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Conservation status of New Zealand freshwater fishes, 2023

Nicholas R. Dunn, Gerard P. Closs, Shannan K. Crow, Bruno O. David, Jane M. Goodman, Marc Griffiths, Andrew S. Hicks, Michael J.H. Hickford, Daniel C. Jack, Jane C. Kitson, Nicholas Ling, Jonathan M. Waters, Matthew J. Wylie, Rodney A. Hitchmough and Troy Makan

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Cover: *Galaxias* "Teviot" (Teviot flathead galaxias (Teviot River)), Threatened – Nationally Critical, from a Lake Onslow tributary in the Teviot River catchment, within the Clutha River / Mata-Au catchment. *Photo: © Rod Morris, www.rodmorris.co.nz*

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CONTENTS

Conservation status of New Zealand freshwater fishes, 2023

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Abstract

New Zealand Threat Classification System (NZTCS) criteria were used to assess the conservation status of 78 freshwater fish taxa in New Zealand. One taxon (1%) was assessed as being Extinct, 22 (28%) as Threatened, 25 (32%) as At Risk, 6 (8%) as Not Threatened, 3 (4%) as Non-resident Native, and 21 (27%) as Introduced and Naturalised. Since 2017, when the conservation status of freshwater fishes was last assessed, the status of 11 taxa has worsened and the status of 12 taxa has improved. These changes are in part due to a reinterpretation of how the NZTCS criteria are applied, particularly in terms of the area of occupancy, with the smallest area at any life stage (i.e. the spawning habitat for freshwater fish taxa) now being recognised. Additional changes arise from more accurate assessments of area of occupancy being available for some taxa.

Keywords: Anguillidae, Cheimarrichthyidae, conservation status, Eleotridae, freshwater fish, Galaxiidae, Geotriidae, Gobiidae, Mugilidae, New Zealand Threat Classification System, Oxudercidae, Retropinnidae, Rhombosoleidae, Tripterygiidae

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1. Background

The New Zealand Threat Classification System (NZTCS) was designed to allow a conservation status to be assigned to a taxon[1] based on an assessment and subsequent categorisation of its threat of extinction. Thus, the NZTCS can be considered a tool that provides a basis for subsequent prioritisation of taxa in conservation programmes and assistance in natural resource decision making (Townsend et al. 2008).

The NZTCS was first published in 2002 (Molloy et al. 2002), having been developed to complement the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. Categories and criteria were defined to reflect New Zealand's unique environments and to account for the country's relatively small size and diversity of ecosystems, as well as the large number of taxa with naturally restricted ranges and/or small population sizes (Molloy et al. 2002). The methodology of Molloy et al. (2002) was utilised to assess the conservation status of 49 New Zealand freshwater fish taxa in 2002 (Hitchmough 2002) and 50 taxa in 2004–2005 (Hitchmough et al. 2007).

The NZTCS methodology was refined in 2007 to ensure that all possible combinations of status and trend were covered within the different categories. This resulted in additional categories, changes in nomenclature, and revision of the definitions, qualifiers and criteria for inclusion. The resulting manual (Townsend et al. 2008) was utilised to assess the conservation status of 74 New Zealand freshwater fish taxa in 2009 (Allibone et al. 2010), 77 taxa in 2013 (Goodman et al. 2014) and 78 taxa in 2017 (Dunn et al. 2018).

The NZTCS methodology underwent further technical review in 2018–2019 (Rolfe 2019), resulting in the publication of amendments and additions to the categories (Michel 2021) and qualifiers (Rolfe et al. 2021) to supplement the manual of Townsend et al. (2008). The conservation status assessment provided in this report utilised the combined methodology of Townsend et al. (2008), Michel (2021) and Rolfe et al. (2021) to assess 78 New Zealand freshwater fish taxa and replaces all previous New Zealand freshwater fish NZTCS assessments.

1.1 Assessment process

NZTCS assessments are reviewed at approximately 5-year intervals by an expert panel. Expert panel members and the expert panel leader 'provide knowledge on their particular field of expertise' (Townsend et al. 2008: 34) and are assisted administratively in the assessment process by a list facilitator and database administrator who contribute technical knowledge about NZTCS processes and ensure consistency between expert panels.

1.2 This assessment

The authors of this report comprised the expert panel for the 2022–2023 NZTCS assessment of New Zealand freshwater fishes. When making its assessment for a taxon, the expert panel considered data and knowledge (described below) on population size, area of occupancy and population trend to assign the taxon to a category and apply qualifiers following Townsend et al. (2008), Michel (2021) and Rolfe et al. (2021). Abridged descriptions of the categories are provided in section 3.3. Notes from the expert panel meeting and rationales for the reclassification of taxa have been summarised in the present report.

Taxa are referred to by their scientific and common English names only, as the Department of Conservation (DOC) does not currently have an agreed list of te reo Māori names for

[1] For the purposes of this report, taxon (plural taxa) refers to both a formally described species and a biological entity as yet without a formal name (Townsend et al. 2008).

freshwater fish taxa across New Zealand. The use of te reo Māori and English in dual place names is based on the New Zealand Gazetteer (https://gazetteer.linz.govt.nz), which is administered by Toitū Te Whenua Land Information New Zealand.

1.2.1 Data sources

Population size

Assessments were informed by data obtained from, and analyses based on, the New Zealand Freshwater Fish Database (NZFFD; McDowall & Richardson 1983; NIWA 2023d), which was accessed on 1 March 2023. For each taxon, NZFFD data were summarised to provide metrics informing the population size and number of sub-populations.

Hitchmough et al. (2007: 139) defined sub-populations as 'geographically or otherwise distinct groups in the population between which there is little exchange (typically one successful migrant individual or gamete per year or less)'. For freshwater fishes, a sub-population is considered to be contained within a single catchment – for example, the Clutha River / Mata-Au. A catchment is defined as the land area drained by a waterway that flows to the marine environment, following the modified Soil Conservation and River Control Council system (SCRCC 1956) as described in Richardson (2008a, b) and utilised in the NZFFD (NIWA 2023d). For non-diadromous taxa within the genera *Galaxias* and *Neochanna*, and for *Gobiomorphus alpinus*, sub-populations are typically further fragmented into one or more local populations, termed 'sub-population fragments', and at this geospatial scale, population size metrics were informed by assessments following the methodology described in Dunn & O'Brien (2022). The term 'sub-population fragment' is particular to these taxa and not typically used for other freshwater fishes or other species groups assessed using the NZTCS. However, use of the term 'fragment' in reference to a localised population has a long history within New Zealand non-diadromous *Galaxias* literature (e.g. Townsend & Crowl 1991) and ecology in general (Krebs 2014).

Area of occupancy

Data informing estimates and the categorisation of areas of occupancy were collated using a Geographical Information System (GIS) approach, whereby point data from the NZFFD (NIWA 2023d) were mapped to obtain an initial understanding of taxon distributions. In the absence of robust demographic data, area of occupancy was typically used to estimate population size following Townsend et al. (2008).

For non-diadromous *Galaxias*, *Neochanna* and *Gobiomorphus alpinus*, sub-population habitat fragment polygons were developed following the methodology of Dunn & O'Brien (2022) and used to estimate the areas occupied by extant sub-population fragments. For riverine (river-dwelling) taxa, Dunn & O'Brien (2022) utilised the digital polyline representation of the River Environment Classification (REC; Snelder et al. 2004) river network buffered by estimates of wetted width at 7-day Mean Annual Low Flow (7dMALF; Booker & Hicks 2013) to create polygons, which possess area. For lacustrine (lake-dwelling) and palustrine (wetland-dwelling) taxa, polygons representing these habitat types (LINZ Topo50 data; https://data.linz.govt.nz) were collated where they intersected with known extant sub-populations. In some instances, habitat fragments were obtained based on expert opinion of the habitat extent in the field and/or based on satellite and orthographic imagery (Dunn & O'Brien 2022).

Similar methods were utilised for other taxa, particularly where NZFFD records (NIWA 2023d) intersected with polygons representing lacustrine, palustrine and estuarine habitat types. For taxa occurring in riverine habitats, riverine areas of occupancy were estimated using models of occurrence (Leathwick et al. 2008; Crow et al. 2014; White et al. 2022)

within the REC (Snelder et al. 2004) river network, buffered by wetted width at 7dMALF (Booker & Hicks 2013).

It is acknowledged that these approaches can overestimate areas of occupancy and require future refinement. In particular, overestimates can occur in large braided rivers, wetlands and lakes, where taxa may only be occupying meso-habitats such as riffles, wetted channels or lake littoral margins within larger geospatial polygons (Dunn & O'Brien 2022).

Population trend

Population trend categorisation was informed by the analyses of White et al. (2022), who modelled temporal trends in the occurrence of taxa using NZFFD data, with typically more widespread taxa meeting the statistical requirements of their analyses. For non-diadromous *Galaxias*, *Neochanna* and *Gobiomorphus alpinus*, a different approach was taken. For these taxa, preliminary assessments of temporal trends in density and condition at the sub-population fragment level were used to inform population trend categorisation, where data were available. Fisheries New Zealand (Ministry for Primary Industries) plenary reports (Fisheries New Zealand 2022) were used to inform understanding of the population trends of taxa included in the Quota Management System (QMS).

Information on the life history parameters of New Zealand freshwater fishes that had been collated by Fenton (2022) was used to inform understanding of the generation times over which population trends were assessed. Fenton (2022) found that accurate estimates of generation time were limited for most taxa, so the expert panel used age at first sexual maturity to determine if population trends should be assessed over a 10-year period or longer, where information was available. In the present assessment, population trends were assessed over a 10-year period unless stated otherwise.

1.2.2 Change in assessment approach

During the assessment process, the expert panel reinterpreted the approach being used to assess a taxon's area of occupancy, amending a historical misinterpretation. This was done to more correctly align the assessment of area of occupancy with the definition given by Townsend et al. (2008: 32), who stated that 'the smallest area essential at any stage in the life cycle of the taxon will be used (e.g. colonial nesting sites)' rather than the estimate being based on the area of occupancy of mature individuals. For freshwater fishes, this smallest area is interpreted as spawning habitat. While this misinterpretation was considered by Allibone et al. (2010: 276) and informed subsequent assessments (Goodman et al. 2014; Dunn et al. 2018), the current assessment marks a shift towards its rectification. This change in approach has implications for several taxa, particularly those that display spawning aggregations or move to particular habitats to spawn that are distinct from other adult habitats, notably *Galaxias maculatus*.

2. Summary

2.1 Candidate taxa

The taxa listed in the previous NZTCS assessment of New Zealand freshwater fishes (Dunn et al. 2018) were used as a basis for determining candidate taxa for assessment in 2022–2023. When determining changes to the list, the expert panel considered taxonomic validity and whether estuarine and marine wanderers in particular occupy fresh waters at critical life stages that would qualify them as freshwater taxa (McDowall 1990). Taxonomic nomenclature and the phylogenetic arrangement of candidate taxa adhere to *Eschmeyer's Catalog of Fishes* as at 14 March 2025 (Fricke et al. 2025) and are presented in Appendix 1.

In total, 78 taxa were included in the current assessment. While this number remains the same as the previous assessment of Dunn et al. (2018), several changes have occurred, as outlined below.

2.1.1 Reinstated taxa

Two taxa were reinstated in the current assessment. These taxa were not assigned a conservation status by Dunn et al. (2018) but were assessed previously.

Gobiomorphus dinae Thacker, Geiger & Shelley 2023 is a newly described taxon (Thacker et al. 2023) and is assessed as such for the first time here. Sub-populations of this taxon were previously attributed to *Gobiomorphus* sp. aff. *basalis* (albeit with high uncertainty around taxon distributional boundaries; Hitchmough 2002; Hitchmough et al. 2007) or to *Gobiomorphus basalis* (Allibone et al. 2010; Goodman et al. 2014; Dunn et al. 2018). *Gobiomorphus dinae* occurs within 62 catchments in the lower part of Te Ika-a-Māui / the North Island, south of the Taupō Volcanic Zone and in the Bay of Plenty, extending as far west as Tauranga, approximately following the Kauri Line (Shelley et al. 2020; NIWA 2023d).

Galaxias gracilis McDowall 1967 was assessed by Hitchmough (2002), Hitchmough et al. (2007), Allibone et al. (2010) and Goodman et al. (2014). However, sub-populations attributed to *G. gracilis* were subsumed into *Galaxias maculatus* by Dunn et al. (2018), who recognised these as landlocked sub-populations of *G. maculatus*. Hence, *G. gracilis* was listed as taxonomically indistinct by Dunn et al. (2018). However, since the taxonomic position of these sub-populations remains uncertain, they have been assessed here again as *G. gracilis*.

2.1.2 Taxonomically indistinct taxon

Galaxias "lower Clutha" sub-populations recognised by Goodman et al. (2014) were subsumed into *Galaxias* "species D" by Dunn et al. (2018) and continue to be recognised as such here. In addition, some sub-populations that were previously attributed to *Galaxias* "lower Clutha" and subsequently *Galaxias* "species D" are now attributed to *Galaxias* "Pomahaka", based on Campbell et al. (2022).

2.1.3 Nomenclature changes of taxa

All taxa within class Actinopterygii have been reassigned to class Actinopteri, following Fricke et al. (2025). This change affects all assessed taxa except *Geotria australis*, which remains unchanged in class Petromyzonti.

Cyprinus carpio Linnaeus 1758 in New Zealand is now recognised as *Cyprinus rubrofuscus* Lacepède 1803 based on genetic studies confirming that introduction was of Asian, rather than European, specimens (Smith & McVeagh 2005; Wilderlab 2022).

Ctenopharyngodon idella (Valenciennes 1844) and *Hypophthalmichthys molitrix* (Valenciennes 1844) have been reassigned from Cyprinidae Rafinesque 1815 to Xenocyprididae Günther 1868 (Fricke et al. 2025).

Leuciscus idus (Linnaeus 1758) and *Scardinius erythrophthalmus* (Linnaeus 1758) have been reassigned from Cyprinidae Rafinesque 1815 to Leuciscidae Bonaparte 1835 (Fricke et al. 2025).

Gobiomorphus mataraerore Thacker, Geiger & Shelley 2023 is a newly described taxon (Thacker et al. 2023) that was previously assessed as *Gobiomorphus breviceps* (Hitchmough 2002) and *Gobiomorphus* aff. *breviceps* (Allibone et al. 2010; Goodman et al. 2014; Dunn et al. 2018). *Gobiomorphus mataraerore* occurs within 60 catchments in southern Te Ika-a-Māui / North Island, and western and northern Te Waipounamu / South Island (NZFFD data; NIWA 2023d).

Gobiopterus semivestitus (Munro 1949) has been reassigned from Gobiidae Cuvier 1816 to Oxudercidae Günther 1861.

Parioglossus marginalis Rennis & Hoese 1985 has been reassigned from Microdesmidae Regan 1912 to Gobiidae Cuvier 1816.

2.1.4 Taxa not assessed

Ctenopharyngodon idella (Valenciennes 1844) and *Hypophthalmichthys molitrix* (Valenciennes 1844) were not assessed as they are not known to breed in the wild in New Zealand and therefore do not fit the NZTCS assessment criteria (Townsend et al. 2008). This approach follows that of Goodman et al. (2014) and Dunn et al. (2018).

2.1.5 Taxon of uncertain status

Salmo salar Linnaeus 1758 is an introduced taxon that is now considered restricted to the Waiau River catchment in Southland. McIntosh & McDowall (2004: 17.3) indicated that the status of populations of *S. salar* was 'precarious', while Allibone et al. (2010: 280) considered the taxon to be 'declining towards extinction'. More recent anecdotal reports consider this taxon to now be extinct. However, because uncertainty remains as to whether the extinction process is complete, the taxon continues to be assessed as Introduced and Naturalised.

2.2 Trends

In total, 78 New Zealand freshwater fish taxa were assessed in 2022–2023, of which 1 taxon (1%) was categorised as Extinct, 22 (28%) as Threatened, 25 (32%) as At Risk, 6 (8%) as Not Threatened, 3 (4%) as Non-resident Native, and 21 (27%) as Introduced and Naturalised (Table 1). Considering only the 54 resident native taxa, 2% were categorised as Extinct, 41% as Threatened, 46% as At Risk and 11% as Not Threatened.

A total of 66 of the assessed taxa are taxonomically determinate, while 12 non-diadromous *Galaxias* taxa are taxonomically indeterminate, meaning they are yet to be formally described, although this work is in progress, including by several of the authors of the current report (Dunn, Crow, Ling and Waters).

A comparison of the number of taxa per category for the assessments made in 2009 (Allibone et al. 2010), 2013 (Goodman et al. 2014), 2017 (Dunn et al. 2018) and 2023 (this report), all of which have followed Townsend et al. (2008), is presented in Table 1. The categories reflect those used in the current assessment, with figures from previous assessments re-assigned accordingly.

Table 1. Comparison of the status of New Zealand freshwater fish taxa assessed in 2009 (Allibone et al. 2010), 2013 (Goodman et al. 2014), 2017 (Dunn et al. 2018) and 2023 (this report).

CATEGORY	2009	2013	2017	2023
Data Deficient	0	1	0	0
Extinct	1	1	1	1
Threatened – Nationally Critical	4	5	4	4
Threatened – Nationally Endangered	3	6	6	4
Threatened – Nationally Vulnerable	7	10	12	14
Threatened – Nationally Increasing	0	0	0	0
At Risk – Declining	13	14	11	12
At Risk – Recovering	0	0	0	0
At Risk – Relict	1	0	0	0
At Risk – Naturally Uncommon	6	5	6	13
Not Threatened	17	12	12	6
Non-resident Native – Migrant	0	0	0	1
Non-resident Native – Vagrant	0	0	0	0
Non-resident Native – Coloniser	3	3	3	2
Introduced and Naturalised	20	20	21	21
Total	**75**	**77**	**76**	**78**

Changes in status between 2017 (Dunn et al. 2018) and 2023 (this report) are given in Tables 2 and 3, and the rationale for any change is given in the individual account for each taxon (see section 3.1). Since the previous assessment in 2017, the status of 11 New Zealand freshwater fish taxa has worsened (i.e. they have moved into a worse risk of extinction category, positioned to the left of the black cells forming the diagonal in Table 2), while the status of 12 taxa has improved (i.e. they have moved into a better risk of extinction category, positioned to the right of the black cells forming the diagonal in Table 2).

It is not unexpected that changes in status have occurred. Most changes have occurred because of the change in approach to the interpretation of the area of occupancy and more accurate estimates of area of occupancy, with a GIS approach being used in preference to estimates of the number of mature individuals. Additionally, greater survey effort has provided data for more accurate demographic assessments for some taxa. Taxonomic changes, and to a lesser extent the outcomes of management actions, account for further status changes. As such, only one taxon has shown an 'actual improvement' and three taxa have shown an 'actual decline' (Table 3).

Table 2. Summary of status changes for New Zealand freshwater fish taxa between 2017 (rows; Dunn et al. 2018) and 2023 (columns; this report). Numbers on the diagonal (shaded black) represent those taxa that have not changed in status between 2017 and 2023. Numbers to the right of the diagonal (shaded green) represent taxa with an improved status (e.g. of the four taxa that were assessed as Threatened – Nationally Critical in 2017, one has moved to Threatened – Nationally Endangered and one has moved to Threatened – Nationally Vulnerable in 2023). Numbers to the left of the diagonal (shaded pink) represent taxa with a worse status (e.g. of six taxa that were assessed as At Risk – Naturally Uncommon in 2017, one has moved to Threatened – Nationally Critical and one has moved to Threatened – Nationally Endangered in 2023). Numbers without shading represent taxa that are Non-resident Native or Introduced and Naturalised, or have been newly added to this assessment.

		CONSERVATION STATUS 2023															
		Total	DD	Ext	NC	NE	NV	NI	Dec	Rec	Rel	NU	NT	Mig	Vag	Col	IN
		78	0	1	4	4	14	0	12	0	0	13	6	1	0	2	21
CONSERVATION STATUS 2017	Data Deficient (DD)	0	0														
	Extinct (Ext)	1		1													
	Threatened – Nationally Critical (NC)	4			2	1	1										
	Threatened – Nationally Endangered (NE)	6			1	2	3										
	Threatened – Nationally Vulnerable (NV)	12					8		4								
	Threatened – Nationally Increasing (NI)	0						0									
	At Risk – Declining (Dec)	11					1		7			3					
	At Risk – Recovering (Rec)	0								0							
	At Risk – Relict (Rel)	0									0						
	At Risk – Naturally Uncommon (NU)	6			1	1						4					
	Not Threatened (NT)	12							1			5	6				
	Non-resident Native – Migrant (Mig)	0												0			
	Non-resident Native – Vagrant (Vag)	0													0		
	Non-resident Native – Coloniser (Col)	3												1		2	
	Introduced and Naturalised (IN)	21															21
	Taxonomically indistinct (TI)	1					1										
	New listing	1										1					

Table 3. Summary of changes to the number of New Zealand freshwater fish taxa assigned to each conservation status between 2017 (Dunn et al. 2018) and 2023 (this report).

DIRECTION OF CHANGE, REASON, CONSERVATION STATUS 2023	NO. TAXA
IMPROVED	**12**
Actual improvement	**1**
At Risk – Naturally Uncommon	1
More knowledge	**10**
Threatened – Nationally Endangered	1
Threatened – Nationally Vulnerable	3
At Risk – Declining	4
At Risk – Naturally Uncommon	2
Reinterpretation of data	**1**
Threatened – Nationally Vulnerable	1
WORSENED	**11**
Actual decline	**3**
Threatened – Nationally Critical	2
At Risk – Declining	1
Criteria changed	**6**
Threatened – Nationally Vulnerable	1
At Risk – Naturally Uncommon	5
More knowledge	**1**
Threatened – Nationally Vulnerable	1
Reinterpretation of data	**1**
Threatened – Nationally Endangered	1
NEUTRAL	**1**
Reinterpretation of data	**1**
Non-resident Native – Migrant	1
NO CHANGE	**53**
Extinct	1
Threatened – Nationally Critical	2
Threatened – Nationally Endangered	2
Threatened – Nationally Vulnerable	8
At Risk – Declining	7
At Risk – Naturally Uncommon	4
Not Threatened	6
Non-resident Native – Coloniser	2
Introduced and Naturalised	21
NEW LISTING	**1**
At Risk – Naturally Uncommon	1
TOTAL	**78**

3. Conservation status of New Zealand freshwater fishes, 2023

3.1 Indigenous taxon accounts

The following accounts are designed to be largely standalone summaries of the information, data and rationales that were considered in the expert panel's determination of the conservation status of each indigenous freshwater fish taxon. Accounts are ordered by conservation status, followed by taxonomic status, and then alphabetically matching the order used in Table 4 (see section 3.2). The phylogenetic arrangement of taxa is given in Appendix 1.

