulnerability Assessments (CCVAs) are used to assess species' vulnerability to climate change. They identify which species may be most vulnerable to climate change in the future based on:

(1) their exposure to predicted changes in the environment (e.g., warming oceans or more frequent droughts)

(2) their sensitivity or ability to cope with changes in their environment based on their unique characteristics (e.g., food, habitats, reproduction).

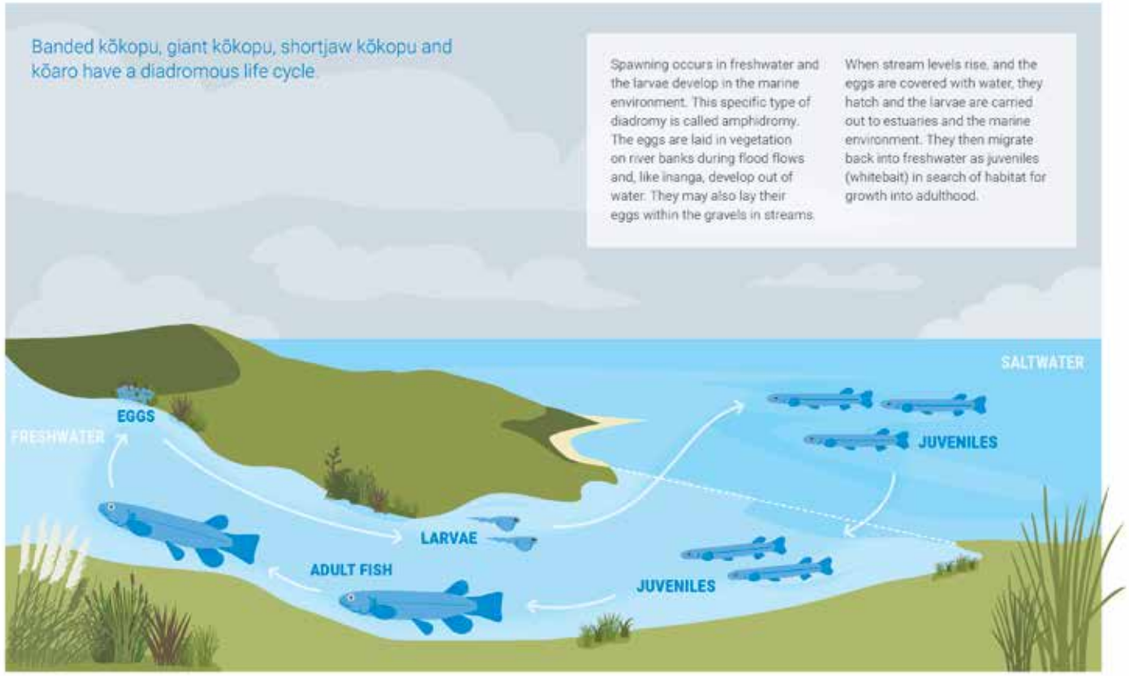
Together, exposure and sensitivity form a species' climate change vulnerability score.

Exposure to multiple pressures

Giant kōkopu are currently exposed to multiple pressures including harvesting of the juvenile whitebait stage in New Zealand, artificial barriers to migration, habitat degradation and destruction, and the impacts of introduced species. The loss of and degradation of habitat through activities such as drainage of wetlands and straightening of river channel systems are the biggest threat to this species. Approximately 85% to 90% of New Zealand's wetlands have been lost in the last 100 years which has severely impacted on the abundance and distribution of this species. Mechanical clearance of drains causes direct mortality, and on-going drain management is continually suppressing the potential for these areas to be recolonised.

EXPOSURE

Giant kōkopu are only found in Aotearoa–New Zealand. They are a coastal species with a patchy distribution. Giant kōkopu are predominantly absent around Fiordland and the East Coast of both North and South Islands. Their patchy distributions mean they are more exposed to environmental change in specific parts of the country.



Species summary: Giant kōkopu (Whitebait)

MODERATE VULNERABILITY

Subset of the exposure variables that will likely increase the vulnerability of giant kōkopu to climate change

Autumn air temperature

For the late century (2081–2100) time period and RCP 8.5, giant kōkopu are likely to be highly exposed to changes in autumn mean air temperature.

