

IMPACTS OF SEDIMENT ON BANDED KŌKOPU

Sediment can affect mahinga kai by influencing habitat, behaviour, feeding, growth and survival.

Background on banded kōkopu (*Galaxias fasciatus*)

Banded kōkopu are one of six species in Aotearoa New Zealand's whitebait catch. Banded kōkopu are diadromous – they spend about 3½ months in the ocean as larvae before entering rivers¹. Banded kōkopu make up about 7% of the whitebait caught in rivers around the whole country, but they are extremely rare in whitebait catches in Canterbury, Otago and Southland². Banded kōkopu whitebait appear to be attracted to warmer, forested rivers rather than cold rivers derived from glaciers and mountain regions³. Banded kōkopu are most often found in small, stable, low-elevation streams that have rocky-boulder beds with small cascades interspersed with small sandy pools⁴. Banded kōkopu whitebait are attracted to waterborne odours released by adults of the same species⁵. This might attract juveniles to streams that contain areas of suitable adult habitat. Banded kōkopu adults are most common in small, forested tributaries⁶ with good instream cover^{7,9}, overhead cover¹⁰ and pool habitat^{4,9}. Female banded kōkopu mature after four years¹¹ and can reproduce several times¹². They probably live for 9+ years^{11,12}.

Banded kōkopu (*Galaxias fasciatus*)



Banded kōkopu sensitivity to elevated sediment



■ Low ■ Medium ■ High

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Effects of suspended sediment on banded kōkopu

Habitat	Adult banded kōkopu are much less common in turbid rivers than in clear rivers ¹³ . However, this is not caused by direct lethal effects of high suspended sediment concentrations ¹⁴ , rather, turbidity reduces the upstream migration of banded kōkopu whitebait so fewer juveniles are recruited into adult habitats in turbid rivers ¹⁵ .
Behaviour	Banded kōkopu whitebait are more reactive to suspended sediments than other native fish species; in the laboratory, banded kōkopu whitebait quickly move from moderately turbid water to less turbid water ¹⁶ . In streams, fewer banded kōkopu whitebait migrate upstream when the water is any more than moderately turbid ¹⁷⁻¹⁸ . A slower migration rate means fewer juveniles will reach adult habitat ¹³ . Moderate turbidity disturbs the attraction of banded kōkopu whitebait to water containing the odour of adults ¹⁹ .
Feeding	Banded kōkopu adults mostly feed on terrestrial insects that fall onto the water's surface ^{6, 20-22} . Because they are typically nocturnal ⁴ , they do not rely heavily on sight for feeding ²³ . Instead, they use their lateral line (pressure sensors along the side of their body) to detect prey movement in the water ²⁴ . Banded kōkopu whitebait may also use their lateral line to detect prey ²³ , but despite this, even moderate turbidity levels cause whitebait to reduce feeding ²³ .
Growth	Direct effects unknown, but if turbidity reduces feeding over longer periods this will affect growth.
Survival	Banded kōkopu whitebait are remarkably immune to turbidity; even extreme turbidity levels have no effect on their survival over a 24 hour period ¹⁴ . It appears that the behavioural responses of banded kōkopu to sub-lethal turbidities may allow the fish to navigate better or continue feeding ¹⁵ .

Effects of deposited sediment on banded kōkopu

Habitat	<p>Banded kōkopu occur more frequently in pools than runs, riffles or rapids^{25, 26}. Larger banded kōkopu (> 90 mm) prefer deeper pools with slower water velocities²⁷, but their presence in pools is highly dependent on there being instream cover such as boulders⁹. If deposited sediments clog these coarse substrates, then banded kōkopu will be more vulnerable to predation, mainly from longfin eels⁹ and more vulnerable to downstream displacement during high flows. Large banded kōkopu are not strong swimmers and cannot climb falls or barriers that are easily surmounted by juvenile migrants. Downstream displacement by floods probably poses a major threat for the maintenance of banded kōkopu populations in streams with significant sediment deposits.</p> <p>Banded kōkopu spawn high on stream banks during flood events²⁸ and their eggs are deposited well above baseflow water levels²⁹. Because of this, it is unlikely that banded kōkopu spawning habitat is affected by deposited sediments or that their eggs could be smothered by sediment.</p>
Behaviour	Direct effects unknown.
Feeding	Banded kōkopu adults prefer terrestrial prey over aquatic prey, even when benthic prey are abundant ⁶ . The importance of terrestrial drift as food for banded kōkopu, over all seasons, makes it unlikely that deposited sediments will affect their ability to feed, or their food sources.
Growth	If deposited sediments do not affect the preferred food or ability to feed of banded kōkopu, then it is unlikely that their growth will be affected.
Survival	If deposited sediments smother instream refuges from predation, then it is likely that adult survival may be reduced slightly ⁹ .

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