The life history of each taxon is summarised, providing information on the migration pattern and breeding biology, which are important for understanding biological traits, critical life stages, how threats can influence the risk of extinction and the applicability of management actions. The migration / life history strategy classification was based on McDowall (1997a, b, 2007) or McIntosh & McDowall (2004) and distinguished between three forms of *diadromous* life history strategies for taxa that exhibit true migrations between freshwater and marine environments, where *anadromous* fishes utilise the freshwater environment for reproduction and early life stage feeding and growth and then migrate to the marine environment, where they spend the majority of their life feeding and growing; *catadromous* fishes utilise the marine environment for reproduction and early life stage feeding and growth and then migrate to the freshwater environment, where they spend the majority of their life feeding and growing; and *amphidromous* fishes reproduce in the freshwater environment, migrate as larvae to the marine environment for early feeding and growth, and then migrate back into the freshwater environment as juveniles, where the majority of their life's feeding and growth occurs. *Euryhaline wanderers* move between marine and freshwater environments but do not undertake true life history migrations at a particular life stage. *Non-diadromous* taxa are confined entirely to the freshwater environment, and no further subclassification of this life history strategy has yet been identified in New Zealand freshwater fishes. Breeding biology categorisation was based on the information collated in Fenton (2022), being either *iteroparous* for fishes that reproduce in successive years or *semelparous* for fishes that reproduce only once, typically at the end of their lifetime. Seasons in which breeding is considered to occur are also provided where known, based on the information collated in Fenton (2022). These terms describe the dominant life history and migration strategies, but some individuals or sub-populations may display exceptions – for example, a small number of individuals in otherwise semelparous taxa may reproduce multiple times over multiple years, or individuals of otherwise obligatory migratory taxa may facultatively form landlocked sub-populations.

The summarised global distribution of each taxon is given as either indigenous or endemic to New Zealand based on McDowall (2010), and for range-restricted taxa, the regions they occur in are also given (based on regional or unitary council boundaries; Stats NZ 2023). Descriptions of distributions and numbers of sub-populations are based on NZFFD data (NIWA 2023d) for all taxa, as well as demographic assessments following the methods of Dunn & O'Brien (2022) for non-diadromous *Galaxias*, *Neochanna* and *Gobiomorphus alpinus*.

Reasoning for the assessed conservation status is provided with a description of the categorisation of population size based on either a categorised estimate of the number of mature individuals or a categorised estimated area of occupancy. Similarly, reasoning is provided for the categorised ongoing or predicted population trend, which was informed by the analyses of White et al. (2022), who modelled temporal trends in the occurrence of select

taxa using NZFFD data (NIWA 2023d); preliminary assessments based on Dunn & O'Brien (2022) for non-diadromous *Galaxias*, *Neochanna* and *Gobiomorphus alpinus*; and Fisheries New Zealand (Ministry for Primary Industries) plenary reports (Fisheries New Zealand 2022) for taxa included in the QMS.

Many pressures on freshwater fishes have been identified that can impact different taxa and different life stages by varying means (DOC 2003, 2004, 2005; O'Brien & Dunn 2007; Williams et al. 2017; MfE & Stats NZ 2023). Pressures resulting from abiotic factors include, but are not limited to, modification of the proximate hydrological environment, changes to the physical habitat (typically in terms of channel form and structure, spawning habitat degradation, and impediments to passage through a river network) and modification of water physico-chemical parameters. Additional abiotic pressures that affect aquatic habitats include deforestation and afforestation, fire, and longer-term climatic changes. Biotic pressures include competition and predation from indigenous and introduced taxa, and disease. The expert panel's understanding of impacts under climate change scenarios was largely informed by Collins et al. (2018), MfE (2018) and Egan et al. (2020). In its deliberations, the expert panel considered both generalised and taxon-specific pressures, summaries of which are provided in the following taxon accounts.

While undertaking the current assessments and compiling the taxon accounts, the expert panel continued to note areas of work requiring research or further refinement. In particular, information on generation time was surmised rather than known for all taxa, despite this being essential for the categorisation of the ongoing and predicted population trend. This is symptomatic of the acute need for fundamental biological and ecological research on indigenous freshwater fish taxa. Little is known of the population size of all taxa due to a lack of survey and monitoring effort and systems to analyse demographic temporal trends. The expert panel has begun to use estimates of area of occupancy in lieu of population size, but spatial estimates are needed for all taxa in all habitat types and require ongoing refinement in terms of habitat utilisation at all life stages, particularly for spawning habitat. Additionally, knowledge of the extant/extinct status of sub-population fragments for each taxon is itself impeded by the lack of survey and monitoring effort. Further work is also required to clarify the taxonomic status of indeterminate taxa and, where applicable, provide a formal taxonomic description. For those taxa that have been assigned the Conservation Research Needed (CR) qualifier, research is required to understand the causes of decline and/or solutions for recovery. Furthermore, in-depth work is required on all taxa to understand physiological tolerances and the genetic potential for and behavioural responses to changes in hydrological environments in order to assess the effects of climate change impacts.

3.1.1 Extinct

***Prototroctes oxyrhynchus* Günther 1870 (grayling)**

Prototroctes oxyrhynchus was an amphidromous, iteroparous, likely autumnal–hiemal spawner. *Prototroctes oxyrhynchus* was an endemic taxon that was widely distributed on Te Ika-a-Māui / the North Island and Te Waipounamu / the South Island based on NZFFD data (NIWA 2023d) and the distribution data collated by Lee & Perry (2019). However, the area of habitat that was previously occupied or utilised by *P. oxyrhynchus* is unknown.

Prototroctes oxyrhynchus was assessed as Extinct based on there having been no extant observations of this taxon since the assessment of Dunn et al. (2018). As such, *P. oxyrhynchus* is the only known New Zealand freshwater fish to have become extinct since the arrival of humans.

3.1.2 Threatened – Nationally Critical

***Neochanna burrowsius* (Phillipps 1926) (Canterbury mudfish)**

Neochanna burrowsius is a non-diadromous, iteroparous, vernal spawner. *Neochanna burrowsius* is an endemic taxon that is restricted to Canterbury and Otago on Te Waipounamu / the South Island. *Neochanna burrowsius* has a large number (80 remaining) of high-density, highly fragmented, small (total 28 ha remaining) natural sub-population fragments that are scattered over 17 catchments across a large, highly agriculturally intensified geographical range from the catchments of the Ashley River / Rakahuri to the Waitaki River.

Neochanna burrowsius was assessed as Threatened – Nationally Critical based on it having a very high ongoing or predicted population trend decline. This status was determined by the high percentage of surveyed sub-population fragments that are experiencing population trends with >70% declines (based on preliminary trend assessments for 24% of sub-population fragments, 58% of which indicated declines of >70%, representing the highest decline rate among the taxa analysed) and the fact that this taxon has experienced the highest number of recorded sub-population fragment extinctions (49), 37% of which have occurred in the last 10 years.

Neochanna burrowsius has a highly fragmented distribution that continues to contract within areas of Canterbury that have high levels of land-use intensification for agriculture. Core and peripheral populations are compromised by hydrological insecurity, such as climate change influenced drought conditions, and this is exacerbated by the abstraction of ground and surface water for irrigation further modifying hydrological conditions, continued agricultural development leading to the loss of wetland and meandering stream habitats, and the closure of stock water races (McDowall & Eldon 1996; O'Brien & Dunn 2007), as well as a loss of genetic diversity (Davey et al. 2003). *Neochanna burrowsius* was first assessed as Threatened – Nationally Critical in 2009 (Allibone et al. 2010), and little has changed since then to benefit this taxon, despite regional planning provisions and attempts at restoration, so its continued persistence remains precarious across its natural range.

***Stokellia anisodon* (Stokell 1941) (Stokell's smelt)**

Stokellia anisodon is an anadromous, semelparous, vernal–estival–autumnal spawner. *Stokellia anisodon* is an endemic taxon that is restricted to Canterbury and Otago on Te Waipounamu / the South Island. *Stokellia anisodon* is known from nine catchments, typically occurring in hāpua-type and tidal lagoon class estuaries (Hume et al. 2016) and the lower reaches of influent rivers, totalling an estimated area of occupancy of 687 ha.

Stokellia anisodon was assessed as Threatened – Nationally Critical, having previously been assessed by Dunn et al. (2018) as At Risk – Naturally Uncommon. This worsened conservation status is due to *S. anisodon* having a very high rate of decline of three orders of magnitude, based on a comparison of recent survey results (Arthur & Gray 2022) with work conducted in the 1980s (Eldon & Greager 1983), and a moderate to large area of occupancy. The work of Eldon & Greager (1983) led McDowall (2006: 260) to consider *S. anisodon* to be a taxon that 'remains hugely abundant, despite predation and [historic] human exploitation' which, coupled with a lack of survey, may mean that the plight of this taxon has been overlooked for some time.

Stokellia anisodon occurs within estuarine and marine environments, each of which has different pressures, including changes in migration pathways, degradation of and changes to life stage specific habitats, and competition and predation with and from other taxa (Hickford 2022). In the freshwater-brackish tidal lagoon habitat of *S. anisodon,* sedimentation of spawning habitat and reduced flows impeding passage and contributing to water quality issues are considered important ecosystem pressures, along with the predation of *S. anisodon*

eggs by *Aldrichetta forsteri* (yellow-eye mullet) and the predation of adults by indigenous and introduced estuarine-dwelling fishes and birds (McDowall 2006). In the coastal marine environment, successive marine heatwaves resulting in increased sea surface temperature may have reduced larval survival rates (Hickford 2022). The semelparous breeding biology of this taxon, coupled with its small population experiencing a very large decline, indicates that *S. anisodon* is at serious risk of population collapse, especially when considered in the context of habitat modification and climate change predictions.

Galaxias aff. *cobitinis* "Waitaki" (lowland longjaw galaxias (Waitaki River))

Galaxias aff. *cobitinis* "Waitaki" is a non-diadromous, iteroparous, vernal spawner. *Galaxias* aff. *cobitinis* "Waitaki" is an endemic taxon that is restricted to Canterbury on Te Waipounamu / the South Island. *Galaxias* aff. *cobitinis* "Waitaki" has a small number (nine remaining) of low-density, highly fragmented, small (total 3 ha remaining) sub-population fragments, all of which are scattered within the catchment of the upper Waitaki River.

Galaxias aff. *cobitinis* "Waitaki" was assessed as Threatened – Nationally Critical, having previously been assessed by Dunn et al. (2018) as Threatened – Nationally Endangered. This worsened conservation status is due to *Galaxias* aff. *cobitinis* "Waitaki" having a higher rate of decline because of the failure of conservation actions on which its persistence depends, resulting in almost half of the known sub-populations being in severe decline or considered extinct. These failures have resulted in a small remaining area of occupancy, with only 0.01 ha considered to be secure.

Galaxias aff. *cobitinis* "Waitaki" is sustaining ongoing invasion by piscivorous salmonids and *Galaxias brevipinnis* (koaro) into nearly all its habitat due to the failure of artificial barriers following localised severe weather events or because of poor structural design and placement (DOC, unpubl. data). For some sub-populations, conservation management actions such as controlling invasive macrophytes (particularly *Erythranthe guttata* (monkey musk) and *Salix* spp. (willows)) in spring and wetland habitats, and stock exclusion appear to be failing (D. Nelson, DOC Twizel, pers. comm.). Conservation research is required into more targeted control of invasive macrophytes (Raal 2015) in particular to reduce the likelihood of higher rates of decline or local extinction from occurring, especially if there is a reduction in frost events under climate change scenarios, as *E. guttata* is frost intolerant.

Galaxias "Teviot" (Teviot flathead galaxias (Teviot River))

Galaxias "Teviot" is a non-diadromous, iteroparous, vernal spawner. *Galaxias* "Teviot" is an endemic taxon that is restricted to Otago on Te Waipounamu / the South Island. *Galaxias* "Teviot" has a small number (10 remaining) of low-density, fragmented, very small (total 1 ha remaining) sub-population fragments that are scattered within the catchments of the Taiari / Taieri River and Clutha River / Mata-Au.

Galaxias "Teviot" was assessed as Threatened – Nationally Critical based on it having a very small total area of occupancy. Recent intensive survey work has located three new sub-population fragments, but gains in the estimated area of occupancy are counteracted by increased understanding of the distributional extent, leading to a reduction in the overall area of some sub-population fragments. Further genetic analyses (Campbell 2021) have also reduced the estimated area of occupancy, assigning the Old Hut Creek sub-population fragment solely to *Galaxias pullus*.

Galaxias "Teviot" occurs in small, fragmented wetlands and streams with riparian habitats of varying degrees of wetness (Jack 2021b; Gerbeaux et al. 2022), above barriers that impede the upstream movement of *Salmo trutta* (brown trout) and thus afford this taxon some security (Jack 2020c). *Galaxias* "Teviot" habitats are within an agricultural landscape, making them

prone to agricultural intensification and sedimentation. The small distribution and close proximity of sub-population fragments means that this taxon is at risk of local extirpation from extreme precipitation events. The Lake Onslow area has also been under investigation as part of a pumped hydroelectric power scheme. This project is currently shelved, but should it proceed at some future time, the lake level would likely be raised, inundating the habitat of at least two sub-populations and potential translocation sites, and likely affecting other sub-populations through associated infrastructure.

3.1.3 Threatened – Nationally Endangered

***Galaxias cobitinis* McDowall & Waters 2002 (lowland longjaw galaxias (Kakanui River))**

Galaxias cobitinis is a non-diadromous, iteroparous, vernal spawner. *Galaxias cobitinis* is an endemic taxon that is restricted to Otago on Te Waipounamu / the South Island. *Galaxias cobitinis* has a very small number (three remaining) of low-density, small to moderately large (total 26 ha remaining) sub-population fragments, all of which occur within the catchment of the Kākaunui / Kakanui River.

Galaxias cobitinis was assessed as Threatened – Nationally Endangered, having previously been assessed by Dunn et al. (2018) as Threatened – Nationally Critical. This improved conservation status is due to an increased understanding of how the taxon responds to extreme population fluctuations and the longer-term stability of the population trend, which was monitored through an intensive programme that was active until 2015 (Golder Associates 2014). There has also been an increase in knowledge of the area of occupancy of *G. cobitinis*, particularly in terms of recognition of the extent of the Kākaunui / Kakanui River sub-population fragment (NIWA 2023d). The expert panel acknowledged that the conservation status of Threatened – Nationally Critical that was applied by Hitchmough (2002) based on a categorisation of < 250 mature individuals was continued to be applied by Hitchmough et al. (2007), Allibone et al. (2010), Goodman et al. (2014) and Dunn et al. (2018), despite increases in the knowledge of this taxon. However, because the braided gravel-bed rivers *G. cobitinis* occurs within can lose surface water during prolonged low- to no-flow periods, it is difficult to calculate an estimated area of occupancy, so the expert panel continued to assess this taxon based on the lowest estimated number of mature individuals.

Galaxias cobitinis has a restricted distribution in the braided gravel-bed river habitats within the catchment of the Kākaunui / Kakanui River, where it is likely that there will be an increased frequency and intensity of drought events resulting in prolonged low- or no-flow periods under climate change scenarios, making this taxon vulnerable (McDowall & Allibone 2004). *Galaxias cobitinis* is also known to prefer unconsolidated cobble-boulder substrata within riffle habitats, as these provide interstitial refugia during extremes in flow (floods and droughts; Baker et al. 2003; Dunn & O'Brien 2006). This critical habitat can be degraded through gravel extraction reducing substratum particle size (Dunn & O'Brien 2006) and riverbed stabilisation because of increased riparian woody weed densities. The recognition of these pressures has led to changes in gravel and herbicide management within the river (Ravenscroft et al. 2010). However, there is still a limited understanding of this taxon's biology and habitat preferences, as evidenced by the failure of an attempted translocation into another catchment, highlighting the experimental nature of this management action for threatened freshwater fishes.

***Galaxias* aff. *paucispondylus* "Manuherikia" (alpine galaxias (Manuherikia River))**

Galaxias aff. *paucispondylus* "Manuherikia" is a non-diadromous, iteroparous, vernal spawner. *Galaxias* aff. *paucispondylus* "Manuherikia" is an endemic taxon that is restricted to Otago on Te Waipounamu / the South Island. *Galaxias* aff. *paucispondylus* "Manuherikia" has a single, very low density, small (≤ 10 ha remaining) population in the braided upper reaches of the Manuherekia / Manuherikia River within the catchment of the Clutha River / Mata-Au.

Galaxias aff. *paucispondylus* "Manuherikia" was assessed as Threatened – Nationally Endangered based on it having a small estimated area of occupancy and a stable ongoing and predicted population trend. Although survey work for *Galaxias* aff. *paucispondylus* "Manuherikia" has recently abated, the taxon is known to experience extreme fluctuations in population size and has also experienced range retraction in the Manuherekia / Manuherikia River East and West branches and in a main braid of the mainstem of the river because of predation from three piscivorous salmonid taxa. Therefore, the pressure driving the population trend remains unchanged. Moreover, the occurrence of *Galaxias* aff. *paucispondylus* "Manuherikia" in braided river habitat has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of reaches it is known from and there are further known issues with the routing of the REC model (Snelder et al. 2004) in this area of the Manuherekia / Manuherikia River.

Since *Galaxias* aff. *paucispondylus* "Manuherikia" occurs only in the Manuherekia / Manuherikia River, it is prone to extremes in flow (floods and droughts), which are likely to increase in frequency and intensity in Central Otago under climate change scenarios. The parent taxon, *Galaxias paucispondylus,* is considered to be limited by elevated water temperatures, which are encountered at lower altitudes and also occur during drought conditions (Stokell 1938; Dunn 2003; Boddy & McIntosh 2016), but paradoxical survey and population monitoring results create uncertainty as to whether *Galaxias* aff. *paucispondylus* "Manuherikia" has similar thermal tolerances (Water Ways Consulting Ltd 2018). Survey work conducted in the 2000s and 2010s (Jack 2009; Ravenscroft 2014) focused on assessing the potential effects of raising the level of Falls Dam. Should this proceed, this would likely inundate the lower reaches of the Manuherekia / Manuherikia River above the current reservoir extent, which would further reduce the area of occupancy of *Galaxias* aff. *paucispondylus* "Manuherikia" and potentially create more piscivorous salmonid habitat in the reservoir, which would increase predation pressure when these salmonids move into the upstream river reaches.

Galaxias "dune lakes" (dune lakes galaxias (Kai Iwi lakes))

Galaxias "dune lakes" is non-diadromous, has an unknown reproductive episodic strategy and is likely an autumnal–hiemal spawner. *Galaxias* "dune lakes" is an endemic taxon that is restricted to Northland on Te Ika-a-Māui / the North Island. *Galaxias* "dune lakes" has a very small number (two remaining) of high-abundance, fragmented sub-population fragments that occur in the littoral zones of the dune lakes Taharoa and Waikere, which have a combined surface area of 234 ha.

Galaxias "dune lakes" was assessed as Threatened – Nationally Endangered, having previously been assessed by Dunn et al. (2018) as At Risk – Naturally Uncommon. This worsened conservation status is due to a change in the application of criteria. *Galaxias* "dune lakes" was assessed as having a small area of occupancy and a low to high ongoing or predicted population trend decline, whereas Dunn et al. (2018) based their assessment on the taxon having a moderate to large area of occupancy and a stable ongoing and predicted population trend. The expert panel now recognises that assessments of a taxon's area of occupancy should be based on the estimated area of spawning habitat, amending a historical misinterpretation that was introduced in the assessments of Hitchmough (2002) and Hitchmough et al. (2007). For *Galaxias* "dune lakes", the critical spawning habitat is considered to be the sedge- and rush-dominated littoral zone of lakes (Rowe & Chisnall 1995, 1996, 1997; Rowe et al. 1999; DOC 2008; Pingram 2009). An estimate of 2 ha of critical spawning habitat was obtained by multiplying the combined perimeter of Lakes Taharoa and Waikere by the approximate width of the vegetated littoral zone (11.05 km perimeter × 2 m wide littoral zone), which was categorised as a small area (≤ 10 ha). *Galaxias* "dune lakes" was also categorised as having a low ongoing or predicted population trend decline.

Galaxias "dune lakes" has become extinct in Lake Kaiiwi and is threatened by the presence of introduced *Gambusia affinis* (gambusia) and *Oncorhynchus mykiss* (rainbow trout) in

Lakes Taharoa and Waikere (Rowe & Chisnall 1997). *Galaxias* "dune lakes" is also considered prone to stochastic events, especially prolonged drought conditions lowering lake levels and decreasing access to littoral reed beds. These events are likely to increase in frequency and intensity under climate change scenarios, resulting in extreme fluctuations in the estimated adult abundance.

Galaxias "Nevis" (Nevis galaxias (Nevis River))

Galaxias "Nevis" is a non-diadromous, iteroparous, vernal spawner. *Galaxias* "Nevis" is an endemic taxon that is restricted to Otago on Te Waipounamu / the South Island. *Galaxias* "Nevis" has a moderate number (29 remaining) of moderate-density, fragmented, small (total ≤ 10 ha remaining) sub-population fragments, all of which occur in the Nevis River catchment within the catchment of the Clutha River / Mata-Au.

Galaxias "Nevis" was assessed as Threatened – Nationally Endangered based on it having a small area of occupancy and a low to high ongoing or predicted population trend decline. However, a large number of sub-population fragments have not been resurveyed recently, and observations from those that have been resurveyed indicate that *Galaxias* "Nevis" is unlikely to co-occur with piscivorous salmonids, with these taxa being separated within waterbodies by waterfall barriers. This indicates that many of the sub-population habitat fragment extents may be smaller than previously thought, as some barrier locations may not have been identified yet, leading to an overestimation of the area of occupancy for *Galaxias* "Nevis".

