Technical Advice – Native Fish by Richard Mark Allibone

Date	29 August 2025
To	Ellie Watson, Environmental Manager – South Island Renewables, Genesis Energy
From	Richard Allibone, Water Ways Consulting
Project advice provided for	Takapō Power Scheme – Applications for Replacement Resource Consents
Documents referred to	Documents I have read and rely on: Allibone RM. 2025a. Takapō Power Scheme: native fish assessment of ecological effects. Water Ways Consulting client report 61-2018 prepared for the Genesis Energy Limited. (submitted as Appendix M Native Fish Assessment Takapō PS Reconsenting with the Genesis Fast-track Approvals Act Takapō applications). Allibone RM. 2024a. Haldon Station Stony River water take and fish screen. Water Ways Consulting client report 41-2023D prepared for the Haldon Station. Allibone RM. 2024b. Takapō Military Training Area freshwater fish survey 2024. Water Ways Consulting client report 40-2023 prepared for the New Zealand Defence Force. Allibone RM. 2025b. Takapō Military Training Area fish survey January 2025. Water Ways Consulting client report 48-2024 prepared for the New Zealand Defence Force. Dunn NR. Allibone RM, Closs GP, Crow SK, David BO, Goodman JM, Griffiths M, Jack DC, Ling N, Waters JM, Rolfe JR 2018. Conservation status of New Zealand freshwater fishes,2017. New Zealand Threat Classification Series 24. Department of Conservation, Wellington.11 p. Gabrielsson, R. 2013. Takapō Canal fish salvage project: summary report-January 2013. Cawthron Report 2304, prepared for Genesis Energy. McArthur KJ. 2025. Statement of evidence of Kathryn Jane McArthur aquatic ecology and water quality. Statement before an Expert Panel Takapō Power Scheme. McDowall RM. & Allibone RM. 1994. Possible competitive exclusion of common river galaxias (*Galaxias vulgaris*) by koaro (*G. brevipinnis*) following impoundment of the Waipori River, Otago, New Zealand. *Journal of the Royal Society of New Zealand 24:* 191-168. Meijer C. 2025. Appendix 8: Technical Advice – River Values. Environment Canterbury advice for the Genesis Takapō Power Scheme Fast Track Act application.

Qualifications	I hold a BSc (Zoology and geology), MSc (Zoology) and PhD (Zoology) all from the University of Otago. I have over forty years experience researching, surveying and managing native fish working in North Island, South Island, Stewart Island and Chatham Island. Much of this work has concentrated on the galaxiid group of fishes. My MSc thesis investigated the population structures of diadromous and non-diadromous galaxiids and was one of the factors leading to the discovery of eleven new species of non-diadromous galaxiids. My PhD thesis investigated the biology of four non-migratory galaxiids, and provided the first information on spawning behaviours, diets, growth and data on the interactions amongst native fish and native fish with salmonids. I worked for the Department of Conservation and led the development of the three freshwater fish recovery plans, the non-migratory galaxiid recovery plan, the large galaxiid recovery plan and the mudfish recovery plan. I was also the initial leader of the non-migratory galaxiid recovery and a member of the large galaxiid and mudfish recovery groups. I was a member of the freshwater fish threat ranking expert panel from 2000 to 2022 and chaired the threat ranking process in 2009. I have undertaken extensive survey work for native fish in the upper Waitaki catchment including three of the lowland longjaw galaxias 'waitaki' sites – Ruataniwha wetlands, Fork Stream and Fraser Spring. I have provided advice to the local Department of Conservation staff on potential salmonid and koaro management and removal options at these sites. I provided technical advice on bignose galaxias surveys and assisted Environment Canterbury staff with bignose galaxias survey and monitoring work in the Greys River wetland. I have conducted fish surveys in the Takapō , Cass, Godley, MacAuley, Ahuriri, Otamatopaia and Stony (a tributary of the Takapō River) rivers and the upper reaches of Mary Burn and Irishman Creek, two of the major tributaries of the Takapō River. As a fisheries scientist at NIWA I was part of the team that developed the first habitat preference curves for lowland longjaw galaxias and other galaxiids that are now used for habitat modelling for these galaxiid species.
Code of Conduct	As an expert witness I have read, and I am familiar with, the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023. This memorandum has been prepared in compliance with that Code. In particular, unless I state otherwise, this response is within my area of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

Signature	

Longjaw galaxias taxa

There is some mixed use of taxonomic terminology for longjaw galaxiids in the various documents and statements. The draft Kahu Ora Indigenous Biodiversity Enhancement Programme, Ms McArthur and Dr Meijer all refer to lowland and upland longjaw galaxias. However, the longjaws in the Waitaki catchment are both distinct from the described species *Galaxias cobitinis* the lowland longjaw found in the Kakanui River catchment and *Galaxias prognathus,* the upland longjaw found in the Rangitata and Rakaia catchments. The longjaws in the Waitaki catchment are referred to as lowland longjaw 'Waitaki' (*G cobitinis* 'Waitaki'*)* and upland longjaw 'Waitaki' (*G prognathus* 'Waitaki'). Using this terminology will match with the four longjaw taxa in the New Zealand threat rankings (Dunn et al 2018). However, to keep this statement brief the I have simply referred to the 'Waitaki' taxa and lowland and upland longjaws.