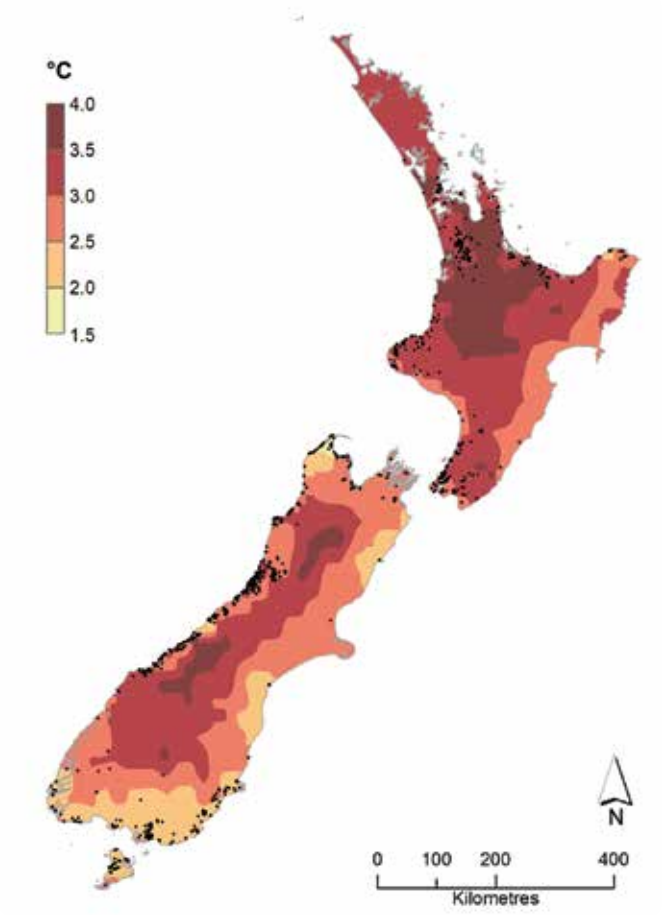
Giant kōkopu spawning occurs in autumn from late April to late June. At present, the specific temperature triggers for spawning are not well known. Optimum egg hatching occurs at 10°C. Baseline autumn air temperatures (1986-2005) range 2°C to 18°C with mean autumn air temperatures in the North Island mostly >12°C. This means that an additional projected increase of >3°C during autumn may affect successful egg development and egg survival for giant kōkopu. However, the microhabitat conditions of their spawning habitats may buffer any projected changes in autumn air temperatures. Furthermore, spawning is known to occur in the winter (July and August) meaning some populations will avoid these projected temperature increases.

Winter precipitation

Giant kōkopu are likely to be highly exposed to projected changes in mean winter rainfall for mid–century (2046–2065) and late century (2081–2100) under RCP 8.5. Predictable periodicity in rainfall is an important trigger for reproduction in giant kōkopu and it is believed that the winter hydrograph triggers reproduction. In an urban stream in Hamilton, low spawning success was observed in a dry winter indicating changes in the frequency, timing and magnitude of flood events that are predicted with climate change may alter the reproductive cues used by giant kōkopu. In catchments with high intensity rain events that occur with moderate frequency, giant kōkopu are mostly migratory (i.e., complete larval development in marine/estuarine environments). Any changes to rainfall patterns may therefore affect diadromy in giant kōkopu.

Temperature extremes

For the late century (2081–2100) and RCP 8.5, giant kōkopu will likely be highly exposed to projected increases in the annual number of hot days. Giant kōkopu are found in temperatures between 11 and 15°C, however, their temperature preferences are not apparent. Although giant kōkopu may be encountered more frequently in cooler water, this may be biased by maps of their known geographical distribution because there are substantially more records from Westland and Southland regions than from warmer northern regions.



Current giant kōkopu distribution (dark circles) mapped with projected changes in mean autumn temperature (for time period 2081–2100 under RCP 8.5).

This document summarises some of the key findings from the report: Egan, E., Woolley, J.M., Williams, E. (2020) Climate change vulnerability assessment of selected taonga freshwater species: Technical report. NIWA Client Report: 2020073CH. April 2020. 85 p.

For more on the methodology of CCVAs and the assessment of 10 freshwater taonga species (eight fish and two invertebrates) visit: **niwa.co.nz/te-kuwaha/CCVA**