Galaxias "Nevis" occurs in wetlands and streams with riparian habitats of varying degrees of wetness (Gerbeaux et al. 2022) within an extensive pastoral agricultural landscape that is also experiencing a resurgence in localised gold mining activities, making these habitats prone to water abstraction, sedimentation and riparian damage. In the Nevis River catchment, many waterbodies are also influenced by the diversion of headwaters into extensive across-catchment water races. These water races were historically used in alluvial gold mining operations, but water is now conveyed out of catchment for irrigation purposes. Given that *Galaxias* "Nevis" occurs in a single catchment, it is also prone to extreme precipitation events, which may increase in frequency and intensity under predicted climate change scenarios, affecting all its habitat and potentially allowing opportunistic piscivorous salmonid invasion, particularly if natural barriers are compromised.

3.1.4 Threatened – Nationally Vulnerable

Galaxias anomalus Stokell 1959 (central Otago roundhead galaxias)

Galaxias anomalus is a non-diadromous, iteroparous, vernal spawner. *Galaxias anomalus* is an endemic taxon that is restricted to Otago on Te Waipounamu / the South Island. *Galaxias anomalus* has a moderate number (73 remaining) of moderate-density, highly fragmented, small to moderately large (total 91 ha remaining) sub-population fragments that are scattered within the catchments of the Taiari / Taieri River and Manuherekia / Manuherikia River in the catchment of the Clutha River / Mata-Au.

Galaxias anomalus was assessed as Threatened – Nationally Vulnerable, having previously been assessed by Dunn et al. (2018) as Threatened – Nationally Endangered. This improved conservation status is due to a change in the ongoing or predicted population trend from a 50–70% decline (Dunn et al. 2018) to a 10–30% decline (this report). The change in population trend categorisation is based on recent intensive survey work, which recognised that *G. anomalus* may have undergone historic range and population size reductions. Survey data have identified the extinction of sub-population fragments in parts of the taxon's range, and *G. anomalus* now persists as small, highly fragmented sub-population fragments, for which there is a high degree of concern, as many are not secure from pressures and there are no large, secure sub-population fragments.

Galaxias anomalus occurs in a range of habitats, including gravel-bed streams (Baker et al. 2003) and wetlands within an intensive, water-short agricultural landscape (DOC 2004). The gravel-bed Kye Burn is particularly prone to extremes in flow (floods and droughts), which are likely to increase in frequency and intensity in Central Otago under climate change scenarios. Additionally, *G. anomalus* sub-population fragments are subjected to water abstraction pressures, particularly in former wetland areas in the catchment of the Manuherekia / Manuherikia River. While some sub-population fragments may be sustained by inefficient irrigation infrastructure, changes to water conveyance infrastructure could lead to their extirpation through the removal of water or the facilitation of piscivorous salmonid passage into their habitats, leading to concerns that they may become sink populations (Leprieur et al. 2006). Thus, *G. anomalus* requires ongoing coordinated conservation management actions such as the installation of barriers (Jack 2023a), the removal of piscivorous salmonids and *Salix* spp. (willows), and the provision of appropriate flow regimes in reaches that are subject to water abstraction.

Galaxias eldoni McDowall 1997 (Eldon's galaxias)

Galaxias eldoni is a non-diadromous, iteroparous, vernal spawner. *Galaxias eldoni* is an endemic taxon that is restricted to Otago on Te Waipounamu / the South Island. *Galaxias eldoni* has a moderate number (37 remaining) of low-density, fragmented, small (total 37 ha remaining) sub-population fragments that are scattered within the catchments of the Taiari / Taieri River and Tokomairaro River.

Galaxias eldoni was assessed as Threatened – Nationally Vulnerable, having previously been assessed by Dunn et al. (2018) as Threatened – Nationally Endangered. This improved conservation status is due to increased knowledge of the area of occupancy of *G. eldoni*, which has changed from small to moderate based on the geospatial assessment described in Dunn & O'Brien (2022). Additionally, there has been a change in the categorisation of the ongoing or predicted population trend from a 10–50% decline (Dunn et al. 2018) to a 10–30% decline (this report). The change in population trend categorisation was based on recent intensive survey work, which recognised that *G. eldoni* may have undergone a historic population size reduction and now persists as small, highly fragmented sub-population fragments.

Galaxias eldoni occupies small-tussock-dominated wetlands and associated streams, typically in plantation forestry or agricultural landscapes, although several sub-population fragments reside within large tussockland conservation parks, with protection secured through the Crown Pastoral Land Act 1998 tenure review process. *Galaxias eldoni* remains dependent on conservation management to secure its persistence through actions such as the installation of barriers to impede piscivorous salmonid invasion into sub-population habitat fragments, and restrictions on water abstraction and plantation forestry activities through legislative instruments. Fire is also recognised as a potential pressure that may become more frequent during prolonged drought events under climate change scenarios, particularly in tussock and plantation forestry areas.

Galaxias gracilis McDowall 1967 (dwarf inanga (North Kaipara Head dune lakes))

Galaxias gracilis is non-diadromous, has an unknown reproductive episodic strategy and is likely an estival–autumnal spawner. *Galaxias gracilis* is an endemic taxon that is restricted to Northland on Te Ika-a-Māui / the North Island. *Galaxias gracilis* has a small number (seven remaining) of high-abundance, fragmented, large (total 283 ha remaining) sub-population fragments, which are scattered over seven dune-lake sub-populations.

Galaxias gracilis was assessed as Threatened – Nationally Vulnerable, having previously been assessed by Dunn et al. (2018) as taxonomically indistinct. This changed conservation status is due to the expert panel considering it appropriate to assess the taxon as taxonomically

determinate, despite taxonomic uncertainties remaining. *Galaxias gracilis* was assessed as having a moderate to large area of occupancy and a moderate to high ongoing or predicted population trend decline due to a large number of sub-population fragment extinctions and concern for the remaining sub-population fragments, particularly at Lake Rototuna.

Galaxias gracilis occupies isolated dune lakes that are disconnected from the marine environment within a small geographical range. There is concern that a single weather event, such as a prolonged drought lowering lake water levels or an ex-tropical cyclone disturbing lake conditions, could adversely affect the entire *G. gracilis* population, and such events are likely to become more extreme and frequent under climate change scenarios. Further threats include plantation forestry activities, eutrophication and the presence of the introduced predatory fish *Perca fluviatilis* (perch).

Galaxias macronasus McDowall & Waters 2003 (bignose galaxias)

Galaxias macronasus is a non-diadromous, iteroparous, vernal spawner. *Galaxias macronasus* is an endemic taxon that is restricted to Canterbury on Te Waipounamu / the South Island. *Galaxias macronasus* has a moderate number (25 remaining) of moderate-density, fragmented, small (total 43 ha remaining) sub-population fragments, all of which are scattered within the catchment of the upper Waitaki River.

Galaxias macronasus was assessed as Threatened – Nationally Vulnerable based on it having a moderate area of occupancy and a low ongoing or predicted population trend decline. *Galaxias macronasus* receives conservation management, such as the installation of barriers, to protect at-risk sub-population fragments from piscivorous salmonids (DOC, unpubl. data) and regular surveys of all sub-population fragments, although there remains a high degree of concern for their security and persistence.

Galaxias macronasus occupies small wetland habitats and spring-fed streams from submontane alluvial terraces downstream into the arid, agriculturally modified catchment of the upper Waitaki River. Further conservation management actions, such as the control of invasive macrophytes (particularly *Erythranthe guttata* (monkey musk) and *Salix* spp. (willows)) in spring and wetland habitats, and stock exclusion, appear to be failing for some sub-population fragments. These sub-population habitat fragments are also prone to dewatering during prolonged drought events, while others have experienced extreme floods that have altered channel form and flow patterns in small streams (D. Nelson, DOC Twizel, pers. comm.). Both types of extremes in flow are likely to increase in frequency and intensity in the catchment of the upper Waitaki River under climate change scenarios.

Galaxias maculatus (Jenyns 1842) (inanga)

Galaxias maculatus is marginally catadromous, semelparous and predominantly an autumnal spawner. *Galaxias maculatus* is an indigenous taxon that is widely distributed on Te Ika-a-Māui / the North Island and Te Waipounamu / the South Island. In New Zealand, *G. maculatus* is known from 603 catchments, where it occurs at high abundances, but has an unknown population size and an uncertain area of occupancy within riverine (9132 ha), lacustrine (60 894 ha), palustrine (27 295 ha) and estuarine (405 321 ha) habitats.

Galaxias maculatus was assessed as Threatened – Nationally Vulnerable, having previously been assessed by Dunn et al. (2018) as At Risk – Declining. This worsened conservation status is due to a change in the application of criteria. *Galaxias maculatus* was assessed as having a moderate area of occupancy and a stable ongoing and predicted population trend, whereas Dunn et al. (2018) based their assessment on the taxon having a very large population size and a low to high ongoing or predicted population trend decline. The expert panel now recognises that assessments of a taxon's area of occupancy should be based on the estimated area of spawning habitat, amending a historical misinterpretation that was introduced

in the assessments of Hitchmough (2002) and Hitchmough et al. (2007). While this misinterpretation was considered for *G. maculatus* by Allibone et al. (2010) and informed subsequent assessments (Goodman et al. 2014; Dunn et al. 2018), the current assessment marks a shift towards its rectification. The spawning habitat of *G. maculatus* can be very small (Hickford & Schiel 2011), and there is high uncertainty as to the actual area utilised within catchments across New Zealand. The expert panel estimated that each of 1100 recognised catchments (Leathwick et al. 2010) contained at least 0.01 ha of spawning habitat but also recognised uncertainty with this estimate. However, the expert panel considered that it could confidently categorise the estimated area of *G. maculatus* spawning habitat as being ≤ 1000 ha and, using a precautionary approach, likely ≤ 100 ha. Categorisation of the adult population trend was informed by the assessment of White et al. (2022), which indicated a historic stability, leading the expert panel to consider the predicted trend to also be stable.

Galaxias maculatus is a widespread taxon that is subject to a range of pressures in the habitats it occupies throughout its life cycle, being impacted by fish passage barriers such as flap gates, pump stations, weirs and culverts due to its limited climbing abilities, and the degradation and loss of habitat through drainage, straightening and fragmentation. Spawning occurs in the lower reaches of rivers and the upper reaches of estuaries, which are prone to anthropogenically elevated sedimentation. Conservation management research is required to accurately map the extent of spawning habitat and interannual variation in its location and size. While small-scale initiatives to protect and/or restore *G. maculatus* spawning habitat have been undertaken, it is unclear if these have resulted in demonstrable changes to the taxon more broadly. *Galaxias maculatus* was considered to have a high vulnerability to climate change by Egan et al. (2020). However, knowledge of the impacts of predicted climate change scenarios are limited – while spawning habitat may be resilient to small perturbations, extreme weather events such as ex-tropical cyclones can result in catastrophic sedimentation, and changes in the coastal marine environment may affect larval survival.

Galaxias postvectis Clarke 1899 (shortjaw kokopu)

Galaxias postvectis is an amphidromous, iteroparous, autumnal–hiemal spawner. *Galaxias postvectis* is an endemic taxon that is widely but sporadically distributed on Te Ika-a-Māui / the North Island and Te Waipounamu / the South Island, predominantly on western coasts. *Galaxias postvectis* is known from 188 catchments, where it occurs at low abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (2633 ha), lacustrine (116 ha, relating to a single artificial lake) and estuarine (7 ha) habitats.

Galaxias postvectis was assessed as Threatened – Nationally Vulnerable based on it having a moderate population size and a moderate ongoing or predicted population trend decline. This is a change in the criteria but not the category from Dunn et al. (2018), who based their assessment on the taxon having a moderate to large population size and a moderate to high ongoing or predicted decline. This change in population size was based on recent intensive survey work that also identified range retraction. Categorisation of the population trend was also based on the results of recent survey work in locations for which historical data sets exist (Jack 2020a, b; Olleycology Limited 2021; Orchard 2021), as it was considered that the trend analyses of White et al. (2022) were unreliable for *G. postvectis* and so would likely introduce a high level of uncertainty.

Galaxias postvectis is a widespread taxon that is subject to a range of pressures in the habitats it occupies throughout its life cycle, being impacted by fish passage barriers and the degradation and loss of native forested habitat. The increased flooding of habitats and extreme weather events under climate change scenarios will likely influence the persistence of *G. postvectis* (Jack 2020a). However, the impacts of pressures on larval and juvenile *G. postvectis* in the marine environment are currently unknown.

Galaxias prognathus Stokell 1940 (upland longjaw galaxias (Canterbury))

Galaxias prognathus is a non-diadromous, iteroparous, vernal spawner. *Galaxias prognathus* is an endemic taxon that is now restricted to Canterbury on Te Waipounamu / the South Island. *Galaxias prognathus* has a moderate number (27 remaining) of very low density, fragmented, very small to moderately large (total 76 ha remaining) extant sub-population fragments that are scattered across the catchments of the Rakaia and Rangitata Rivers. The sub-populations that once occurred in the catchments of the Hurunui River and the Maruia River (in the catchment of the Kawatiri / Buller River) are now considered extinct based on extensive survey work.

Galaxias prognathus was assessed as Threatened – Nationally Vulnerable based on it having a moderate area of occupancy and a low to high ongoing or predicted population trend decline. However, most sub-population fragments have not been resurveyed recently and there is a high degree of concern for their condition. Moreover, the occurrence of *G. prognathus* in larger braided rivers has likely resulted in an overestimation of the area of occupancy, as this taxon does not occupy the entire extent of reaches it is known from, typically being associated with spring or upwelling areas (Clucas 2010; Water Ways Consulting Ltd 2020).

Galaxias prognathus occurs in largely unmodified alpine braided gravel-bed river habitats that experience extremes in flow (floods and droughts) in areas that lack piscivorous salmonids. *Galaxias prognathus* is particularly prone to severe flood events, which are likely to increase in frequency and intensity under climate changes scenarios. Such events can lead to extreme population fluctuations, as observed when the Lawrence River shifted course during a large flood event, destroying the largest known spawning and rearing habitat and severely depleting the Rangitata River sub-population (Dunn 2016).

Galaxias pullus McDowall 1997 (dusky galaxias)

Galaxias pullus is a non-diadromous, iteroparous, vernal spawner. *Galaxias pullus* is an endemic taxon that is restricted to Otago on Te Waipounamu / the South Island. *Galaxias pullus* has a moderate number (43 remaining) of low-density, highly fragmented, small (total 44 ha remaining) sub-population fragments that are scattered across the catchments of the Taiari / Taieri River and lower Clutha River / Mata-Au.

Galaxias pullus was assessed as Threatened – Nationally Vulnerable, having previously been assessed by Dunn et al. (2018) as Threatened – Nationally Endangered. This improved conservation status is due to increased knowledge of the area of occupancy, which has changed from small to moderate based on the geospatial assessment described in Dunn & O'Brien (2022), as well as a change in the categorisation of the ongoing or predicted population trend from a 10–50% decline (Dunn et al. 2018) to a 10–30% decline (this report). The change in population trend categorisation is based on recent intensive survey work, which recognised that despite almost three-quarters of *G. pullus* sub-population fragments not having been resurveyed recently, recent intensive survey work in the Teviot River catchment within the catchment of the Clutha River / Mata-Au as part of hydroelectric power scheme investigations has increased knowledge of sub-population fragment demographics and habitat extents and located new sub-population fragments. The estimated area of occupancy has also increased in part as a result of genetic analyses leading to the reassignment of sub-population fragments from *Galaxias* "Teviot" to *G. pullus* (Campbell 2021).

Galaxias pullus occupies a range of habitats, from tussock-dominated wetlands and streams to rocky, beech forest streams (Allibone & McDowall 1997), as well as areas of plantation forestry for some sub-population fragments. Several sub-populations of *G. pullus* co-occur with *Galaxias depressiceps* within large tussockland conservation parks, with protection secured through the Crown Pastoral Land Act 1998 tenure review process. *Galaxias pullus* remains dependent on conservation management, such as the installation of barriers to impede the invasion of piscivorous salmonids and *Galaxias brevipinnis* (koaro) into sub-population habitat fragments (Tabak 2021), to secure its persistence.

Geotria australis Gray 1851 (lamprey)

Geotria australis is an anadromous, semelparous, vernal–estival spawner. *Geotria australis* is an indigenous taxon that is widely distributed on Te Ika-a-Māui / the North Island, Te Waipounamu / the South Island and Stewart Island / Rakiura. In New Zealand, *G. australis* is known from 193 catchments, where it occurs at low to moderate abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (896 ha), lacustrine (58 489 ha), palustrine (13 ha) and estuarine (3540 ha) habitats.

Geotria australis was assessed as Threatened – Nationally Vulnerable based on it having a moderate area of occupancy and a low ongoing or predicted population trend decline. Spawning habitat area estimates were used in the assessments of Goodman et al. (2014) and Dunn et al. (2018) and continued to be used in the present assessment. This was because the area of occupancy of this critical life stage is considered to more accurately categorise *G. australis* than attempts to estimate the adult population size, although a genetic effective population size has been estimated (Miller et al. 2022). Unfortunately, the area of spawning habitat is largely unknown, but this habitat is considered to be highly specialised (Baker et al. 2017; Miller et al. 2021) and very small in relation to the amount of adult freshwater habitat occupied. The expert panel's concern and considerations for this taxon led it to categorise the ongoing or predicted population trend decline as low.

Geotria australis occurs in, or migrates through, a range of freshwater habitats that are considered to be influenced by loss of habitat (including as a result of drain maintenance, especially in Southland), as well as reduced connectivity through the river network at key migration times. Additionally, disease – particularly lamprey reddening syndrome (Williams et al. 2017) – is now considered a major pressure, while Egan et al. (2020) considered *G. australis* to be very highly vulnerable to climate change impacts.

Neochanna heleios Ling & Gleeson 2001 (Northland mudfish)

Neochanna heleios is a non-diadromous, iteroparous, autumnal–hiemal–vernal spawner. *Neochanna heleios* is an endemic taxon that is restricted to Northland on Te Ika-a-Māui / the North Island. *Neochanna heleios* has a small number (20 remaining) of moderate- to low-density, fragmented, small to large (uncertain occupied area within wetland complexes totalling 967 ha) sub-population fragments, which are scattered over seven catchments.

Neochanna heleios was assessed as Threatened – Nationally Vulnerable based on it having a moderate area of occupancy and a low ongoing or predicted population trend decline, which is an improvement from the moderate population trend decline assessed by Dunn et al. (2018). However, a very high number of *N. heleios* sub-population fragments have not been resurveyed recently, resulting in a very high degree of concern for their condition, including for previously secure sub-population fragments. This lack of survey work is due to many sub-population fragments occurring on private land, as well as a reduction in the once intensive survey and monitoring work conducted by DOC (Lake 2021). The occurrence of *N. heleios* in larger wetland complexes has also likely resulted in an overestimation of the area of occupancy, as this taxon does not occupy the entire extent of wetlands it is known from.

Neochanna heleios occurs in wetlands within a small geographical range in Northland. Major pressures on sub-population fragments include the modification of hydrological processes, including drainage and water abstraction, and hydrological fluctuations caused by extremes in precipitation events (floods and droughts) (O'Brien & Dunn 2007; Lake 2021), which are likely to increase in frequency and intensity under climate change scenarios. *Neochanna heleios* sub-population fragments are also subjected to adjacent land development creating edge effects on wetland ecosystem processes, the encroachment of wilding pines, the degradation of water quality, and the presence of pest fish taxa and predatory *Anguilla* spp. (eels).

Galaxias aff. *prognathus* "Waitaki" (upland longjaw galaxias (Waitaki River))

Galaxias aff. *prognathus* "Waitaki" is a non-diadromous, iteroparous, vernal spawner. *Galaxias* aff. *prognathus* "Waitaki" is an endemic taxon that is restricted to Canterbury on Te Waipounamu / the South Island. *Galaxias* aff. *prognathus* "Waitaki" has a moderate number (35 remaining) of very low density, highly fragmented, very small to moderately large (total 95 ha remaining) sub-population fragments, all of which are scattered within the catchment of the upper Waitaki River.

Galaxias aff. *prognathus* "Waitaki" was assessed as Threatened – Nationally Vulnerable based on it having a moderate area of occupancy and a moderate ongoing or predicted population trend decline. However, two-thirds of *Galaxias* aff. *prognathus* "Waitaki" sub-population fragments have not been resurveyed recently, leading to a very high degree of concern for their condition. Thus, the expert panel applied a higher population trend decline categorisation. Moreover, the occurrence of *Galaxias* aff. *prognathus* "Waitaki" in larger braided rivers has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of reaches it is known from.

Galaxias aff. *prognathus* "Waitaki" occurs in alpine braided gravel-bed river habitats, typically in association with springs and upwelling areas. These habitats are prone to intense maritime westerly-derived precipitation events that cause extreme floods and prolonged droughts, which are likely to increase in frequency and intensity under climate change scenarios. Such events can alter channel form and hydrological patterns, making it difficult to locate *Galaxias* aff. *prognathus* "Waitaki" and resulting in extreme fluctuations in population size being recorded. Spring habitats of *Galaxias* aff. *prognathus* "Waitaki" located on the periphery of active flood plains are also favoured as spawning habitats by piscivorous salmonids due to their hydrological and thermal stability, so ongoing conservation management actions are needed to ensure that these habitats remain free of these introduced taxa.

Galaxias "northern" (northern flathead galaxias (Marlborough, Nelson, West Coast))

Galaxias "northern" is a non-diadromous, iteroparous, vernal spawner. *Galaxias* "northern" is an endemic taxon that is widely distributed in Marlborough and has additional sub-population fragments in parts of Nelson, Tasman and the West Coast on Te Waipounamu / the South Island. *Galaxias* "northern" has a large number (104 remaining) of very low density, highly fragmented, small to moderately large (total 156 ha remaining) sub-population fragments, which are scattered over five catchments across a large geographical range.

Galaxias "northern" was assessed as Threatened – Nationally Vulnerable based on it having a moderate area of occupancy and a low to high ongoing or predicted population trend decline. However, a large number of sub-population fragments have not been resurveyed recently, and the occurrence of *Galaxias* "northern" in larger braided rivers has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of reaches it is known from. Recent survey work has located new sub-population fragments, particularly in the Mātakitaki River within the catchment of the Kawatiri / Buller River, and in the Rainy River within the Motueka River catchment. Recent survey work has also recognised that piscivorous salmonids have become more frequent in *Galaxias* "northern" sub-population habitat fragments in the catchment of the Waiau Toa / Clarence River, leading to a high degree of concern for most sub-population fragments.