I have reviewed the evidence prepared by Forest and Bird / CRC and my assessment (Allibone 2025a) still stands. I do note that key differences are present due to differences in what is considered the baseline state of the system for the assessment of effects.

I note the following in response to Forest and Bird and CRC evidence:

Lowland longjaw 'Waitaki' in the Takapō River

My native fish assessment (Allibone 2025a) reports finding no lowland longjaw in the Takapō River. Ms McArthur (paragraph 60) suggests that *spring upwellings inside channels and backwaters provide ideal habitat for lowland longjaw and bignose galaxiids. Reestablishment of flow to the upper Takapō may provide for reconnection of springs with side braid or backwater features, habitats that are used for feeding and spawning*

One of the features I specifically searched for during the Takapō River fish surveys was small springs similar to those I have seen at Ruataniwha and Fraser springs. I could not find any springs along the river. With respect to the Ruataniwha and other Ohau River lowland longjaw sites the spring systems were all at the base of terraces where ground water emerges onto the valley floor. I found no such terrace features alongside the Takapō River. Furthermore, if these features existed increasing the Takapō River flow to reconnect the springs to the main river would allow invasion by salmonids and koaro (discussed below) that would most likely lead to major lowland longjaw losses or local extinctions as occurred at the Ruataniwha and lower Ohau River lowland longjaw populations.

Therefore, I would not support any reconnection of any spring with lowland longjaws (if they were present) to the main Takapō River unless there are effective exclusion mechanisms to prevent koaro, longfin eel and salmonid invasion. In my opinion such action would be very detrimental to any small non-migratory galaxiids that were using the spring habitat and highly likely to lead to significant declines and possibly local extinctions.

I would further add that I believe the likelihood that undiscovered populations of lowland longjaw galaxias is very low. I have previously surveyed areas of the Gray River with CRC staff

and found only bignose galaxias. Over the last two summers I have completed fish surveys of the upper reaches of Irishman Creek and Mary Burn on the New Zealand Defence Force Takapō Military Training Area. (Allibone 2024b, 2025b). We found remanent populations of bignose galaxias, alpine galaxias and Canterbury galaxias in Irishman Creek and Canterbury galaxias in Mary Burn. These populations were almost exclusively present in the areas free of brown trout which was the most widespread species. There was no evidence of lowland longjaw galaxias anywhere on the military training area.

Upland longjaw galaxias

Dr Meijer discusses (paragraph 17) the need for management action to protect freshwater fish directly affected by the power scheme and notes that the draft Kahu Ora Indigenous Biodiversity Enhancement Programme does not have any actions for upland longjaw galaxiids. These fish are only found upstream of Lake Takapō in rivers such as the Cass and Godley. The only possible effect on any fish that occur upstream of Lake Takapō is if lake level rising was going to occur that would flood the existing habitat. Lake level increases are not proposed so the Takapō Power Scheme cannot impact the existing upland longjaw populations. In this case there is no requirement for management action.

Threat status of koaro (*Galaxias brevipinnis*)

Dr Meijer (e.g., paragraph 12), and Ms McArthur (paragraph 48) refer to koaro's threat ranking as *At Risk – Declining*. This is correct, but threat rankings also include qualifiers. These are designated by the Freshwater Fish Threat Ranking Expert Panel to provide further information on the threat ranking. Koaro has the qualifier, *Partial Decline (PO)* in the threat ranking publication (Dunn et al 2018). This indicates that some koaro populations are considered stable or increasing and only some populations are declining. In the case of koaro the Expert Panel determined that landlocked populations, including those associated with Waitaki hydro-electric lakes are stable or increasing. The assessment did conclude that the diadromous koaro population is declining and the *At Risk Declining* status applies to the diadromous koaro.

In the upper Waitaki catchment range expansion is believed to be occurring and is reflected in the increasing presence of koaro in rivers and streams downstream of their natural larval rearing habitat in the three natural lakes. Koaro now use Lake Benmore as larval rearing habitat and whitebait migrate up the Takapō River from Lake Benmore and reside, as I found, in the Takapō River (Allibone 2025b) and in Takapō River tributaries, e.g., lower Fork Stream (Allibone 2025b) and Stony River (a trib of the lower Takapō River, Allibone 2024a). Therefore, the Partial Decline qualifier and the observed range expansion by koaro in the upper Waitaki catchments means the *At Risk Declining* threat status does not represent the state of the upper Waitaki koaro population.

Koaro Management Issues

Ms McArthur has recommended that management of the Takapō River is conducted to raise flows with the expected outcome of increasing the native fish populations. However, this ignores that changes have occurred in fish communities in the Takapō River over the last 150

years. Koaro is one of the common native fish in the Takapō River, and it has been shown to have a detrimental effect on the abundance of smaller non-migratory galaxiids. Over 30 years ago it was recognised that koaro can eliminate the smaller non-migratory galaxiids and koaro range expansion can lead to the loss of non-migratory galaxiid populations (e.g., McDowall & Allibone 1994). The negative effect of koaro on lowland longjaw populations has been a fisheries management issue at Fraser Spring. Koaro, that prey upon lowland longjaw, are generally removed each year as the juvenile koaro can climb the trout exclusion barrier and reestablish themselves with each upstream juvenile koaro migration.

Koaro dispersal throughout the rivers and streams between Lake Benmore and Lake Takapō is a serious management issue. Koaro whitebait migrate upstream from Lake Benmore and can disperse throughout the catchment and threaten rare non-migratory galaxiid populations. For instance in my fish surveys of the Takapō River I located post-whitebait stage koaro at the Takapō Canal culvert over Fork Stream (Allibone 2025a). These koaro will have migrated up the full length of the Takapō River from Lake Benmore and were attempting to pass through the culvert and fish pass structure into Fork Stream. Movement up Fork Stream ultimately could lead to koaro colonising the trout removal areas as is happening at Fraser Spring. As the adult koaro population continues to grow in rivers and streams upstream of Lake Benmore more koaro juveniles will rear in Lake Benmore each year until the lake reaches carrying capacity.

Therefore, in my opinion any ecosystem management that improves conditions for koaro can have unwanted effects on the small non-migratory galaxiids as koaro colonise new areas. Ms McArthur repeatedly ignores this issue when recommending increased flows for the Takapō River. Koaro are also able to utilise a greater range of flow conditions than the smaller non-migratory galaxiids and will gain more benefit from increased flow, as will salmonids.

Longfin eel

Firstly, I note that longfin eel/tuna management is proposed to sit within Meridian conditions (as supported and deemed appropriate by Rūnaka, with a Genesis contribution towards the Rūnaka-led implementation of a tuna management plan). I have provided some important considerations in response to Ms McArthur's suggestion of catchment-wide restoration of tuna populations are provided below.

Ms McArthur correctly notes that the hydro-electric dams, Waitaki, Aviemore and Benmore are fish passage barriers to both upstream and downstream fish passage. Furthermore, she notes that the longfin eel population has declined significantly since the dams were constructed.

Ms McArthur advocates for the restoration of longfin eel throughout the upper Waitaki catchment area as part of the restoration of the freshwater ecosystems in the area. However, in my opinion the restoration of the longfin eel population is not simply a process of trying to restore longfin eels to whole of the upper Waitaki catchment.

I would expect any longfin eel management plan to identify limitations and to determine whether the major objective is catchment ecosystem restoration or more local ecosystem restoration while improving longfin eel spawning migration success. The management plan should consider the restoration of longfin eel stocks to important customary harvest areas for Ngāi Tahu / Waitaki Rūnanga, and also consider the potential for unwanted effects of longfin eel restocking.

If longfin eel elvers are widely dispersed across the upper Waitaki to restore the river ecology this creates a very widespread population. Recapturing the downstream migrant eels will require fishing in many rivers, streams, lakes and wetlands to attempt to collect migrant longfin eels. I would expect that the capture success will decrease as the area to be fished increases as human resources and access to fishing sites becomes more limiting. However, if elver releases are concentrated in smaller areas of the upper catchment the recapture of downstream migrant longfin eels can be more successful as fishing effort is concentrated in a smaller areas. The more adult migrant eels that are aided in reaching the ocean as opposed to passing through the hydro-electric schemes turbines the greater the contribution of the Waitaki catchment's longfin eels will make to longfin eel spawning.

An additional consideration for the longfin eel restocking is the effect of eels in colonising areas with threatened non-migratory galaxiids as the eels are likely to have detrimental effects on the galaxiids Longfin eels greater than 300 mm are piscivores and in my experience larger eels can impact on small non-migratory galaxiids. I would strongly urge caution with the return of eels to catchments with threatened galaxiid habitat as this may lead to declines and loss of the galaxiids, at least at the local scale.