Galaxias "northern" occurs within gravel-bed stream and river habitats that experience extremes in flow (floods and droughts), scattered within a landscape that grades from unmodified to extensive agriculture, where the taxon is influenced by piscivorous salmonids and water abstraction. Moreover, Nelson, Tasman and Marlborough can receive extreme precipitation events and prolonged, severe drought events (NIWA 2021, 2022, 2023a), which are likely to increase in frequency and intensity under climate change scenarios.

Galaxias "Pomahaka" (Pomahaka galaxias (Pomahaka River))

Galaxias "Pomahaka" is a non-diadromous, iteroparous, vernal spawner. *Galaxias* "Pomahaka" is an endemic taxon that is restricted to Otago and Southland on Te Waipounamu / the South Island. *Galaxias* "Pomahaka" has a large number (84 remaining) of moderate-density, highly fragmented, very small (total 46 ha remaining) sub-population fragments that are scattered within the catchments of the Tokomairaro River and lower Clutha River / Mata-Au.

Galaxias "Pomahaka" was assessed as Threatened – Nationally Vulnerable based on it having a moderate area of occupancy and a low ongoing or predicted population trend decline. Recent survey work has increased knowledge of the extents of *Galaxias* "Pomahaka" sub-population habitat fragments, while genetic analyses by Campbell (2021) have resulted in some sub-population fragments that were previously assigned to *Galaxias* "Pomahaka" being reassigned to *Galaxias* "species D" and vice versa – and future genetic studies may see further reassignment of sub-population fragments between these taxa. Despite these advances, little is known about the population demographics of many sub-population fragments, leading to a high degree of concern regarding their condition.

Galaxias "Pomahaka" occupies degraded wetlands and streams, and drains associated with these areas, within an intensive agricultural landscape (Jack 2021a). Ongoing land development and drainage, including tile drains, channel modification (particularly straightening) and online stock water dams, are considered major pressures for *Galaxias* "Pomahaka", while piscivorous salmonids present a further pressure for some sub-population fragments.

Galaxias "species D" (Clutha flathead galaxias (Clutha River))

Galaxias "species D" is a non-diadromous, iteroparous, vernal spawner. *Galaxias* "species D" is an endemic taxon that is widely distributed in Otago on Te Waipounamu / the South Island. *Galaxias* "species D" has a large number (83 remaining) of low-density, highly fragmented, very small to small (total 57 ha remaining) sub-population fragments, which are scattered over eight catchments across a large, highly agriculturally intensified geographical range.

Galaxias "species D" was assessed as Threatened – Nationally Vulnerable, having previously been assessed by Dunn et al. (2018) as Threatened – Nationally Critical. *Galaxias* "species D" was originally assessed as Threatened – Nationally Vulnerable by Hitchmough (2002), and then as At Risk – Gradual Decline by Hitchmough et al. (2007), before being reassessed as Threatened – Nationally Vulnerable by Allibone et al. (2010). Further genetic considerations summarised in Bowie et al. (2014) then saw Goodman et al. (2014) assess *Galaxias* "species D" *sensu lato* as *Galaxias* "species D", *Galaxias* "lower Clutha" and *Galaxias* "Pomahaka". Sub-population fragments occurring in the catchment of the Clutha River / Mata-Au above the Benger Burn were recognised by Goodman et al. (2014) as *Galaxias* "species D", which was assessed as Threatened – Nationally Critical based on it having a very high ongoing or predicted rate of decline, particularly in sub-population fragments in the catchments of the Ōrau / Cardrona and Ōmakō / Lindis Rivers. Subsequent consideration of *Galaxias* genetics saw Dunn et al. (2018) subsume *Galaxias* "lower Clutha" sub-population fragments into *Galaxias* "species D", re-expanding the taxon's distribution back into the catchments of the lower Clutha River / Mata-Au and The Catlins area, in addition to the catchments of the upper Clutha River / Mata-Au. Future genetic studies may see further reassignment of sub-population fragments between taxa. Dunn et al. (2018), however, did not reassess the population trend. Thus, *Galaxias* "species D" was assessed in the current assessment as Threatened – Nationally Vulnerable based on it having a moderate area of occupancy and a moderate ongoing or predicted population trend decline. However, more than three-quarters of *Galaxias* "species D" sub-population fragments have not been resurveyed recently and a

high number of local extinctions have been recorded, so the expert panel remained highly concerned about the condition of the remaining sub-population fragments, particularly in the catchments of the Ōrau / Cardrona and Ōmakō / Lindis Rivers. Moreover, increased knowledge gained during recent resurveys of some sub-population fragments has led to reductions in their known habitat extents due to the identification of the location of natural barriers that impede invasion from piscivorous salmonids, such as in Hopes Creek within the catchment of the Clutha River / Mata-Au.

Galaxias "species D" occurs in a range of habitats, predominantly in smaller tributary streams but also in larger streams, usually above barriers that impede piscivorous salmonid invasion. Mainstem *Galaxias* "species D" sub-population fragments in the Ōrau / Cardrona and Ōmakō / Lindis Rivers are considered nearly extinct or extinct. *Galaxias* "species D" sub-population fragments are heavily influenced by water abstraction and associated water conveyance practices and infrastructure within agricultural landscapes, particularly in the catchment of the upper Clutha River / Mata-Au. This arid area of Central Otago is especially prone to extremes in flow (floods and droughts), which are likely to increase in frequency and intensity under climate change scenarios. *Galaxias* "species D" sub-population fragments in the catchment of the lower Clutha River / Mata-Au and The Catlins area are located within an intensive agricultural landscape and also face piscivorous salmonid pressures. Therefore, ongoing conservation management actions, such as the installation of barriers to piscivorous salmonids, are required to ensure the persistence of *Galaxias* "species D".

3.1.5 At Risk – Declining

***Anguilla dieffenbachii* Gray 1842 (longfin eel)**

Anguilla dieffenbachii is catadromous and semelparous, but the timing of spawning is unknown. *Anguilla dieffenbachii* is an endemic taxon that is widely distributed on Te Ika-a-Māui / the North Island, Te Waipounamu / the South Island, Stewart Island / Rakiura and Chatham Island / Rēkohu. *Anguilla dieffenbachii* is known from 684 catchments, where it occurs at low abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (36 786 ha), lacustrine and palustrine habitats (the areas of the latter two habitat types are yet to be determined).

Anguilla dieffenbachii was assessed as At Risk – Declining based on it having a very large area of occupancy and a low ongoing or predicted population trend decline. The area of occupancy was based on estimated areas in riverine habitats alone, so it will be substantially greater when lacustrine and palustrine areas are included. Categorisation of the population trend was informed by the assessment of White et al. (2022), which indicated a historic decline, leading the expert panel to consider the predicted trend to also be in decline over the next 100 years because of the lifespan of the taxon. Assessment of commercial catch data (Fisheries New Zealand 2022) also showed a decline in landings over the last decade, with the estimated catch in 2020–2021 being 64 tonnes, which is below the Total Allowable Commercial Catch (TACC) within the Quota Management System (QMS) administered by Fisheries New Zealand (Ministry for Primary Industries). However, while an allocation is also set for recreational and customary non-commercial fisheries, there were no catch data available. It should also be noted that catch data, including estimates of densities, do not represent a census of the entire *A. dieffenbachii* population and so were considered indicative only in this assessment.

Anguilla dieffenbachii is a widespread taxon that is subject to a range of pressures in the habitats it occupies throughout its life cycle. While fishing pressure appears to be reducing, the expert panel remained concerned about the continuing degradation of *A. dieffenbachii* habitat, especially in lowland areas, and ongoing issues with fish passage (both upstream and downstream). A decline in water quality in many areas has also resulted in *Anguilla australis*

occupying habitat that formerly held *A. dieffenbachii*. Moreover, Egan et al. (2020) assessed *A. dieffenbachii* as being very highly vulnerable to the effects of climate change on larval recruitment processes in the marine environment, and particularly to increases in the frequency and intensity of extremes in flow (floods and droughts) once in the freshwater environment – indeed, anguillids are typically the most recorded fish taxa in mass mortality events during drought conditions. Furthermore, lowland habitats are prone to marine inundation under climate change scenarios.

Galaxias argenteus (Gmelin 1789) (giant kokopu)

Galaxias argenteus is an amphidromous, iteroparous, autumnal–hiemal spawner. *Galaxias argenteus* is an endemic taxon that is widely distributed on Te Ika-a-Māui / the North Island, Te Waipounamu / the South Island, Stewart Island / Rakiura and Chatham Island / Rēkohu. *Galaxias argenteus* is known from 248 catchments, where it occurs at low abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (1772 ha), lacustrine (37 027 ha), palustrine (16 352 ha) and estuarine (1925 ha) habitats.

Galaxias argenteus was assessed as At Risk – Declining based on it having a large population size and a low ongoing or predicted population trend decline. The expert panel recognised that there is uncertainty in the categorisation of the population size for *G. argenteus*, but population trends are more detectable and certain for population size than if an estimate of the adult area of occupancy (in which spawning also occurs) had been used. These uncertainties in categorising the population size arise because *G. argenteus* typically occurs at low abundances (potentially a function of the sampling methodologies) in numerous, small, particularly riverine habitats but also as facultatively landlocked populations, and the taxon can be long lived, meaning that surveys can repeatedly capture the same individuals. Variation between sub-populations also occurs because of likely habitat-mediated differences in recruitment dynamics, with those sub-populations that occur near juvenile lacustrine rearing habitat typically being larger. Categorisation of the population trend was informed by the assessment of White et al. (2022), which indicated a historic ongoing decline, leading the expert panel to consider that the predicted population trend will also be in decline.

Galaxias argenteus is a widespread taxon that is subject to a range of pressures in the habitats it occupies throughout its life cycle. *Galaxias argenteus* is impacted by fish passage barriers, sedimentation, water quality degradation and the presence of pest fish taxa in some habitats. *Galaxias argenteus* was also considered to have a moderate vulnerability to climate change by Egan et al. (2020), while laboratory studies by Wylie et al. (2016) found that the fertilisation rate decreased as salinity increased and that increased temperatures appeared to be detrimental to hatching success. Increased flooding and the inundation of habitats under climate change scenarios, and potential thermal limitations on larval survival are also considered to influence the persistence of *G. argenteus*.

Galaxias brevipinnis Günther 1866 (koaro)

Galaxias brevipinnis is an amphidromous, iteroparous, autumnal–hiemal spawner. *Galaxias brevipinnis* is an indigenous taxon that is widely distributed on Te Ika-a-Māui / the North Island, Te Waipounamu / the South Island, Stewart Island / Rakiura, Chatham Island / Rēkohu and Pitt Island (Rangiauria). In New Zealand, *G. brevipinnis* is also known from the subantarctic islands (Campbell Island / Motu Ihupuku, Auckland Island and Adams Island). *Galaxias brevipinnis* is known from 393 catchments, where it occurs at low abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (5480 ha), lacustrine (263 576 ha), palustrine (957 ha) and estuarine (113 650 ha) habitats.

Galaxias brevipinnis was assessed as At Risk – Declining based on it having a very large population size and a low ongoing or predicted population trend decline. While *G. brevipinnis* does occur in lacustrine, palustrine and estuarine habitats, inclusion of the entire geospatial polygons representing these habitats would likely have resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of habitats it is known from. Thus, the expert panel considered that there was more certainty in making an assessment based on the estimated population size. Categorisation of the population trend was informed by the assessment of White et al. (2022), which indicated a recent decline. This led the expert panel to consider that the predicted population trend would also be in decline when calculated over a 30-year period, based on the long lifespan of *G. brevipinnis*. Sub-population declines are considered to be occurring in more coastal populations of *G. brevipinnis*, while facultatively landlocked populations show some stability and even range expansion in some hydroelectric dams.

Galaxias brevipinnis is a widespread taxon that is subject to a range of pressures in the habitats it occupies throughout its life cycle. *Galaxias brevipinnis* is considered to be impacted by sedimentation in adult stream habitats in which spawning also occurs, particularly in areas of agricultural intensification. *Galaxias brevipinnis* was also considered to have a high vulnerability to climate change by Egan et al. (2020), and it is considered that there may be potential thermal limitations which will lead to range reduction under climate change scenarios, particularly in lowland and northern Te Ika-a-Māui / North Island coastal and lake populations.

Galaxias depressiceps McDowall & Wallis 1996 (Taieri flathead galaxias)

Galaxias depressiceps is a non-diadromous, iteroparous, vernal spawner. *Galaxias depressiceps* is an endemic taxon that is restricted to Otago on Te Waipounamu / the South Island. *Galaxias depressiceps* has a moderate number (54 remaining) of low-density, highly fragmented, small to moderately large (total 184 ha remaining) sub-population fragments, which are scattered over five catchments.

Galaxias depressiceps was assessed as At Risk – Declining, having previously been assessed by Dunn et al. (2018) as Threatened – Nationally Vulnerable. This improved conservation status is due to increased knowledge of the area of occupancy, which has changed from 'moderate' to 'moderate to large' based on the geospatial assessment described in Dunn & O'Brien (2022), and a low ongoing or predicted population trend decline. There is concern that a small number of *G. depressiceps* sub-population habitat fragments constitute most of the estimated area of occupancy, such as the upper Taiari / Taieri River, given the proximity of piscivorous salmonids and the reliance on natural barriers to protect large areas of habitat from their invasion. Furthermore, only approximately half of the known *G. depressiceps* sub-population fragments have been resurveyed recently, and there remains a high degree of concern and uncertainty about their condition, with some being thought to be experiencing population declines and others decreasing in extent or considered sink populations.

Galaxias depressiceps occurs in a range of small to large streams and rivers, typically in the upper reaches of catchments within an extensive agricultural landscape. Additional *G. depressiceps* sub-population fragments occur within areas of plantation forestry, such as those in Whakatōrea / Akatore Creek, while some upper catchment sub-population fragments are being influenced by afforestation for carbon farming, which potentially could reduce catchment water yields. *Galaxias depressiceps* is considered prone to low- to no-flow conditions during drought events, which are likely to increase in frequency and intensity under climate change scenarios. Ongoing conservation management actions, such as the installation of barriers to piscivorous salmonids, are required to ensure the persistence of *G. depressiceps* (Jack et al. 2023). *Galaxias depressiceps* is also subject to hybridisation, such as with

Galaxias "species D" in Totara Creek within the catchment of the Taiari / Taieri River, which has been mediated by an inter-catchment water race (Allibone 2000; Esa et al. 2000), but management of this pressure remains unresolved.

Galaxias divergens Stokell 1959 (dwarf galaxias (West Coast))

Galaxias divergens is a non-diadromous, iteroparous, vernal spawner. *Galaxias divergens* is an endemic taxon that is widely distributed in parts of the West Coast, Tasman and Nelson on Te Waipounamu / the South Island. *Galaxias divergens* has a large number (76 remaining) of low-density, highly fragmented, small to moderately large (total 190 ha remaining) sub-population fragments, which are scattered over four catchments.

Galaxias divergens was assessed as At Risk – Declining based on it having a moderate to large area of occupancy and a low ongoing or predicted population trend decline. Categorisation of the population trend was informed by the assessment of White et al. (2022), although they did not separate *G. divergens* and *Galaxias* aff. *divergens* "northern" in their analyses, hindering the expert panel's interpretation. However, based on the sub-population fragment assessment described in Dunn & O'Brien (2022), almost two-thirds of the sub-population fragments have not been resurveyed recently and there is a very high degree of concern for the condition of sub-population fragments, as well as a high number of recently confirmed local extinctions and observations of extreme population fluctuations over time (Jack 2023b). Moreover, the occurrence of *G. divergens* in larger braided rivers has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of reaches it is known from.

Galaxias divergens occurs in a range of habitat types, with sub-population fragments that occur in gravel-bed rivers being particularly prone to extreme flood flows and disturbance, which are likely to increase in frequency and intensity under climate change scenarios. Further pressures on *G. divergens* in such habitats include piscivorous salmonids and alluvial gold mining using dredges. *Galaxias divergens* also occurs within spring-fed systems that are now surrounded by agricultural landscapes where re-contouring in the form of 'humping and hollowing' has modified the land surface and drainage patterns.

Galaxias gollumoides McDowall & Chadderton 1999 (Gollum galaxias)

Galaxias gollumoides is a non-diadromous, iteroparous, vernal spawner. *Galaxias gollumoides* is an endemic taxon that is widely distributed in Southland and The Catlins area of Otago on Te Waipounamu / the South Island and Stewart Island / Rakiura. *Galaxias gollumoides* has a very large number (218 remaining) of low-density, very highly fragmented, very small (total 111 ha remaining) sub-population fragments, which are scattered over 17 catchments across a large, highly agriculturally intensified geographical range.

Galaxias gollumoides was assessed as At Risk – Declining, having previously been assessed by Dunn et al. (2018) as Threatened – Nationally Vulnerable. This improved conservation status is due to a change in the application of criteria. *Galaxias gollumoides* was assessed as having a moderate to large estimated area of occupancy and a low ongoing or predicted population trend decline, whereas Dunn et al. (2018) based their assessment on the taxon having 15 or fewer sub-populations and a moderate population size in the largest sub-population, and a low ongoing or predicted population trend decline. This change is due to recent survey work locating new sub-population fragments, particularly on the periphery of the taxon's distribution, such as in The Catlins area. However, more than two-thirds of sub-population fragments have not been resurveyed recently, so it is considered that the declines and extinctions observed in those sub-population fragments that have been resurveyed may be more widespread but as yet unreported. Therefore, there is heightened concern for the condition of these sub-population fragments and the persistence of *G. gollumoides*, particularly as core populations become degraded.

Galaxias gollumoides occurs in wetland and stream habitats (Dunn et al. 2022) in a highly intensified agricultural landscape, including increasingly developed hill country on Crown pastoral lease land. Large areas of wetland have been drained and intensified in Southland (Robertson et al. 2019), representing half of the wetlands lost in New Zealand between 1996 and 2018 (Denyer 2020). Waterbodies that are managed publicly and privately as drains, particularly on the plains of Southland, have a high degree of coincidence with *G. gollumoides* sub-population fragments (Dunn 2021), and these habitats are subject to nuisance weed and sediment removal activities, which are known to degrade water and habitat quality (Greer et al. 2012, 2015). In The Catlins area, *G. gollumoides* sub-population fragments are considered to be influenced by land-use intensification for dairy farming, dairy support and forestry, and their habitat is also becoming increasingly fragmented by piscivorous salmonids. Furthermore, uncertainty remains about the identification and distributions of taxa in The Catlins in areas of potential sympatry and/or introgression with *Galaxias* "Pomahaka" and *Galaxias* "species D" (Anderson 2007; Campbell 2021), and future genetic studies may see further reassignment of sub-population fragments between taxa. Southland also experienced prolonged drought conditions in the summers and autumns of 2021, 2022 and 2023 (NIWA 2021, 2022, 2023a, b, c), which are likely to increase in frequency and intensity under climate change scenarios. Consequently, there is concern that *G. gollumoides* sub-population fragments are subject to extended periods of adverse conditions during low-flow periods, leading to population fluctuations and an inability for potentially extirpated sub-population habitat fragments to be recolonised.

Neochanna apoda Günther 1867 (brown mudfish)

Neochanna apoda is a non-diadromous, iteroparous, autumnal–hiemal spawner. *Neochanna apoda* is an endemic taxon that is widely distributed in southern Te Ika-a-Māui / North Island and on the West Coast of Te Waipounamu / the South Island. *Neochanna apoda* has a large number (127 remaining) of high-density, fragmented, large (uncertain occupied area within wetland complexes totalling 19 064 ha) sub-population fragments, which are scattered over 45 catchments.

Neochanna apoda was assessed as At Risk – Declining based on it having a moderate to large area of occupancy and a low ongoing or predicted population trend decline. This is a change in the criteria (due to a change in their application) but not the category from Dunn et al. (2018), who based their assessment on *N. apoda* having a very large population and a low ongoing or predicted population trend decline. A very high number of *N. apoda* sub-population fragments have not been resurveyed recently, leading to a very high degree of concern for their condition, particularly given the reduced frequency of monitoring programmes. Moreover, the occurrence of *N. apoda* in larger wetland complexes has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of wetlands it is known from. The area estimate is applied to the taxon as a whole, despite the West Coast wetlands occupied by *N. apoda* typically being much larger than those in the south of Te Ika-a-Māui / the North Island, which are typically very small, highly fragmented and very vulnerable.

Neochanna apoda occurs in a wide range of wetlands across a large geographical range (O'Brien & Dunn 2007). Major pressures include the modification of hydrological processes within the proximate catchment, including drainage and water abstraction, as well as hydrological fluctuations due to extreme weather events (floods, droughts and tornadoes; O'Brien & Dunn 2007; White 2016), which are likely to increase in frequency and intensity under climate change scenarios. Furthermore, *N. apoda* sub-population fragments within agricultural landscapes are subjected to adjacent land development, with re-contouring in the form of 'humping and hollowing' on the West Coast having modified the land surface and drainage patterns or created edge effects on wetland ecosystem processes. Drain maintenance practices to remove nuisance weeds and sediment, and the presence of pest fish taxa in some sub-population habitat fragments are also considered to be pressures.

***Neochanna diversus* Stokell 1949 (black mudfish)**

Neochanna diversus is a non-diadromous, iteroparous, autumnal–hiemal spawner. *Neochanna diversus* is an endemic taxon that is widely distributed in northern Te Ika-a-Māui / North Island. *Neochanna diversus* has a large number (98 remaining) of moderate-density, highly fragmented, very small to very large (uncertain occupied area within wetland complexes totalling 28 451 ha) sub-population fragments, which are scattered over 20 catchments.

Neochanna diversus was assessed as At Risk – Declining based on it having a very large population and a moderate ongoing or predicted population trend decline. This is a change in the criteria (due to a change in their application) but not the category from Dunn et al. (2018), who based their assessment on *N. diversus* having a large area of occupancy and a low ongoing or predicted population trend decline. A high number of *N. diversus* sub-population fragments have not been resurveyed recently, leading to a very high degree of concern for their condition, particularly given the reduced frequency of monitoring programmes. Moreover, the occurrence of *N. diversus* in larger wetland complexes has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of wetlands it is known from. The population decline has increased due to large areas of peat-dominated wetland in Northland that are occupied by *N. diversus* experiencing fire in the summer of 2021/22 and the high degree of uncertainty as to whether the sub-population fragments that occur here can recover because of a lack of pre-event monitoring. Large declines and extinctions of sub-population fragments are also considered to be occurring in the Auckland and Waikato sub-populations.