Native fishery management

One overriding factor, in my opinion, not considered by Ms McArthur, is that when considering fisheries management in the upper Waitaki the protection of threatened species (upland longjaw galaxias 'Waitaki', the lowland longjaw galaxias 'Waitaki' and bignose galaxias) is important. In the pre salmonid, pre-dam era these three small galaxiids would have only had to co-exist with one piscivore, the longfin eel. In the late 19th century salmonids were introduced and koaro, another piscivore, has expanded its range since the creation of Lake Benmore and koaro also have impacts on the small non-migratory galaxiids in areas koaro did not previously exist. Restoring longfin eel will add a third piscivore to the catchment. While the longfin eel is the original piscivore it represents additional pressure on the non-migratory galaxiids. Furthermore, longfin elvers, like juvenile koaro can climb the weir barriers used to prevent salmonids entering lowland longjaw and bignose galaxias habitat at Fraser Spring, Corbies Creek and Fork Stream increasing the management risk. Given the major changes to the catchment and its fish fauna simply advocating for a return of longfin eel and river flows that will preferentially benefit koaro to restore the ecological health of the upper Waitaki ignores the fact the fish fauna has been significantly altered and will remain so for the foreseeable future, irrespective of the power scheme. Fisheries management needs to reflect the present state and risks not the past state of the upper Waitaki fish fauna.

Ms McArthur (paragraph 61) quotes a recommendation from Woodford & McIntosh (2013) '*trout-free source populations must be maintained and new sources created*'. I agree with this recommendation, hence my concerns given above for the protection of existing populations but would extend the requirement to protect source populations for all predators as there are very few lowland longjaw populations left. However, protection of existing populations cannot be done in the Takapō River and adding flow to the Takapō River will not create lowland longjaw or bignose galaxiid habitat.

In my Takapō report (Allibone 2025a) I did note that Edwards Stream has a population of lowland longjaw galaxias that is under threat from salmonids and also crack willow habitat

modification. Protecting additional sites with lowland longjaws or creating new populations could be considered under the Kahu Ora Indigenous Biodiversity Enhancement Programme and would, in my opinion, reduce the threat status of lowland galaxias.

Woody weed management in the Takapō Catchment

Neither Dr Meijer or Ms McArthur note an important component of the draft Kahu Ora Indigenous Biodiversity Enhancement Programme. The programme includes a range of weed management tasks and goals for riverbeds upstream of Lake Takapō , and the Takapō River. The Zone 2 outcomes include control of woody weeds (e.g., crack willow) in the upper Takapō River. I see this as a very important habitat management goal as woody weeds have a number of negative effects on naturally mobile river channels, including stabilising channel forms, promoting the creation of scour pools that provide habitat for large salmonids and preventing braid migration during high flows. This is an important river management outcome not noted by either person in their statements and in my opinion a highly important river habitat management goal.

Native Fish Salvage

Dr Meijir (paragraph 8) notes there are two threatened species, koaro and longfin eel in the Takapō Canal. The Department of Conservation threat ranking manual and the NPS-FM (2020) both state that threatened species are species with the threat rankings of *Nationally critical, Nationally endangered* and *Nationally vulnerable*. Longfin eel and koaro have the threat ranking of *At Risk – Declining* (as noted by Dr Meijir paragraph 12) and are not considered threatened species. To my knowledge there are no threatened native fish in the Takapō River, Takapō Canal or Lake Takapō.

Dr Meijir also proposes including native fish in the Sports Fish Salvage Management Plan, when undertaking sports fish salvage for the Takapō River downstream of Gate 16 and provides a suggested change to the consent conditions for the sports fish salvage to include native fish. I would support the inclusion of native fish in a sports fish salvage operation where practicable. It is the "where practicable" that is critical. Previous salvage efforts show that salvage of all native fish is unlikely to be achieved. For example, Gabrielsson (2013) provides a summary of a previous fish salvage operation in the Takapō Canal and reports that while two longfin eels and a few koaro were rescued, bullies were often entangled in macrophyte beds and stranded in small pools too small to fish, preventing their capture. I also consider that common bullies are most likely native fish to move downstream from Lake Takapō if Gate 16 is open. Common bully are the most abundant native fish in Lake Takapō and were probably introduced to Lake Takapō as trout food rather than being present naturally. Lake resident koaro also are expected to resist downstream movement so are unlikely to enter the Takapō River. Therefore, while I support the inclusion of native fish in a salvage operation where practicable, I would not expect many native fish to be present downstream of Gate 16 and would not require that all native fish are captured as that will not be possible nor is it required to maintain the main bully and koaro populations that occur in Lake Takapō.

Richard Allibone

31 August 2025