Neochanna diversus occurs in a wide range of wetlands across a large geographical range (O'Brien & Dunn 2007). Major pressures include the modification of hydrological processes within the proximate catchment, including through drainage, as well as hydrological fluctuations due to extreme weather events (floods and droughts; O'Brien & Dunn 2007), which are likely to increase in frequency and intensity under climate change scenarios. However, the impacts of these events are difficult to quantify, as *N. diversus* is considered to occupy transitional zones between wetter and drier areas of wetlands. The potential increase in fire events under drier climate change scenarios is of major concern, and research is required to better understand the impact of fire in wetlands, including the use of fire retardants and the effects of fire on the modification and loss of pool habitat structure, which would influence post-event population recovery. This is particularly important, as previous attempts to translocate *N. diversus* to new habitats have failed. *Neochanna diversus* sub-population fragments are also subjected to adjacent land development, which can cause sedimentation issues, alter drainage patterns and create edge effects on wetland ecosystem processes, and the presence of pest fish taxa is considered an additional pressure for some sub-population fragments.

***Retropinna retropinna* (Richardson 1848) (common smelt)**

Retropinna retropinna is an anadromous, semelparous, estival–autumnal spawner. *Retropinna retropinna* is an endemic taxon that is widely distributed on Te Ika-a-Māui / the North Island, Te Waipounamu / the South Island, Stewart Island / Rakiura and Chatham Island / Rēkohu. *Retropinna retropinna* is known from 315 catchments, where it occurs at very high abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (5480 ha), lacustrine (263 576 ha), palustrine (957 ha) and estuarine (113 650 ha) habitats.

Retropinna retropinna was assessed as At Risk – Declining, having previously been assessed by Dunn et al. (2018) as Not Threatened. This worsened conservation status is due to *R. retropinna* having a very large population size and a low ongoing or predicted population trend decline. Categorisation of the population trend was informed by the assessment of White et al.

(2022), which indicated a decline in the last 10 years, leading the expert panel to consider the predicted trend to also be in decline. The population estimate for *R. retropinna* was based on categorisation of the number of mature individuals rather than the estimated area of lacustrine littoral spawning habitat that was used for other taxa, such as *Galaxias* "dune lakes". This is because the expert panel considered that information on *R. retropinna* spawning habitat area is currently too limited and presents too great an uncertainty for its application in this assessment. Using the adult area of occupancy was also considered but rejected because it was estimated to be very large due to the occurrence of *R. retropinna* in large lacustrine and lowland riverine habitats which, combined with the low ongoing or predicted population decline, resulted in the same conservation status as using the mature individual criteria.

Retropinna retropinna occupies a range of habitats both naturally and following introductions (McDowall 1979), including lowland rivers and lakes, and inland lakes, where it can form facultatively landlocked populations. It is considered that *R. retropinna* is declining in some lowland riverine and shallow lake habitats, possibly due to sedimentation affecting spawning habitat. *Retropinna retropinna* is also harvested as part of the recreational and customary whitebait catch, typically arriving later in the season, but there is only limited information on the pressure this activity places on the taxon (Goodman 2018).

Galaxias aff. _divergens_ "northern" (dwarf galaxias (Marlborough, Nelson, North Island))

Galaxias aff. *divergens* "northern" is a non-diadromous, iteroparous, vernal spawner. *Galaxias* aff. *divergens* "northern" is an endemic taxon that is widely distributed in southern Te Ika-a-Māui / North Island, with disjunct sub-populations in Waikato and the Bay of Plenty, and in northern Te Waipounamu / South Island. *Galaxias* aff. *divergens* "northern" has a very large number (201 remaining) of very low density, fragmented, small to large (total 476 ha remaining) sub-population fragments, which are scattered over 36 catchments across a large geographical range.

Galaxias aff. *divergens* "northern" was assessed as At Risk – Declining based on it having a moderate to large area of occupancy and a low ongoing or predicted population trend decline. Categorisation of the population trend was informed by the assessment of White et al. (2022), although they did not separate *G. divergens* and *Galaxias* aff. *divergens* "northern" in their analyses, hindering the expert panel's interpretation. However, based on the sub-population fragment assessment described in Dunn & O'Brien (2022), 70% of the sub-population fragments have not been resurveyed recently and there is a very high degree of concern for the condition of sub-population fragments, with some sub-population fragments considered to be in decline, experiencing extreme population fluctuations or extinct. Moreover, the occurrence of *Galaxias* aff. *divergens* "northern" in larger braided rivers has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of reaches it is known from.

Galaxias aff. *divergens* "northern" typically occupies larger gravel-bed streams and rivers, in which it is subject to adverse interactions with piscivorous *Anguilla* spp. (eels) and salmonids, particularly during periods of low flow. Moreover, the habitats in which *Galaxias* aff. *divergens* "northern" occurs are likely to experience increases in the frequency and intensity of extremes in flow events (floods and droughts) under climate change scenarios. While barriers to piscivorous salmonids in tributary habitats afford security to some *Galaxias* aff. *divergens* "northern" sub-population fragments, the sub-population fragment in the Waihou River has previously been subject to degradation of the macrophyte bed cover through excessive recreational use of the habitat.

Galaxias aff. *paucispondylus* "Southland" (alpine galaxias (Southland))

Galaxias aff. *paucispondylus* "Southland" is a non-diadromous, iteroparous, vernal spawner. *Galaxias* aff. *paucispondylus* "Southland" is an endemic taxon that is restricted to Otago and Southland on Te Waipounamu / the South Island. *Galaxias* aff. *paucispondylus* "Southland" has a small number (11 remaining) of very low density, fragmented, small to very large (total 263 ha remaining) sub-population fragments, which are scattered over four catchments.

Galaxias aff. *paucispondylus* "Southland" was assessed as At Risk – Declining, having previously been assessed by Dunn et al. (2018) as Threatened – Nationally Vulnerable. This improved conservation status is due to a change in the categorisation of the ongoing and predicted population trend from a 30–50% decline (Dunn et al. 2018) to a 10–30% decline (this report). There is also greater knowledge of the distribution of *Galaxias* aff. *paucispondylus* "Southland" as a result of recent survey work locating new sub-population fragments, particularly on the periphery of the taxon's greywacke-limited distribution. The expert panel also considered that *Galaxias* aff. *paucispondylus* "Southland" may have undergone historic range and population size reductions, and now occurs sparsely at very low densities in larger braided rivers. Moreover, the occurrence of *Galaxias* aff. *paucispondylus* "Southland" in these habitat types has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of reaches it is known from.

Galaxias aff. *paucispondylus* "Southland" occurs within highly disturbed gravel-bed stream and river habitats that experience extremes in flow (floods and droughts) and are scattered within an agricultural landscape. In these habitats, *Galaxias* aff. *paucispondylus* "Southland" is influenced by piscivorous salmonids, water abstraction, gravel extraction and the domination of riparian margins by *Salix* spp. (willows), which stabilise habitat. Southland experienced prolonged drought conditions in the summers and autumns of 2021, 2022 and 2023 (NIWA 2021, 2022, 2023a, b, c), and drought events are likely to increase in frequency and intensity under climate change scenarios. Therefore, concern is held for *Galaxias* aff. *paucispondylus* "Southland" because sub-population fragments are subject to extended periods of adverse conditions during low-flow conditions, leading to population fluctuations and an inability for potentially extirpated sub-population fragments to be recolonised.

Galaxias "southern" (southern flathead galaxias (Otago, Southland))

Galaxias "southern" is a non-diadromous, iteroparous, vernal spawner. *Galaxias* "southern" is an endemic taxon that is widely distributed in Southland and has additional sub-populations in Otago on Te Waipounamu / the South Island and Stewart Island / Rakiura. *Galaxias* "southern" has a large number (93 remaining) of low-density, highly fragmented, very small to very large (total 710 ha remaining) sub-population fragments, which are scattered over six catchments across a large, highly agriculturally intensified geographical range.

Galaxias "southern" was assessed as At Risk – Declining, having previously been assessed by Dunn et al. (2018) as Threatened – Nationally Vulnerable. This improved conservation status is due to *Galaxias* "southern" having a larger estimated area of occupancy as a result of recent survey work locating new sub-population fragments, particularly on the periphery of the taxon's distribution. However, nearly two-thirds of the sub-population fragments have not been resurveyed recently, and there is concern that the declines observed in those sub-population fragments that have been resurveyed may be more widespread but as yet unreported. Moreover, the occurrence of *Galaxias* "southern" in larger braided rivers has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of reaches it is known from.

Galaxias "southern" occurs within gravel-bed stream and river habitats that experience extremes in flow (floods and droughts) and are scattered within an agricultural landscape. In these habitats, *Galaxias* "southern" is influenced by piscivorous salmonids,

water abstraction, gravel extraction and, in some instances, weed and sediment removal. Southland experienced prolonged drought conditions in the summers and autumns of 2021, 2022 and 2023 (NIWA 2021, 2022, 2023a, b, c), and drought events are likely to increase in frequency and intensity under climate change scenarios. Therefore, concern is held for *Galaxias* "southern" because sub-population fragments are subject to extended periods of adverse conditions during low-flow conditions, leading to population fluctuations and an inability for potentially extirpated sub-population fragments to be recolonised.

3.1.6 At Risk – Naturally Uncommon

Cheimarrichthys fosteri Haast 1874 (torrentfish)

Cheimarrichthys fosteri is an amphidromous, iteroparous, vernal–estival–autumnal spawner. *Cheimarrichthys fosteri* is an endemic taxon (and the only member of Cheimarrichthyidae, New Zealand's only endemic freshwater fish family), and is widely distributed on Te Ika-a-Māui / the North Island and Te Waipounamu / the South Island. *Cheimarrichthys fosteri* is known from 338 catchments, where it occurs at low abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (9297 ha), lacustrine (343 935 ha), palustrine (34 797 ha) and estuarine (66 037 ha) habitats.

Cheimarrichthys fosteri was assessed as At Risk – Naturally Uncommon, having previously been assessed by Dunn et al. (2018) as At Risk – Declining. This improved conservation status is due to *C. fosteri* having a moderate to large area of occupancy and a stable ongoing and predicted population trend, which is a change from Dunn et al. (2018), who based their assessment on the taxon having a very large area of occupancy and a low to high ongoing or predicted population trend decline. The expert panel now recognises that assessments of a taxon's area of occupancy should be based on the estimated area of spawning habitat, amending a historical misinterpretation that was introduced in the assessments of Hitchmough (2002) and Hitchmough et al. (2007). The spawning habitat of *C. fosteri* is assumed to be within adult habitat in the lower reaches of riverine habitats, above the marine environment (Warburton 2016; Warburton et al. 2023). This specialised adult habitat is typically very small; however, the expert panel considered that it could confidently categorise the estimated area of *C. fosteri* spawning habitat as being >100 ha and ≤1000 ha. Categorisation of the population trend was informed by the assessment of White et al (2022), which indicated a historic stability, leading the expert panel to consider the predicted population trend to also be stable, although it was considered that some sub-populations have shown recent declines, with environmental DNA sampling suggesting high abundances in Te Ika-a-Māui / North Island sites but a scarcity in Te Waipounamu / South Island sites.

Cheimarrichthys fosteri typically occurs in riverine habitat, where it is considered prone to flow modifications, especially low- to no-flow events because of water abstraction, as well as drought events, which are predicted to increase in frequency and intensity under climate change scenarios. A loss of connectivity through the river network during spawning migrations from adult habitats to the lower reaches of rivers (Warburton et al. 2023) is considered a particular threat to *C. fosteri*, and an intolerance to higher water temperatures may lead to a reduction in occupied habitat.

Galaxias fasciatus Gray 1842 (banded kokopu)

Galaxias fasciatus is an amphidromous, iteroparous, autumnal–hiemal spawner. *Galaxias fasciatus* is an endemic taxon that is widely distributed on Te Ika-a-Māui / the North Island, Te Waipounamu / the South Island, Stewart Island / Rakiura, Chatham Island / Rēkohu and Pitt Island (Rangiauria). *Galaxias fasciatus* is known from 518 catchments, where it occurs at low abundances, but has an unknown population size and an uncertain

area of occupancy or utilisation within riverine (5052 ha), lacustrine (18 341 ha), palustrine (24 125 ha) and estuarine (1978 ha) habitats.

Galaxias fasciatus was assessed as At Risk – Naturally Uncommon, having previously been assessed by Dunn et al. (2018) as Not Threatened. This worsened conservation status was due to a change in the application of criteria. *Galaxias fasciatus* was assessed as having a large area of occupancy and stable ongoing and predicted population trend, whereas Dunn et al. (2018) based their assessment on the taxon having a very large population size and a stable ongoing or predicted population trend. While *G. fasciatus* does occur in lacustrine habitats – where it can form facultatively landlocked populations – and palustrine habitats, inclusion of the entire geospatial polygons representing these habitats has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of habitats it is known from. Thus, the expert panel considered that the preferred riverine habitat area estimate more accurately reflected the area of occupancy. Categorisation of the population trend was informed by the assessment of White et al. (2022), which indicated a historic ongoing stability.

Galaxias fasciatus is a widespread taxon that is subject to a range of pressures in the habitats it occupies throughout its life cycle. Sedimentation is considered a major pressure on *G. fasciatus* (Rowe et al. 2000), both in urban streams and in those streams where intensive precipitation events have caused increased sediment run-off and landslips. Sedimentation is likely to increase under climate change scenarios that predict an increase in the frequency and intensity of flood flows. Furthermore, increasing drought conditions under climate change scenarios may see the favoured small, forested streams that *G. fasciatus* occupies dewatering more frequently and for longer periods, leading to a loss of habitat for this taxon. Thus, *G. fasciatus* was considered to have a high vulnerability to climate change by Egan et al. (2020).

Galaxias paucispondylus Stokell 1938 (alpine galaxias (Canterbury, Marlborough))

Galaxias paucispondylus is a non-diadromous, iteroparous, vernal spawner. *Galaxias paucispondylus* is an endemic taxon that is widely distributed in Canterbury and Marlborough on Te Waipounamu / the South Island. *Galaxias paucispondylus* has a large number (150 remaining) of low-density, highly fragmented, small to very large (total 956 ha remaining) sub-population fragments, which are scattered over 12 catchments across a large geographical range.

Galaxias paucispondylus was assessed as At Risk – Naturally Uncommon based on it having a moderate to large area of occupancy and a stable ongoing and predicted population trend. This is a change from Dunn et al. (2018), who based their assessment on *G. paucispondylus* having a large area of occupancy and a stable ongoing or predicted population trend. Increased knowledge of the area of occupancy was based on the geospatial assessment described in Dunn & O'Brien (2022). Categorisation of the population trend was informed by the assessment of White et al. (2022), although they did not separate *G. paucispondylus*, *Galaxias* aff. *paucispondylus* "Manuherikia" and *Galaxias* aff. *paucispondylus* "Southland" in their analyses, hindering the expert panel's interpretation. However, based on the sub-population fragment assessment described in Dunn & O'Brien (2022), three-quarters of sub-population fragments have not been resurveyed recently, increasing uncertainty about their current condition. Moreover, the occurrence of *G. paucispondylus* in larger braided rivers has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of reaches it is known from.

Galaxias paucispondylus typically occurs within alpine river catchments that are influenced by water abstraction, gravel extraction and disturbance-mediated salmonid predation, all of which place pressure on sub-population fragments (Lavender 2001; Dunn 2003; Boddy & McIntosh 2016). The habitats in which *G. paucispondylus* occurs are also likely to experience increases in the frequency and intensity of extremes in flow events (floods and droughts)

under climate change scenarios. Consequently, *G. paucispondylus* is prone to the effects of climate change, particularly during low-flow drought events, as this taxon has a specialised upper thermal tolerance of 13.8°C (Stokell 1938; Dunn 2003; Boddy & McIntosh 2016), so its distribution and area of habitat occupied may decrease as water temperatures increase.

Galaxias vulgaris Stokell 1949 (Canterbury galaxias)

Galaxias vulgaris is a non-diadromous, iteroparous, vernal spawner. *Galaxias vulgaris* is an endemic taxon that is widely distributed in Canterbury and northern Otago on Te Waipounamu / the South Island. *Galaxias vulgaris* has a very large number (452 remaining) of very low density, highly fragmented, very small to large (total 2310 ha remaining) sub-population fragments, which are scattered over 43 catchments across a large, highly agriculturally intensified geographical range.

Galaxias vulgaris was assessed as At Risk – Naturally Uncommon, having previously been assessed by Dunn et al. (2018) as At Risk – Declining. This improved conservation status was based on increased knowledge of the area of occupancy, which has changed from 'moderate to large' to 'large' based on the geospatial assessment described in Dunn & O'Brien (2022), and due to a change in the categorisation of the ongoing and predicted population trend from a 10–30% decline by Dunn et al. (2018) (based on Crow et al. 2016) to a stable ongoing and predicted population trend (based on White et al. 2022). However, two-thirds of sub-population fragments have not been resurveyed recently, increasing uncertainty about their current condition, and the occurrence of *G. vulgaris* in larger braided rivers has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of reaches it is known from.

Galaxias vulgaris typically occurs within foothill and alpine river catchments that are influenced by water abstraction, gravel extraction, salmonid predation and extremes in flow (floods and droughts, which are likely to increase in frequency and intensity under climate change scenarios), all of which place pressure on sub-population fragments (Lavender 2001; Dunn 2003; Davey et al. 2006; Davey & Kelly 2007; Crow et al. 2013; Boddy et al. 2019).

Gobiomorphus alpinus Stokell 1962 (Tarndale bully)

Gobiomorphus alpinus is non-diadromous and iteroparous, but the timing of spawning is unknown. *Gobiomorphus alpinus* is an endemic taxon that is restricted to Marlborough on Te Waipounamu / the South Island. *Gobiomorphus alpinus* has a small number (five remaining) of high-density, isolated, small to moderately large (total 59.52 ha remaining) sub-population fragments that occur in lacustrine habitats within the Tarndale basin of the catchments of the Wairau River and Waiau Toa / Clarence River.

Gobiomorphus alpinus was assessed as At Risk – Naturally Uncommon based on it having a moderate area of occupancy and a stable ongoing and predicted population trend. However, there has been no recorded survey work for *G. alpinus* since 2012. Thus, based on survey work conducted in 1997 (Barrier 1998) and 2012 (Rutledge & Clayton-Greene 2012), the expert panel considered it likely that while there has been no change in the estimated area of occupancy, there may have been a historic decline in population size since pre-human time, with *G. alpinus* now persisting at a reduced but stable population size. However, further survey work is required to confirm this.

Gobiomorphus alpinus occupies a small number of tarns and lakes of differing characteristics within an extensive agricultural landscape in the Molesworth Recreation Reserve (public conservation land administered by DOC). Much of the reserve is covered by a farming lease, and cattle around the waterbody margins have caused sedimentation (Barrier 1998). Further pressures include introduced piscivorous *Salmo trutta* (brown trout) in some waterbodies, the introduction of aquatic pest plants and water quality issues related to waterfowl, particularly *Branta canadensis* (Canada geese).

***Gobiomorphus basalis* (Gray 1842) (Cran's bully)**

Gobiomorphus basalis is a non-diadromous, iteroparous, vernal–estival spawner. *Gobiomorphus basalis* is an endemic taxon that is widely distributed in northern Te Ika-a-Māui / North Island. *Gobiomorphus basalis* is known from 56 catchments, where it occurs at moderate abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (2415 ha), lacustrine margin (259 ha) and palustrine (22 ha) habitats.

Gobiomorphus basalis was assessed as At Risk – Naturally Uncommon, having previously been assessed by Dunn et al. (2018) as Not Threatened. This worsened conservation status is due to a change in the application of criteria. *Gobiomorphus basalis* was assessed as having a large area of occupancy and a stable ongoing and predicted population trend, whereas Dunn et al. (2018) based their assessment on the taxon having a very large population size and a stable ongoing or predicted population trend. While *G. basalis* does occur in lacustrine and palustrine habitats, inclusion of the entire geospatial polygons representing these habitats has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of habitats it is known from. The number of sub-populations, distribution and estimated area of occupancy of *G. basalis* have also changed since the assessment of Dunn et al. (2018) due to sub-populations across southern Te Ika-a-Māui / North Island having been reassigned to *Gobiomorphus dinae*. This recent taxonomic change and the difficulty with field identification may see the currently recognised distributions of these taxa changing following the analysis of further genetic material. Categorisation of the population trend was informed by the assessment of White et al. (2022), although they did not separate *G. basalis* and *G. dinae* in their analyses, hindering the expert panel's interpretation. However, the expert panel considered that the population trend presented by White et al. (2022) indicated that the ongoing population trend had been stable over the last 10 years, resulting in the predicted trend also being categorised as stable.

Gobiomorphus basalis is a widespread taxon that is subject to a range of pressures in the habitats it occupies, including factors that influence the hydrological environment, physical habitat structure and water quality. *Gobiomorphus basalis* is also considered to have been historically impacted by piscivorous salmonids.

***Gobiomorphus breviceps* (Stokell 1939) (upland bully)**

Gobiomorphus breviceps is a non-diadromous, iteroparous, vernal–estival spawner. *Gobiomorphus breviceps* is an endemic taxon that is widely distributed in eastern and southern Te Waipounamu / South Island and on Stewart Island / Rakiura. *Gobiomorphus breviceps* is known from 78 catchments, where it occurs at moderate abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (19 810 ha), lacustrine (23 203 ha), palustrine (5024 ha) and estuarine (459 ha) habitats.

Gobiomorphus breviceps was assessed as At Risk – Naturally Uncommon, having previously been assessed by Dunn et al. (2018) as Not Threatened. This worsened conservation status is due to a change in the application of criteria. *Gobiomorphus breviceps* was assessed as having a very large area of occupancy and a stable ongoing and predicted population trend, whereas Dunn et al. (2018) based their assessment on the taxon having a very large population size and a stable ongoing or predicted population trend. While *G. breviceps* does occur in lacustrine, palustrine and estuarine habitats, inclusion of the entire geospatial polygons representing these habitats has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of habitats it is known from. However, this overestimation is not likely to have influenced the categorisation of the taxon due to its very large area of occupancy in riverine habitats. The number of sub-populations, distribution and estimated area of occupancy of *G. breviceps* have also changed since the assessment of Dunn et al. (2018)

due to sub-populations in northern Te Waipounamu / South Island having been reassigned to *Gobiomorphus mataraerore*. This recent taxonomic change and the difficulty with field identification may see the currently recognised distributions of these taxa changing following the analysis of further genetic material. Categorisation of the population trend was informed by the assessment of White et al. (2022), although they did not separate *G. mataraerore* and *G. breviceps* in their analyses, hindering the expert panel's interpretation. However, the expert panel considered that the population trend presented by White et al. (2022) indicated that the ongoing population trend had been stable over the last 10 years, resulting in the predicted trend also being categorised as stable.

Gobiomorphus breviceps is a widespread taxon that is subject to a range of pressures in the habitats it occupies, including factors that influence the hydrological environment, physical habitat structure and water quality. *Gobiomorphus breviceps* is also considered to be particularly impacted by piscivorous salmonids.

Gobiomorphus dinae Thacker, Geiger & Shelley 2023 (Dinah's bully)

Gobiomorphus dinae is a non-diadromous, iteroparous, vernal–estival spawner. *Gobiomorphus dinae* is an endemic taxon that is widely distributed in southern Te Ika-a-Māui / North Island. *Gobiomorphus dinae* is known from 62 catchments, where it occurs at moderate abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (7699 ha), lacustrine (91 ha), palustrine (8 ha) and estuarine (26 ha) habitats.

Gobiomorphus dinae was assessed for the first time here as At Risk – Naturally Uncommon based on it having a large area of occupancy and a stable ongoing and predicted population trend. While *G. dinae* does occur in lacustrine, palustrine and estuarine habitats, inclusion of the entire geospatial polygons representing these habitats has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of habitats it is known from. The recent taxonomic changes to *G. basalis* with the recognition of *G. dinae*, and the assignment of lower Te Ika-a-Māui / North Island sub-populations to this newly recognised taxon and the difficulty with field identification may see the currently recognised distributions of these taxa changing following the analysis of further genetic material. Categorisation of the population trend of *G. dinae* was informed by the assessment of White et al. (2022), although they did not separate *G. basalis* and *G. dinae* in their analyses, hindering the expert panel's interpretation. However, the expert panel considered that the population trend presented by White et al. (2022) indicated that the ongoing population trend had been stable over the last 10 years, resulting in the predicted trend also being categorised as stable.

Gobiomorphus dinae is a widespread taxon that is subject to a range of pressures in the habitats it occupies, including factors that influence the hydrological environment, physical habitat structure and water quality. *Gobiomorphus dinae* is also considered to have been historically impacted by piscivorous salmonids.

Gobiomorphus gobioides (Valenciennes 1837) (giant bully)

Gobiomorphus gobioides is an amphidromous, iteroparous, vernal spawner. *Gobiomorphus gobioides* is an endemic taxon that is widely distributed on Te Ika-a-Māui / the North Island, Te Waipounamu / the South Island and Stewart Island / Rakiura. *Gobiomorphus gobioides* is known from 247 catchments, where it occurs at low abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (803 ha), lacustrine (91 ha), palustrine (8 ha) and estuarine (26 ha) habitats.

Gobiomorphus gobioides was assessed as At Risk – Naturally Uncommon based on it having a moderate to large area of occupancy and a stable ongoing and predicted population trend. While *G. gobioides* does occur in lacustrine, palustrine and the upper, brackish reaches of

estuarine habitats, inclusion of the entire geospatial polygons representing these habitats has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of habitats it is known from and is considered to predominantly occupy riverine habitat.

Gobiomorphus gobioides is a widespread taxon that is subject to a range of pressures in the habitats it occupies. In particular, the lower reaches of rivers and upper brackish areas of estuaries where *G. gobioides* occurs could potentially be impacted by predicted sea level rise under climate change scenarios. However, it is considered that this zone of habitat will still be accessible to *G. gobioides* if it is not constrained from moving further inland as a result of human activities.

Gobiomorphus hubbsi (Stokell 1959) (bluegill bully)

Gobiomorphus hubbsi is an amphidromous, iteroparous, vernal spawner. *Gobiomorphus hubbsi* is an endemic taxon that is widely distributed on Te Ika-a-Māui / the North Island and Te Waipounamu / the South Island. *Gobiomorphus hubbsi* is known from 209 catchments, where it occurs at moderate abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (1849 ha), lacustrine (1231 ha), palustrine (4 ha) and estuarine (103 159 ha) habitats.

Gobiomorphus hubbsi was assessed as At Risk – Naturally Uncommon, having previously been assessed by Dunn et al. (2018) as At Risk – Declining. This improved conservation status is due to a change in the application of criteria. *Gobiomorphus hubbsi* was assessed as having a large area of occupancy and a stable ongoing and predicted population trend, whereas Dunn et al. (2018) based their assessment on the taxon having a very large area of occupancy and low ongoing or predicted population trend decline. While *G. hubbsi* does occur in lacustrine, palustrine and estuarine habitats, inclusion of the entire geospatial polygons representing these habitats has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of habitats it is known from. Furthermore, the expert panel considered that estuarine habitat is predominantly utilised by juvenile *G. hubbsi*. Consequently, the area of occupancy was categorised based on the riverine and lacustrine habitats of adults. Categorisation of the population trend was informed by the assessment of White et al. (2022), which indicated a historic decline before stabilisation in the last 10 years, resulting in the predicted trend also being categorised as stable. However, it is acknowledged that *G. hubbsi* occurs in habitats that are not routinely sampled and that changes in survey methods may reduce the probability of detection.

Gobiomorphus hubbsi is a widespread taxon that is subject to a range of pressures in the habitats it occupies, including factors that influence the hydrological environment, physical habitat structure and water quality. *Gobiomorphus hubbsi* is considered to be particularly impacted by low-flow events, which are likely to increase in frequency and intensity under climate change scenarios.

Gobiomorphus huttoni (Ogilby 1894) (redfin bully)

Gobiomorphus huttoni is an amphidromous, iteroparous, vernal spawner. *Gobiomorphus huttoni* is an endemic taxon that is widely distributed on Te Ika-a-Māui / the North Island, Te Waipounamu / the South Island, Stewart Island / Rakiura, Chatham Island / Rēkohu and Pitt Island (Rangiauria). *Gobiomorphus huttoni* is known from 571 catchments, where it occurs at low to moderate abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (8304 ha), lacustrine (6678 ha), palustrine (8487 ha) and estuarine (233 217 ha) habitats.

Gobiomorphus huttoni was assessed as At Risk – Naturally Uncommon, having previously been assessed by Dunn et al. (2018) as Not Threatened. This worsened conservation status is due to a change in the application of criteria. *Gobiomorphus huttoni* was assessed as having

a very large area of occupancy and a stable ongoing and predicted population trend, whereas Dunn et al. (2018) based their assessment on the taxon having a very large population size and a stable ongoing or predicted population trend. While *G. huttoni* does occur in lacustrine and palustrine habitats, inclusion of the entire geospatial polygons representing these habitats has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of habitats it is known from. Consequently, the area of occupancy was categorised based on the riverine habitat of adults. Categorisation of the population trend was informed by the assessment of White et al. (2022), which indicated a historic decline before stabilisation in the last 10 years, resulting in the predicted trend also being categorised as stable. However, it is acknowledged that *G. huttoni* occurs in habitats that are not routinely sampled and that changes in survey methods may reduce the probability of detection.

Gobiomorphus huttoni is a widespread taxon that is subject to a range of pressures in the habitats it occupies, including factors that influence the hydrological environment, physical habitat structure and water quality. *Gobiomorphus huttoni* is considered to be particularly impacted by low-flow events, which are likely to increase in frequency and intensity under climate change scenarios.

Gobiomorphus mataraerore Thacker, Geiger & Shelley 2023 (Kaharore bully)

Gobiomorphus mataraerore is a non-diadromous, iteroparous, vernal–estival spawner. *Gobiomorphus mataraerore* is an endemic taxon that is widely distributed in southern Te Ika-a-Māui / North Island and in northern and western Te Waipounamu / South Island. *Gobiomorphus mataraerore* is known from 60 catchments, where it occurs at moderate abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (10 775 ha), lacustrine (681 ha), palustrine (94 ha) and estuarine (28 ha) habitats.

Gobiomorphus mataraerore was assessed as At Risk – Naturally Uncommon, having previously been assessed by Dunn et al. (2018) as Not Threatened, at which time it was recognised as *Gobiomorphus* aff. *breviceps*. This worsened conservation status is due to a change in the application of criteria. *Gobiomorphus mataraerore* was assessed as having a very large area of occupancy and a stable ongoing and predicted population trend, whereas Dunn et al. (2018) based their assessment on the taxon having a very large population size and a stable ongoing or predicted population trend. While *G. mataraerore* does occur in lacustrine, palustrine and estuarine habitats, inclusion of the entire geospatial polygons representing these habitats has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of habitats it is known from. However, this overestimation is not likely to have influenced the categorisation due to the very large area of occupancy of *G. mataraerore* in riverine habitats. The number of sub-populations, distribution and estimated area of occupancy of *G. mataraerore* have also changed since the assessment of Dunn et al. (2018) due to sub-populations in northern Te Waipounamu / South Island having been reassigned from *G. breviceps*. This recent taxonomic change and the difficulty with field identification may see the currently recognised distributions of these taxa changing following the analysis of further genetic material. Categorisation of the population trend was informed by the assessment of White et al. (2022), although they did not separate *G. mataraerore* and *G. breviceps* in their analyses, hindering the expert panel's interpretation. However, the expert panel considered that the population trend presented by White et al. (2022) indicated that the ongoing population trend had been stable over the last 10 years, resulting in the predicted trend also being categorised as stable.

Gobiomorphus mataraerore is a widespread taxon that is subject to a range of pressures in the habitats it occupies, including factors that influence the hydrological environment, physical habitat structure and water quality. *Gobiomorphus mataraerore* is also considered to be particularly impacted by piscivorous salmonids.

***Neochanna rekohua* (Mitchell 1995) (Chatham Island mudfish)**

Neochanna rekohua is non-diadromous and iteroparous, but the timing of spawning is unknown. *Neochanna rekohua* is an endemic taxon that is restricted to Chatham Island / Rēkohu. *Neochanna rekohua* has a small number (six remaining) of high-density, fragmented, small to large (uncertain occupied area within wetland-lake complexes totalling 113 ha) sub-population fragments, which are scattered across four catchments.

Neochanna rekohua was assessed as At Risk – Naturally Uncommon based on it having a moderate to large area of occupancy and a stable ongoing and predicted population trend. This is a change from Dunn et al. (2018), who based their assessment on *N. rekohua* having a moderate area of occupancy, due to increased knowledge of the area of occupancy based on the geospatial assessment described in Dunn & O'Brien (2022). There is also greater knowledge of the distribution of *N. rekohua* as a result of recent survey work locating new sub-population fragments in Lakes Rotoeka, Rotokawau and Rotorua / Te Rotorua nui ā Kahumatamomoe, meaning that *N. rekohua* is now also known to occur in the large catchment of Te Whanga Lagoon. The expert panel considered the ongoing or predicted population trend to be stable based on knowledge from previous monitoring work. However, based on the sub-population fragment assessment described in Dunn & O'Brien (2022), two-thirds of sub-population fragments have not been resurveyed recently, leading to a high degree of concern for their condition. Also, there has been little research on the habitat preferences of *N. rekohua* (O'Brien & Dunn 2007), resulting in uncertainty as to whether the use of entire lake and wetland polygons has resulted in an overestimation of the area of occupancy, as the taxon may not occupy the entire extent of lake-wetland complexes it is known from.

Neochanna rekohua predominantly occurs in lake-wetland complexes in the southern area of Chatham Island / Rēkohu that are relatively isolated and have little development. The largest pressure on this taxon is fire, which may increase under climate change scenarios. However, the recent location of new sub-population fragments towards the north-northeast of the island necessitates further assessment of the pressures, as these are currently unknown in this area.

3.1.7 Not Threatened

***Aldrichetta forsteri* (Valenciennes 1836) (yellow-eye mullet)**

Aldrichetta forsteri is a euryhaline wanderer that facultatively enters fresh water and an iteroparous, estival–autumnal spawner. *Aldrichetta forsteri* is an indigenous taxon that is widely distributed on Te Ika-a-Māui / the North Island, Te Waipounamu / the South Island and Chatham Island / Rēkohu. In New Zealand, *A. forsteri* is known from 131 catchments, where it occurs at very high abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine, lacustrine and estuarine habitats totalling 270 359 ha.

Aldrichetta forsteri was assessed as Not Threatened based on it having a very large population size and a stable ongoing and predicted population trend. This assessment utilised analyses of commercial catch data (Fisheries New Zealand 2022), which indicated that landings have been below the Total Allowable Commercial Catch (TACC) within the Quota Management System (QMS) administered by Fisheries New Zealand (Ministry for Primary Industries). Similarly, estimates of recreational catch obtained by panel surveys of fishers in 2017–2018 and reported in Fisheries New Zealand (2022) indicated that catches in most Fisheries Management Areas (FMAs) have been below the recreational allowance, with the exception of Auckland (West). However, it is considered that stocks, particularly those associated with the Manukau Harbour, 'may be susceptible to localised depletion' (Fisheries New Zealand 2022: 1885). It should also be noted that catch data, including estimates of density, do not represent a census of the entire *A. forsteri* population and so were considered indicative only in this assessment.

Anthropogenic activities leading to the degradation of harbours and estuaries that are utilised as feeding and survival habitat by *A. forsteri* are potential pressures on this taxon (Fisheries New Zealand 2022). However, *A. forsteri* was considered to have a low vulnerability to climate change by Egan et al. (2020).

Anguilla australis Richardson 1841 (shortfin eel)

Anguilla australis is catadromous and semelparous, but the timing of spawning is unknown. *Anguilla australis* is an indigenous taxon that is widely distributed on Te Ika-a-Māui / the North Island, Te Waipounamu / the South Island, Stewart Island / Rakiura, Chatham Island / Rēkohu and Pitt Island (Rangiauria). In New Zealand, *A. australis* is known from 552 catchments, where it occurs at moderate abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (14 392 ha), lacustrine and palustrine habitats (the areas of the latter two habitat types are yet to be determined).

Anguilla australis was assessed as Not Threatened based on it having a very large population size and a stable ongoing and predicted population trend. This is a change from Dunn et al. (2018), who based their assessment on *A. australis* having an increasing ongoing or predicted population trend based on the analyses of Crow et al. (2016). This change occurred because the trend analyses of White et al. (2022) indicated that the ongoing population trend of *A. australis* has stabilised, leading the expert panel to consider that the predicted population trend is also likely to be stable over the next 100 years (this longer time frame is used because of the long lifespan of *A. australis*). The assessment of a very large population size utilised analyses of commercial catch data, which indicated that landings in 2020–2021 (247 tonnes) were below the Total Allowable Commercial Catch (TACC) within the Quota Management System (QMS) administered by Fisheries New Zealand (Ministry for Primary Industries) and that the commercial catch has continued to decline over the last decade (Fisheries New Zealand 2022). However, while an allocation is also set for recreational and customary non-commercial fisheries, there were no catch data available. It should also be noted that catch data, including estimates of densities, do not represent a census of the entire *A. australis* population and so are considered indicative only in this assessment.

Anguilla australis is a widespread taxon that is subject to a range of pressures in the lowland riverine and lacustrine habitats it occupies. *Anguilla australis* was considered to be highly vulnerable to climate change by Egan et al. (2020), particularly in relation to the effects of sea temperature rise and ocean acidification on spawning and recruitment, as well as increases in the frequency and intensity of extremes in flow (floods and droughts) – indeed, anguillids are typically the most recorded fish taxa during mass mortality events under drought conditions. Furthermore, lowland habitats are prone to inundation under climate change scenarios, which may affect the freshwater habitats of *A. australis*.

Forsterygion nigripenne (Valenciennes 1836) (estuarine triplefin)

Forsterygion nigripenne is a euryhaline wanderer that enters estuarine habitat and an iteroparous, vernal spawner. *Forsterygion nigripenne* is an endemic taxon that is widely distributed on Te Ika-a-Māui / the North Island and Te Waipounamu / the South Island. *Forsterygion nigripenne* is known from 69 catchments, where it occurs at moderate abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within estuarine habitats and the lower reaches of influent rivers totalling 193 972 ha.

Forsterygion nigripenne was assessed as Not Threatened based on it having a very large population size and a stable ongoing and predicted population trend. However, there is likely uncertainty with this assessment, as no population monitoring of *F. nigripenne* occurs and the estuarine habitats it occupies are only rarely sampled.

***Gobiomorphus cotidianus* McDowall 1975 (common bully)**

Gobiomorphus cotidianus is an amphidromous, iteroparous, vernal–estival spawner. *Gobiomorphus cotidianus* is an endemic taxon that is widely distributed on Te Ika-a-Māui / the North Island, Te Waipounamu / the South Island and Stewart Island / Rakiura. *Gobiomorphus cotidianus* is known from 542 catchments, where it occurs at moderate abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine (9297 ha), lacustrine (343 935 ha), palustrine (34 797 ha) and estuarine (66 037 ha) habitats.

Gobiomorphus cotidianus was assessed as Not Threatened based on it having a very large area of occupancy and a stable ongoing and predicted population trend. This is a change in the criteria (due to a change in their application) but not the category from Dunn et al. (2018), who based their assessment on *G. cotidianus* having a very large population size and a stable ongoing or predicted population trend. While *G. cotidianus* does occur in lacustrine, palustrine and estuarine habitats, inclusion of the entire geospatial polygons representing these habitats has likely resulted in an overestimation of the area of occupancy, as it does not occupy the entire extent of habitats it is known from. However, given the very large area of occupancy in riverine and lacustrine habitats – where it can form facultatively landlocked populations – this overestimation is unlikely to have influenced the categorisation. Categorisation of the population trend was informed by the assessment of White et al. (2022), which indicated a historic decline before stabilisation in the last 10 years, resulting in the predicted trend also being categorised as stable.

Gobiomorphus cotidianus is a widespread taxon that is subject to a range of pressures in the lowland river and lake habitats it occupies, including factors that influence the hydrological environment, physical habitat structure and water quality.

***Mugil cephalus* Linnaeus 1758 (grey mullet)**

Mugil cephalus is a euryhaline wanderer that facultatively enters fresh water and an iteroparous, hiemal spawner. *Mugil cephalus* is an indigenous taxon that is widely distributed on Te Ika-a-Māui / the North Island and in northern Te Waipounamu / South Island. In New Zealand, *M. cephalus* is known from 51 catchments, where it occurs at moderate abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine, lacustrine and estuarine habitats totalling 189 145 ha.

Mugil cephalus was assessed as Not Threatened based on it having a very large population size and a stable ongoing and predicted population trend. This assessment utilised analyses of commercial catch data (Fisheries New Zealand 2022), which indicated that landings have been below the Total Allowable Commercial Catch (TACC) within the Quota Management System (QMS) administered by Fisheries New Zealand (Ministry for Primary Industries). The recreational fishery is considered to be a minor component of the overall fishery (Wynne-Jones et al. 2014), so while estimates of the recreational catch were obtained by panel surveys of fishers in 2017–2018 and reported on by Fisheries New Zealand (2022), there is no set allocation. By contrast, it is considered that the customary non-commercial fishery is important, so an allocation has been set for this, although no catch data were available. It should also be noted that catch data, including estimates of density, do not represent a census of the entire *M. cephalus* population and so were considered indicative only in this assessment.

Anthropogenic activities that lead to the degradation of harbours and estuaries that are utilised as feeding and survival habitat by *M. cephalus*, as well as the lower reaches of larger rivers, such as the Waikato River and its lower lakes, are potential pressures on this taxon (Fisheries New Zealand 2022).

***Rhombosolea retiaria* Hutton 1874 (black flounder)**

Rhombosolea retiaria is catadromous, has an unknown but likely iteroparous reproductive episodic strategy and is likely a hiemal spawner. *Rhombosolea retiaria* is an endemic taxon that is widely distributed on Te Ika-a-Māui / the North Island and Te Waipounamu / the South Island. *Rhombosolea retiaria* is known from 109 catchments, where it occurs at low abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine, lacustrine and estuarine habitats totalling 170 859 ha.

Rhombosolea retiaria was assessed as Not Threatened based on it having a large population size and a stable ongoing and predicted population trend. This assessment utilised analyses of commercial catch data (Fisheries New Zealand 2022), although this was hampered by all flatfishes included in the Quota Management System (QMS) administered by Fisheries New Zealand (Ministry for Primary Industries) being recorded and reported on as a single group. However, analyses of the taxon composition of the commercial catch indicated that *R. retiaria* is a small component of the catch and that reported commercial catches are below the Total Allowable Commercial Catch (TACC) within the Fisheries Management Areas (FMAs) – although Jellyman (2011) reported that *R. retiaria* comprised 55% of the catch in Lake Ellesmere / Te Waihora. Estimates of recreational catch obtained by panel surveys of fishers in 2017–2018 and reported in Fisheries New Zealand (2022) indicated that catches in northern FMAs can be high, and there may be progressive depletion of the stock in these areas, whereas flatfishes are more widespread in the south, with no evidence of decline. However, it should be noted that catch data, including estimates of density, do not represent a census of the entire *R. retiaria* population and so were considered indicative only in this assessment.

Anthropogenic activities leading to the degradation of harbours, estuaries and lakes utilised as feeding and survival habitat by *R. retiaria*, and variable juvenile survival in these habitats, are potential pressures on this taxon (Fisheries New Zealand 2022). Moreover, *R. retiaria* spawns at 2–3 years of age (Jellyman 2011) and many individuals only spawn once (Fisheries New Zealand 2022), meaning there are few year classes, making the taxon susceptible to climate impacts in both freshwater and marine environments.

3.1.8 Non-resident Native – Migrant

***Anguilla reinhardtii* Steindachner 1867 (Australian longfin eel)**

Anguilla reinhardtii is catadromous and semelparous, but the timing of spawning is unknown. *Anguilla reinhardtii* is an indigenous taxon that is sporadically distributed on Te Ika-a-Māui / the North Island and Te Waipounamu / the South Island. In New Zealand, *A. reinhardtii* is known from 13 catchments, where it occurs at low abundances, but has an unknown population size and an uncertain area of occupancy or utilisation within riverine and lacustrine habitats (the area occupied is yet to be determined).

Anguilla reinhardtii was assessed as Non-resident Native – Migrant, having previously been assessed by Hitchmough (2002), Allibone et al. (2010), Goodman et al. (2014) and Dunn et al. (2018) as Non-resident Native – Coloniser. This reassignment was considered by the expert panel as a more appropriate application of the NZTCS assessment criteria of Townsend et al. (2008). However, the expert panel recognised that further work is required to understand the population size and area of occupancy of *A. reinhardtii*, and thus future conservation status assessments may more appropriately assess the taxon in another category. *Anguilla reinhardtii* was first recognised in New Zealand in 1996 (Jellyman et al. 1996) but may have been present since the 1970s (Roberts et al. 2015), as it is easily misidentified as *Anguilla australis* or *Anguilla dieffenbachii* (McDowall 2000). *Anguilla reinhardtii* is recorded as comprising an unknown but likely small proportion of the North Island commercial freshwater eel fishery (Fisheries New Zealand 2022), but little is otherwise known of its distribution or demographics.

3.1.9 Non-resident Native – Coloniser

***Gobiopterus semivestitus* (Munro 1949) (glass goby)**

Gobiopterus semivestitus is a euryhaline wanderer that facultatively enters fresh water, but the reproductive episodic strategy and timing of spawning are unknown. *Gobiopterus semivestitus* is an indigenous taxon that is sparsely distributed in northern Te Ika-a-Māui / North Island. In New Zealand, *G. semivestitus* is known from three catchments but has an unknown population size and an uncertain area of occupancy or utilisation within estuarine habitats and the lower reaches of influent rivers (the area occupied is yet to be determined).

Gobiopterus semivestitus was assessed as Non-resident Native – Coloniser based on it first being recognised in New Zealand by McDowall & David (2008). However, limited information exists about the life history, demographics or distribution of *G. semivestitus*, and it is not included in the NZFFD (NIWA 2023d). Roberts et al. (2015) summarised that *G. semivestitus* is easily overlooked because of its size, while commentaries in Global Biodiversity Information Facility records (GBIF 2023) further suggest the tendency for this taxon to be misidentified due to its resemblance to similar taxa inhabiting estuarine habitats.

***Parioglossus marginalis* Rennis & Hoese 1985 (dart goby)**

Parioglossus marginalis is a euryhaline wanderer that facultatively enters fresh water, but the reproductive episodic strategy and timing of spawning are unknown. *Parioglossus marginalis* is an indigenous taxon that is sparsely distributed in northern Te Ika-a-Māui / North Island. In New Zealand, *P. marginalis* is known from four catchments but has an unknown population size and an uncertain area of occupancy or utilisation within brackish riverine habitats (the area occupied is yet to be determined).

Parioglossus marginalis was assessed as Non-resident Native – Coloniser based on McDowall (2001) being unable to determine if it is native to New Zealand or has been introduced. However, Roberts et al. (2015: 1584) considered *P. marginalis* to be 'an adventive' taxon that was likely introduced from Australia by ship, as its larval stages would be unable to transit in ocean currents. Thus, future conservation status assessments may more appropriately recognise *P. marginalis* as Introduced and Naturalised. *Parioglossus marginalis* was first recognised in New Zealand by McDowall (2001: 170), who considered that it may have been present for some time but overlooked because of it being 'insignificantly-looking' and occurring in rarely sampled habitats. As such, limited information exists about the life history, demographics or distribution of *P. marginalis*.

3.2 Assessments

The conservation statuses of 78 New Zealand freshwater fish taxa are presented in Table 4. Taxa were assessed according to the criteria of Townsend et al. (2008) and have been grouped by conservation status and then alphabetically by scientific name. Categories are ordered by degree of loss, with Extinct at the top and Not Threatened at the bottom, above Non-resident Native and Introduced and Naturalised.

Brief descriptions of the NZTCS categories and criteria are provided in section 3.3. See Townsend et al. (2008), Michel (2021) and Rolfe et al. (2021) for details.

Data for the taxa listed in Table 4 can be viewed and downloaded at https://nztcs.org.nz/reports/1119.

Table 4. Conservation status of New Zealand freshwater fish taxa in 2023.

Qualifiers are abbreviated as follows: CD = Conservation Dependent, CI = Climate Impact, CR = Conservation Research Needed, DPR = Data Poor Recognition, DPS = Data Poor Size, DPT = Data Poor Trend, , EF = Extreme Fluctuation, IE = Island Endemic, Inc = Increasing, OL = One Location, PD = Partial Decline, PF = Population Fragmentation, RR = Range Restricted, SO = Secure Overseas, SO? = Secure Overseas?, S?O = Secure? Overseas, Sp = Biologically Sparse.

ASSESSMENT NAME AND AUTHORITY	COMMON NAME (ENGLISH)	FAMILY	CRITERIA	QUALIFIERS	STATUS CHANGE
EXTINCT (1)					
Taxonomically determinate (1)					
Prototroctes oxyrhynchus Günther 1870	grayling	Retropinnidae			No change
THREATENED (22)					
NATIONALLY CRITICAL (4)					
Taxonomically determinate (2)					
Neochanna burrowsius (Phillipps 1926)	Canterbury mudfish	Galaxiidae	C	CD, CI, EF, PF, RR, Sp	No change
Stokellia anisodon (Stokell 1941)	Stokell's smelt	Retropinnidae	C	CI, CR, DPR, RR	Worse
Taxonomically unresolved (2)					
Galaxias aff. *cobitinis* "Waitaki"	lowland longjaw galaxias (Waitaki River)	Galaxiidae	B(3)	CD, CI, CR, DPT, PF, RR	Worse
Galaxias "Teviot"	Teviot flathead galaxias (Teviot River)	Galaxiidae	A(3)	CD, CI, PF, RR	No change
NATIONALLY ENDANGERED (4)					
Taxonomically determinate (1)					
Galaxias cobitinis McDowall & Waters 2002	lowland longjaw galaxias (Kakanui River)	Galaxiidae	B(1)	CD, CI, EF, OL	Better
Taxonomically unresolved (3)					
Galaxias aff. *paucispondylus* "Manuherikia"	alpine galaxias (Manuherikia River)	Galaxiidae	B(3)	CI, DPT, EF, OL	No change
Galaxias "dune lakes"	dune lakes galaxias (Kai Iwi lakes)	Galaxiidae	A(3)	CI, DPT, EF, PF, RR	Worse
Galaxias "Nevis"	Nevis galaxias (Nevis River)	Galaxiidae	A(3)	CD, CI, EF, OL	No change
NATIONALLY VULNERABLE (14)					
Taxonomically determinate (10)					
Galaxias anomalus Stokell 1959	central Otago roundhead galaxias	Galaxiidae	C(3)	CD, CI, EF, PF, RR	Better
Galaxias eldoni McDowall 1997	Eldon's galaxias	Galaxiidae	C(3)	CD, CI, PD, PF, RR	Better
Galaxias gracilis McDowall 1967	dwarf inanga (North Kaipara Head dune lakes)	Galaxiidae	D(3)	CI, CR, DPS	Worse
Galaxias macronasus McDowall & Waters 2003	bignose galaxias	Galaxiidae	C(3)	CD, CI, PF, RR	No change
Galaxias maculatus (Jenyns 1842)	inanga	Galaxiidae	B(3)	CD, DPS, RR, SO?	Worse
Galaxias postvectis Clarke 1899	shortjaw kokopu	Galaxiidae	C(1)	CI	No change
Galaxias prognathus Stokell 1940	upland longjaw galaxias (Canterbury)	Galaxiidae	C(3)	CI, DPT, EF, PF, RR, Sp	No change

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Table 4 continued

ASSESSMENT NAME AND AUTHORITY	COMMON NAME (ENGLISH)	FAMILY	CRITERIA	QUALIFIERS	STATUS CHANGE
Galaxias pullus McDowall 1997	dusky galaxias	Galaxiidae	C(3)	CD, CI, DPT, PD, PF, RR	Better
Geotria australis Gray 1851	lamprey	Geotriidae	C(3)	CI, CR, DPS, DPT, S?O	No change
Neochanna heleios Ling & Gleeson 2001	Northland mudfish	Galaxiidae	C(3)	CD, CI, DPS, PF, RR	No change
Taxonomically unresolved (4)					
Galaxias aff. *prognathus* "Waitaki"	upland longjaw galaxias (Waitaki River)	Galaxiidae	C(3)	CD, CI, DPT, EF, PF, RR, Sp	No change
Galaxias "northern"	northern flathead galaxias (Marlborough, Nelson, West Coast)	Galaxiidae	C(3)	CI, CR, DPS, DPT, PF, RR, Sp	No change
Galaxias "Pomahaka"	Pomahaka galaxias (Pomahaka River)	Galaxiidae	C(3)	CD, CI, DPT, PF, RR	No change
Galaxias "species D"	Clutha flathead galaxias (Clutha River)	Galaxiidae	C(3)	CD, CI, DPT, PF, RR	Better
AT RISK (25)					
DECLINING (12)					
Taxonomically determinate (9)					
Anguilla dieffenbachii Gray 1842	longfin eel	Anguillidae	C(2)	CD, CI, DPT	No change
Galaxias argenteus (Gmelin 1789)	giant kokopu	Galaxiidae	B(1)	CI, DPT, PD	No change
Galaxias brevipinnis Günther 1866	koaro	Galaxiidae	C(1)	CI, DPT, PD	No change
Galaxias depressiceps McDowall & Wallis 1996	Taieri flathead galaxias	Galaxiidae	A(2)	CD, CI, DPT, PF, RR, Sp	Better
Galaxias divergens Stokell 1959	dwarf galaxias (West Coast)	Galaxiidae	A(2)	CI, DPT, PF, RR	No change
Galaxias gollumoides McDowall & Chadderton 1999	Gollum galaxias	Galaxiidae	A(2)	CI, DPT, PF, RR, Sp	Better
Neochanna apoda Günther 1867	brown mudfish	Galaxiidae	B(2)	CI, DPS, DPT, PD, PF	No change
Neochanna diversus Stokell 1949	black mudfish	Galaxiidae	C(1)	CD, CI, CR, DPT, PF	No change
Retropinna retropinna (Richardson 1848)	common smelt	Retropinnidae	C(1)	CI, CR, DPT, PD	Worse
Taxonomically unresolved (3)					
Galaxias aff. *divergens* "northern"	dwarf galaxias (Marlborough, Nelson, North Island)	Galaxiidae	A(2)	CI, DPT, PF	No change
Galaxias aff. *paucispondylus* "Southland"	alpine galaxias (Southland)	Galaxiidae	A(2)	CI, DPT, EF, PF, RR, Sp	Better
Galaxias "southern"	southern flathead galaxias (Otago, Southland)	Galaxiidae	A(2)	CI, CR, DPT, EF, PF, RR, Sp	Better
NATURALLY UNCOMMON (13)					
Taxonomically determinate (13)					
Cheimarrichthys fosteri Haast 1874	torrentfish	Cheimarrichthyidae		DPS, RR	Better
Galaxias fasciatus Gray 1842	banded kokopu	Galaxiidae			Worse
Galaxias paucispondylus Stokell 1938	alpine galaxias (Canterbury, Marlborough)	Galaxiidae		CI, DPT, EF, PF, RR, Sp	No change

Continued on next page

Table 4 continued

ASSESSMENT NAME AND AUTHORITY	COMMON NAME (ENGLISH)	FAMILY	CRITERIA	QUALIFIERS	STATUS CHANGE
Galaxias vulgaris Stokell 1949	Canterbury galaxias	Galaxiidae		CI, DPT, PF	Better
Gobiomorphus alpinus Stokell 1962	Tarndale bully	Eleotridae		DPT, OL, RR	No change
Gobiomorphus basalis (Gray 1842)	Cran's bully	Eleotridae			Worse
Gobiomorphus breviceps (Stokell 1939)	upland bully	Eleotridae			Worse
Gobiomorphus dinae Thacker, Geiger & Shelley 2023	Dinah's bully	Eleotridae			New listing
Gobiomorphus gobioides (Valenciennes 1837)	giant bully	Eleotridae		DPT, RR	No change
Gobiomorphus hubbsi (Stokell 1959)	bluegill bully	Eleotridae			Better
Gobiomorphus huttoni (Ogilby 1894)	redfin bully	Eleotridae			Worse
Gobiomorphus mataraerore Thacker, Geiger & Shelley 2023	Kaharore bully	Eleotridae			Worse
Neochanna rekohua (Mitchell 1995)	Chatham Island mudfish	Galaxiidae		CI, IE, RR	No change
NOT THREATENED (6)					
Taxonomically determinate (6)					
Aldrichetta forsteri (Valenciennes 1836)	yellow-eye mullet	Mugilidae		DPT, SO	No change
Anguilla australis Richardson 1841	shortfin eel	Anguillidae		CI, SO	No change
Forsterygion nigripenne (Valenciennes 1836)	estuarine triplefin	Tripterygiidae			No change
Gobiomorphus cotidianus McDowall 1975	common bully	Eleotridae			No change
Mugil cephalus Linnaeus 1758	grey mullet	Mugilidae		SO	No change
Rhombosolea retiaria Hutton 1874	black flounder	Rhombosoleidae		CI, CR, DPT	No change
NON-RESIDENT NATIVE (3)					
MIGRANT (1)					
Taxonomically determinate (1)					
Anguilla reinhardtii Steindachner 1867	Australian longfin eel	Anguillidae		SO	Neutral
COLONISER (2)					
Taxonomically determinate (2)					
Gobiopterus semivestitus (Munro 1949)	glass goby	Oxudercidae		OL, SO	No change
Parioglossus marginalis Rennis & Hoese 1985	dart goby	Gobiidae		SO	No change

Continued on next page

Table 4 continued

ASSESSMENT NAME AND AUTHORITY	COMMON NAME (ENGLISH)	FAMILY	CRITERIA	QUALIFIERS	STATUS CHANGE
INTRODUCED AND NATURALISED (21)					
Taxonomically determinate (21)					
Acentrogobius pflaumii (Bleeker 1853)	Asian goby	Gobiidae			No change
Ameiurus nebulosus (Lesueur 1819)	brown bullhead catfish	Ictaluridae		Inc	No change
Arenigobius bifrenatus (Kner 1865)	bridled goby	Gobiidae		DPR, Inc, SO	No change
Carassius auratus (Linnaeus 1758)	goldfish	Cyprinidae		Inc	No change
Cyprinus rubrofuscus Lacepède 1803	koi carp	Cyprinidae			No change
Gambusia affinis (Baird & Girard 1853)	gambusia	Poeciliidae		Inc	No change
Leuciscus idus (Linnaeus 1758)	orfe	Leuciscidae			No change
Oncorhynchus mykiss (Walbaum 1792)	rainbow trout	Salmonidae			No change
Oncorhynchus nerka (Walbaum 1792)	sockeye salmon	Salmonidae			No change
Oncorhynchus tshawytscha (Walbaum 1792)	Chinook salmon	Salmonidae			No change
Perca fluviatilis Linnaeus 1758	perch	Percidae		Inc	No change
Phalloceros caudimaculatus (Hensel 1868)	caudo	Poeciliidae			No change
Poecilia latipinna (Lesueur 1821)	sailfin molly	Poeciliidae			No change
Poecilia reticulata Peters 1859	guppy	Poeciliidae			No change
Salmo salar Linnaeus 1758	Atlantic salmon	Salmonidae			No change
Salmo trutta Linnaeus 1758	brown trout	Salmonidae			No change
Salvelinus fontinalis (Mitchill 1814)	brook char	Salmonidae			No change
Salvelinus namaycush (Walbaum 1792)	mackinaw	Salmonidae			No change
Scardinius erythrophthalmus (Linnaeus 1758)	rudd	Leuciscidae		Inc	No change
Tinca tinca (Linnaeus 1758)	tench	Tincidae		Inc	No change
Xiphophorus hellerii Heckel 1848	swordtail	Poeciliidae			No change

3.3 NZTCS categories, criteria and qualifiers

Full details of the criteria and qualifiers included in Table 4 can be found in Townsend et al. (2008), Michel (2021) and Rolfe et al. (2021) or at https://nztcs.org.nz. Summary definitions for the categories are presented below.

Extinct

Taxa for which there is no reasonable doubt – following repeated surveys in known or expected habitats at appropriate times (diurnal, seasonal and annual) and throughout the taxon's historic range – that the last individual has died.

Threatened

Taxa that meet the criteria specified by Townsend et al. (2008) for the categories Nationally Critical, Nationally Endangered, Nationally Vulnerable and Nationally Increasing.

NATIONALLY CRITICAL

A – very small population (natural or unnatural)

A(1) The total population size is < 250 mature individuals; or

A(2) There are ≤ 2 sub-populations *and* ≤ 200 mature individuals in the largest sub-population; or

A(3) The total area of occupancy is ≤ 1 ha (0.01 km^2)

B – small population with a high ongoing or predicted decline of 50–70%

B(1) The total population size is 250–1000 mature individuals; or

B(2) There are ≤ 5 sub-populations *and* ≤ 300 mature individuals in the largest sub-population; or

B(3) The total area of occupancy is ≤ 10 ha (0.1 km^2)

C – population (irrespective of size or number of sub-populations) with a very high ongoing or predicted decline of > 70%

NATIONALLY ENDANGERED

A – small population (natural or unnatural) that has a low to high ongoing or predicted decline of 10–50%

A(1) The total population size is 250–1000 mature individuals; or

A(2) There are ≤ 5 sub-populations *and* ≤ 300 mature individuals in the largest sub-population; or

A(3) The total area of occupancy is ≤ 10 ha (0.1 km^2)

B – small, stable population (unnatural)

B(1) The total population size is 250–1000 mature individuals; or

B(2) There are ≤ 5 sub-populations *and* ≤ 300 mature individuals in the largest sub-population; or

B(3) The total area of occupancy is ≤ 10 ha (0.1 km^2)

C – moderate population and high ongoing or predicted decline of 50–70%

C(1) The total population size is 1000–5000 mature individuals; or

C(2) There are ≤ 15 sub-populations *and* ≤ 500 mature individuals in the largest sub-population; or

C(3) The total area of occupancy is ≤ 100 ha (1 km^2)

NATIONALLY VULNERABLE

A – small population (unnatural), increasing >10%

A(1) The total population size is 250–1000 mature individuals; or

A(2) There are ≤5 sub-populations *and* ≤300 mature individuals in the largest sub-population; or

A(3) The total area of occupancy is ≤10 ha (0.1 km^2)

B – moderate population (unnatural), stable ±10%

B(1) The total population size is 1000–5000 mature individuals; or

B(2) There are ≤15 sub-populations *and* ≤500 mature individuals in the largest sub-population; or

B(3) The total area of occupancy is ≤100 ha (1 km^2)

C – moderate population and population trend that has a low to high ongoing or predicted decline of 10–50%

C(1) The total population size is 1000–5000 mature individuals; or

C(2) There are ≤15 sub-populations *and* ≤500 mature individuals in the largest sub-population; or

C(3) The total area of occupancy is ≤100 ha (1 km^2)

D – moderate to large population and moderate to high ongoing or predicted decline of 30–70%

D(1) The total population size is 5000–20 000 mature individuals; or

D(2) There are ≤15 sub-populations *and* ≤1000 mature individuals in the largest sub-population; or

D(3) The total area of occupancy is ≤1000 ha (10 km^2)

E – large population and high ongoing or predicted decline of 50–70%

E(1) The total population size is 20 000–100 000 mature individuals; or

E(2) The total area of occupancy is ≤10 000 ha (100 km^2)

At Risk

DECLINING

A – moderate to large population and low ongoing or predicted decline of 10–30%

A(1) The total population size is 5000–20 000 mature individuals; or

A(2) The total area of occupancy is ≤1000 ha (10 km^2)

B – large population and low to moderate ongoing or predicted decline of 10–50%

B(1) The total population size is 20 000–100 000 mature individuals; or

B(2) The total area of occupancy is ≤10 000 ha (100 km^2)

C – very large population and low to high ongoing or predicted decline of 10–70%

C(1) The total population size is >100 000 mature individuals; or

C(2) The total area of occupancy is >10 000 ha (100 km^2)

NATURALLY UNCOMMON

Taxa whose distributions are confined to a specific geographical area or which occur within naturally small and widely scattered populations, where these distributions are not the result of human disturbance.

Not Threatened

Resident native taxa that have large, stable populations.

Non-resident Native

Taxa whose natural presence in New Zealand is either discontinuous (Migrant) or sporadic and temporary (Vagrant) or which have succeeded in recently (since 1950) establishing a resident breeding population (Coloniser).

MIGRANT

Taxa that predictably and cyclically visit New Zealand as part of their normal life cycle (a minimum of 15 individuals known or presumed to visit per annum) but do not breed here.

COLONISER

Taxa that would otherwise trigger Threatened or At Risk categories because of their small population sizes but have arrived in New Zealand without direct or indirect help from humans and have been successfully reproducing in the wild only since 1950.

Introduced and Naturalised

Taxa that have become naturalised in the wild after being deliberately or accidentally introduced into New Zealand by human agency.

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5. References

Allibone, R.M. 2000: Water abstraction impacts on the non-migratory galaxiids of Totara Creek. Pp. 25–45 in Allibone, R.M.: Water abstraction impacts on non-migratory galaxiids of Otago. *Science for Conservation 147*. Department of Conservation, Wellington, New Zealand.

Allibone, R.M.; David, B.O.; Hitchmough, R.; Jellyman, D.J.; Ling, N.; Ravenscroft, P.; Waters, J.M. 2010: Conservation status of New Zealand freshwater fish, 2009. *New Zealand Journal of Marine and Freshwater Research 44*: 271–287.

Allibone, R.M.; McDowall, R.M. 1997: Conservation ecology of the dusky galaxias, *Galaxias pullus* (Teleostei: Galaxiidae). *Conservation Sciences Publication 6*. Department of Conservation, Wellington, New Zealand. 48 p.

Anderson, L.V. 2007: Geomorphology and freshwater fish biogeography of the Catlins region, southern New Zealand. Unpublished MSc thesis, University of Otago, Dunedin, New Zealand. 104 p.

Arthur, J.B.; Gray, D.P. 2022: Fish communities of the Rakaia hāpua: a comparison with historical survey data, 1980/81 and 2021/22. Report No. R22/27. Canterbury Regional Council, Christchurch, New Zealand. 59 p.

Baker, C.F.; Jellyman, D.J.; Reeve, K.; Crow, S.; Stewart, M.; Buchinger, T.; Li, W. 2017: First observations of spawning nests in the pouched lamprey (*Geotria australis*). *Canadian Journal of Fisheries and Aquatic Sciences 74*: 1603–1611.

Baker, C.F.; Jowett, I.G.; Allibone, R.M. 2003: Habitat use by non-migratory Otago galaxiids and implications for water management. *Science for Conservation 221*. Department of Conservation, Wellington, New Zealand. 34 p.

Barrier, R.F.G. 1998: Conservation status of the Tarndale bully (*Gobiomorphus alpinus*). *Occasional Publication No. 42*. Nelson / Marlborough Conservancy, Department of Conservation, Wellington, New Zealand. 21 p.

Boddy, N.C.; Fraley, K.M.; Warburton, H.J.; Jellyman, P.G.; Booker, D.J.; Kelly, D.; McIntosh, A.R. 2019: Big impacts from small abstractions: the effects of surface water abstraction on freshwater fish assemblages. *Aquatic Conservation: Marine and Freshwater Ecosystems 30*: 159–172.

Boddy, N.C.; McIntosh, A.R. 2016: Temperature, invaders and patchy habitat interact to limit the distribution of a vulnerable freshwater fish. *Austral Ecology 42*: 459–467.

Booker, D.J.; Hicks, D.M. 2013: Estimating wetted width and fish habitat areas across New Zealand's rivers. Wetted widths estimation. NIWA Client Report No: CHC2013-075. Prepared for the Department of Conservation by the National Institute of Water & Atmospheric Research, Christchurch, New Zealand. 33 p.

Bowie, S.C.; Pham, L.; Dunn, N.R.; Allibone, R.M.; Crow, S.K. 2014: Freshwater fish taxonomic workshop – focussing on New Zealand non-migratory galaxias taxonomic issues. Proceedings of a workshop, Dunedin, 14th May 2013. Department of Conservation, Christchurch, New Zealand (unpublished; DOCDM-1205404). 42 p.

Campbell, C.S.M. 2021: Phylogenomic relationships of the *Galaxias vulgaris* species complex. Unpublished MSc thesis. University of Otago, Dunedin, New Zealand. 101 p.

Campbell, C.S.M.; Dutoit, L.; King, T.M.; Craw, D.; Burridge, C.P.; Wallis, G.P.; Waters, J.M. 2022: Genome-wide analysis resolves the radiation of New Zealand's freshwater *Galaxias vulgaris* complex and reveals a candidate species obscured by mitochondrial capture. *Diversity and Distributions 28*: 2255–2267.

Clucas, R.J. 2010: Upland longjaw galaxias (*Galaxias prognathus*) survey of the Rangitata River and catchment. Raukapuka Area Office, Department of Conservation, Geraldine, New Zealand (unpublished; DOCDM-1444845). 11 p.

Collins, D.; Montgomery, K.; Zammit, C. 2018: Hydrological projections for New Zealand rivers under climate change. NIWA Client Report No: 2018193CH. Prepared for the Ministry for the Environment by the National Institute of Water & Atmospheric Research Ltd, Christchurch, New Zealand. 107 p.

Crow, S.K.; Booker, D.J.; Snelder, T.H. 2013: Contrasting influence of flow regime on freshwater fishes displaying diadromous and nondiadromous life histories. *Ecology of Freshwater Fish 22*: 82–94.

Crow, S.K.; Booker, D.J.; Sykes, J.R.E.; Unwin, M.J.; Shankar, S.U. 2014: Predicting distributions of New Zealand freshwater fishes. NIWA Client Report No: CHC2014-15. Prepared for the Department of Conservation by the National Institute of Water & Atmospheric Research Ltd, Christchurch, New Zealand. 100 p.

Crow, S.K.; Snelder, T.; Jellyman, P.G.; Greenwood, M.; Booker, D.J.; Dunn, A. 2016: Temporal trends in the relative abundance of New Zealand freshwater fishes. Analysis of New Zealand Freshwater Fish Database records. NIWA Client Report No: CHC2016-049. Prepared for the Ministry for the Environment by the National Institute of Water & Atmospheric Research Ltd, Christchurch, New Zealand. 71 p.

Davey, A.J.H.; Kelly, D.J. 2007: Fish community responses to drying disturbances in an intermittent stream: a landscape perspective. *Freshwater Biology 52*: 1719–1733.

Davey, A.J.H.; Kelly, D.J.; Biggs, B.J.F. 2006: Refuge-use strategies of stream fishes in response to extreme low flows. *Journal of Fish Biology 69*: 1047–1059.

Davey, M.L.; O'Brien, L.K.; Ling, N.; Gleeson, D.M. 2003: Population genetic structure of the Canterbury mudfish (*Neochanna burrowsius*): biogeography and conservation implications. *New Zealand Journal of Marine and Freshwater Research 37*: 13–21.

Denyer, K. 2020: The root causes of wetland loss in NZ: 1. Statistics & back stories. Prepared for the Environmental Law Initiative Trust and National Wetland Trust of New Zealand by the National Wetland Trust of New Zealand, Pukekohe, New Zealand. 31 p.

DOC (Department of Conservation) 2003: New Zealand mudfish (*Neochanna* spp.) recovery plan 2003–13. *Threatened Species Recovery Plan 51*. Department of Conservation, Wellington, New Zealand. 25 p.

DOC (Department of Conservation) 2004: New Zealand non-migratory galaxiid fishes recovery plan 2003–13. *Threatened Species Recovery Plan 53*. Department of Conservation, Wellington, New Zealand. 45 p.

DOC (Department of Conservation) 2005: New Zealand large galaxiid recovery plan, 2003–13. Shortjaw kokopu, giant kokopu, banded kokopu, and koaro. *Threatened Species Recovery Plan 55*. Department of Conservation, Wellington, New Zealand. 32 p.

DOC (Department of Conservation) 2008: Conservation of the dune lakes galaxias (*Galaxias* sp.) in Northland – a summary of threats, management options and an environmental impact assessment for translocation to a new site. Department of Conservation, Whangarei, New Zealand (unpublished; DOCDM-243181). 33 p.

Dunn, N.R. 2003: The effects of extremes in flow on alpine (*Galaxias paucispondylus*) and Canterbury (*G. vulgaris*) galaxias. Unpublished MSc thesis, University of Canterbury, Christchurch, New Zealand. 174 p.

Dunn, N.R. 2016: Lawrence River upland longjaw galaxias (*Galaxias prognathus*) survey April 2016. Department of Conservation, Wellington, New Zealand (unpublished; DOC-2777479). 3 p.

Dunn, N.R. 2021: Assessment of Southland Regional Council proposed Southland Water and Land Plan – Rule 78 weed and sediment removal rule testing. Department of Conservation, Wellington, New Zealand (unpublished; DOC-6695242). 33 p.

Dunn, N.R.; Allibone, R.M.; Closs, G.P.; Crow, S.K.; David, B.O.; Goodman, J.M.; Griffiths, M.; Jack, D.C.; Ling, N.; Waters, J.M.; Rolfe, J.R. 2018: Conservation status of New Zealand freshwater fishes, 2017. *New Zealand Threat Classification Series 24*. Department of Conservation, Wellington, New Zealand. 11 p.

Dunn, N.R.; O'Brien, L.K. 2006: Gravel burrowing ability in *Galaxias cobitinis*. *DOC Research & Development Series 236*. Department of Conservation, Wellington, New Zealand. 25 p.

Dunn, N.R.; O'Brien, L.K. 2022: The freshwater fishes sub-population assessment system: an integrated demographic and geospatial approach to the population assessment of freshwater fishes in New Zealand. Department of Conservation, Wellington, New Zealand (unpublished; DOC-7190648). 36 p.

Dunn, N.R.; O'Brien, L.K.; Closs, G.P. 2022: Spawning strategies of *Galaxias gollumoides* McDowall and Chadderton (Gollum galaxias) from wetland and stream habitats. *Ecology of Freshwater Fish 31*: 529–543.

Egan, E.; Woolley, J.M.; Williams, E. 2020: Report summary: assessing the vulnerability of taonga freshwater species to climate change. National Institute of Water & Atmospheric Research Ltd, Christchurch, New Zealand. 51 p.

Eldon, G.A.; Greager, A.J. 1983: Fishes of the Rakaia Lagoon. *Fisheries Environmental Report No. 30*. Ministry of Agriculture and Fisheries, Christchurch, New Zealand. 65 p.

Esa, Y.B.; Waters, J.M.; Wallis, G.P. 2000: Introgressive hybridization between *Galaxias depressiceps* and *Galaxias sp D* (Teleostei: Galaxiidae) in Otago, New Zealand: secondary contact mediated by water races. *Conservation Genetics 1*: 329–339.

Fenton, K. 2022: Life history parameters of New Zealand freshwater fishes – a literature collation. Department of Conservation, Wellington, New Zealand (unpublished; DOC-6570268). 16 p.

Fisheries New Zealand (comps) 2022: Fisheries assessment plenary, May 2022: stock assessments and stock status. Fisheries Science Team, Fisheries New Zealand, Ministry for Primary Industries, Wellington, New Zealand. 1886 p.

Fricke, R.; Eschmeyer, W.N.; Van der Laan, R. (Eds) 2025: Eschmeyer's Catalog of Fishes: genera, species, references. California Academy of Sciences. http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp (accessed 14 March 2025).

GBIF (Global Biodiversity Information Facility) 2023: GBIF species occurrence database. Administered by GBIF Secretariat, København, Danmark. www.gbif.org (accessed 8 September 2023).

Gerbeaux, P.J.; Gosden, J.L.; Dunn, N.R. 2022: Report on a rapid assessment wetland survey of some non-diadromous galaxiid habitats in Otago. Department of Conservation, Christchurch, New Zealand. 12 p.

Golder Associates 2014: A review of the hydrology data and the effects of flow variation on the lowland longjaw galaxias. Report Number: 1078405-500 submitted to Coastal Otago Area Office, Department of Conservation. Golder Associates, Dunedin, New Zealand. 46 p.

Goodman, J.M. 2018: Conservation, ecology and management of migratory galaxiids and the whitebait fishery. A summary of current knowledge and information gaps. Department of Conservation, Nelson, New Zealand. 39 p.

Goodman, J.M.; Dunn, N.R.; Ravenscroft, P.J.; Allibone, R.M.; Boubée, J.A.T.; David, B.O.; Griffiths, M.; Ling, N.; Hitchmough, R.A.; Rolfe, J.R. 2014: Conservation status of New Zealand freshwater fish, 2013. *New Zealand Threat Classification Series 7*. Department of Conservation, Wellington, New Zealand. 12 p.

Greer, M.J.C.; Closs, G.P.; Crow, S.K.; Hicks, A.S. 2012: Complete versus partial macrophyte removal: the impacts of two drain management strategies on freshwater fish in lowland New Zealand streams. *Ecology of Freshwater Fish 21*: 510–520.

Greer, M.J.C.; Crow, S.K.; Hicks, A.S.; Closs, G.P. 2015: The effects of suspended sediment on brown trout (*Salmo trutta*) feeding and respiration after macrophyte control. *New Zealand Journal of Marine and Freshwater Research 49*: 278–285.

Hickford, M.J.H. 2022: Potential drivers of the decline of hāpua fish populations. NIWA Client Report No: 2022282CH. Prepared for Canterbury Regional Council by the National Institute of Water & Atmospheric Research Ltd, Christchurch, New Zealand. 45 p.

Hickford, M.J.H.; Schiel, D.R. 2011: Population sinks resulting from degraded habitats of an obligate life-history pathway. *Oecologia 166*: 131–140.

Hitchmough, R. (comp.) 2002: New Zealand Threat Classification System lists – 2002. *Threatened Species Occasional Publication 23*. Department of Conservation, Wellington, New Zealand. 210 p.

Hitchmough, R.; Bull, L.; Cromarty, P. (comps) 2007: New Zealand Threat Classification System lists – 2005. Department of Conservation, Wellington, New Zealand. 194 p.

Hume, T.; Gerbeaux, P.J.; Hart, D.D.; Kettles, H.; Neale, D. 2016: A classification of New Zealand's coastal hydrosystems. NIWA Client Report No: HAM2016-062. Prepared for the Ministry for the Environment by the National Institute of Water & Atmospheric Research Ltd, Hamilton, New Zealand. 120 p.

Jack, D.C. 2009: Alpine galaxias survey, Manuherikia River, November–December 2009. Coastal Otago Area Office, Department of Conservation, Dunedin, New Zealand (unpublished; DOCDM-549567). 13 p.

Jack, D.C. 2020a: Shortjaw kokopu historic records survey Nelson Marlborough and Buller regions 2020. Department of Conservation, Dunedin, New Zealand (unpublished; DOC-6350178). 75 p.

Jack, D.C. 2020b: Shortjaw kokopu historic records survey West Coast 2020. Department of Conservation, Dunedin, New Zealand (unpublished; DOC-7074570). 23 p.

Jack, D.C. 2020c: Teviot flathead galaxias conservation outcome report. Department of Conservation, Dunedin, New Zealand (unpublished; DOC-2701313). 64 p.

Jack, D.C. 2021a: Non-migratory *Galaxias* spawning habitat investigations: Pomahaka galaxias. Department of Conservation, Dunedin, New Zealand (unpublished; DOC-6718609). 22 p.

Jack, D.C. 2021b: Non-migratory *Galaxias* spawning habitat investigations: Teviot flathead galaxias. Department of Conservation, Dunedin, New Zealand (unpublished; DOC-7058066). 25 p.

Jack, D.C. 2023a: Central Otago roundhead galaxias – managing key populations in the Swin Burn using exclusion barriers. Department of Conservation, Dunedin, New Zealand (unpublished; DOC-7438245). 35 p.

Jack, D.C. 2023b: Surveillance results of dwarf galaxias (West Coast), *Galaxias divergens* 2021–23. Department of Conservation, Dunedin, New Zealand (unpublished; DOC-7457481). 16 p.

Jack, D.C.; Campbell, C.S.M.; Bowie, S.C. 2023: Taieri flathead galaxias – Akatore Creek built barrier and trout removal. Department of Conservation, Dunedin (unpublished; DOC-2799033). 28 p.

Jellyman, D.J. 2011: What causes the high interannual variability of flatfish (*Rhombosolea* spp.) in Lake Ellesmere? *New Zealand Journal of Marine and Freshwater Research 45*: 575–589.

Jellyman, D.J.; Chisnall, B.L.; Dijkstra, L.H.; Boubée, J.A.T. 1996: First record of the Australian longfinned eel, *Anguilla reinhardtii*, in New Zealand. *Marine and Freshwater Research 47*: 1037–1040.

Krebs, C.J. 2014: Ecology: the experimental analysis of distribution and abundance. Sixth edition. Pearson New International Edition. Pearson Education Limited, Harlow, England. 646 p.

Lake, M. 2021: Review of conservation management of Northland mudfish (*Neochanna heleios*). Job Number 1016446.v2. Prepared for the Department of Conservation by Tonkin & Taylor Ltd, Hamilton, New Zealand. 78 p.

Lavender, R. 2001: Analysis of the New Zealand freshwater fish database and the distribution of native fish in Canterbury. Technical Report: Environmental Monitoring Group U01/25. Canterbury Regional Council, Christchurch, New Zealand. 78 p.

Leathwick, J.R.; Julian, K.; Elith, J.; Rowe, D.K. 2008: Predicting the distributions of freshwater fish species for all New Zealand's rivers and streams. National Institute of Water & Atmospheric Research Ltd, Hamilton, New Zealand. 56 p.

Leathwick, J.R.; West, D.; Gerbeaux, P.; Kelly, D.; Robertson, H.; Brown, D.; Chadderton, W.L.; Ausseil, A. 2010: Freshwater Ecosystems of New Zealand. Version 1 – August 2010. User guide. Department of Conservation, Christchurch, New Zealand (unpublished; DOCDM-607620). 51 p.

Lee, F.; Perry, G.L.W. 2019: Assessing the role of off-take and source–sink dynamics in the extinction of the amphidromous New Zealand grayling (*Prototroctes oxyrhynchus*). *Freshwater Biology 64*: 1747–1754.

Leprieur, F.; Hickey, M.A.; Arbuckle, C.J.; Closs, G.P.; Brosse, S.; Townsend, C.R. 2006: Hydrological disturbance benefits a native fish at the expense of an exotic fish. *Journal of Applied Ecology 43*: 930–939.

McDowall, R.M. 1979: Fishes of the family Retropinnidae (Pisces: Salmoniformes) – a taxonomic revision and synopsis. *Journal of the Royal Society of New Zealand 9*: 85–121.

McDowall, R.M. 1990: New Zealand freshwater fishes: a natural history and guide. Heinemann Reed and MAF Publishing Group, Auckland, New Zealand. 553 p.

McDowall, R.M. 1997a: The evolution of diadromy in fishes (revisited) and its place in phylogenetic analysis. *Reviews in Fish Biology and Fisheries 7*: 443–462.

McDowall, R.M. 1997b: Is there such a thing as amphidromy? *Micronesia 30*: 3–14.

McDowall, R.M. 2000: The Reed field guide to New Zealand freshwater fishes. Reed Books, Auckland, New Zealand. 224 p.

McDowall, R.M. 2001: *Parioglossus* (Teleostei: Gobioidei: Microdesmidae) in New Zealand. *New Zealand Journal of Marine and Freshwater Research 35*: 165–172.

McDowall, R.M. 2006: Crying wolf, crying foul, or crying shame: alien salmonids and a biodiversity crisis in the southern cool-temperate galaxioid fishes? *Reviews in Fish Biology and Fisheries 16*: 233–422.

McDowall, R.M. 2007: On amphidromy, a distinct form of diadromy in aquatic organisms. *Fish and Fisheries 8*: 1–13.

McDowall, R.M. 2010: New Zealand freshwater fishes: an historical and ecological biogeography. *Fish & Fisheries Series 32*: 449.

McDowall, R.M.; Allibone, R.M. 2004: Threatened fishes of the world: *Galaxias cobitinis* McDowall & Waters, 2002 (Galaxiidae). *Environmental Biology of Fishes 70*: 42.

McDowall, R.M.; David, B.O. 2008: *Gobiopterus* in New Zealand (Teleostei: Gobiidae), with observations on sexual dimorphism. *New Zealand Journal of Marine and Freshwater Research 42*: 325–331.

McDowall, R.M.; Eldon, G.A. 1996: Threatened fishes of the world: *Neochanna burrowsius* (Phillipps, 1926) (Galaxiidae). *Environmental Biology of Fishes 47*: 190.

McDowall, R.M.; Richardson, J. 1983: New Zealand freshwater fish survey: a guide to input and output. *Fisheries Information Leaflet 12*. Fisheries Research Division, Ministry of Agriculture and Fisheries, Wellington, New Zealand. 15 p.

McIntosh, A.R.; McDowall, R.M. 2004: Fish communities in rivers and streams. Pp. 17.1–17.19 in Harding, J.S.; Mosley, M.P.; Pearson, C.P.; Sorrell, B.K. (Eds): Freshwaters of New Zealand. New Zealand Hydrological Society and New Zealand Limnological Society, Wellington and Christchurch, New Zealand.

MfE (Ministry for the Environment) 2018: Climate change projections for New Zealand. Atmospheric projections based on simulations undertaken for the IPCC 5th Assessment 2nd edition. Publication number: ME 1385. Ministry for the Environment, Wellington, New Zealand. 131 p.

MfE (Ministry for the Environment); Stats NZ 2023: New Zealand's Environmental Reporting Series: Our freshwater 2023. Publication number: ME 1748. Ministry for the Environment, Wellington, New Zealand. 52 p.

Michel, P. 2021: Amendment to the New Zealand Threat Classification System manual 2008: revised categories 2021. Department of Conservation, Wellington, New Zealand. 5 p.

Miller, A.K.; Baker, C.; Kitson, J.C.; Yick, J.L.; Manquel, P.E.I.; Alexander, A.; Gemmell, N.J. 2021: The Southern Hemisphere lampreys (Geotriidae and Mordaciidae). *Reviews in Fish Biology and Fisheries 31*: 201–232.

Miller, A.K.; Timoshevskaya, N.; Smith, J.J.; Gillum, J.; Sharif, S.; Clarke, S.; Baker, C.; Kitson, J.; Gemmell, N.J.; Alexander, A. 2022: Population genomics of New Zealand pouched lamprey (kanakana; piharau; *Geotria australis*). *Journal of Heredity 113*: 380–397.

Molloy, J.; Bell, B.; Clout, M.; de Lange, P.; Gibbs, G.; Given, D.; Norton, D.A.; Smith, N.; Stephens, T. 2002: Classifying species according to threat of extinction. A system for New Zealand. *Threatened Species Occasional Publication 22*. Department of Conservation, Wellington, New Zealand. 26 p.

NIWA (National Institute of Water & Atmospheric Research Ltd) 2021: New Zealand climate summary: 2020. National Institute of Water & Atmospheric Research Ltd, Auckland, New Zealand. 32 p.

NIWA (National Institute of Water & Atmospheric Research Ltd) 2022: Aotearoa New Zealand climate summary: 2021. National Institute of Water & Atmospheric Research Ltd, Auckland, New Zealand. 36 p.

NIWA (National Institute of Water & Atmospheric Research Ltd) 2023a: Aotearoa New Zealand climate summary: 2022. National Institute of Water & Atmospheric Research Ltd, Auckland, New Zealand. 51 p.

NIWA (National Institute of Water & Atmospheric Research Ltd) 2023b: Aotearoa New Zealand climate summary: autumn 2023. National Institute of Water & Atmospheric Research Ltd, Auckland, New Zealand. 14 p.

NIWA (National Institute of Water & Atmospheric Research Ltd) 2023c: Aotearoa New Zealand climate summary: summer 2022–2023. National Institute of Water & Atmospheric Research Ltd, Auckland, New Zealand. 16 p.

NIWA (National Institute of Water & Atmospheric Research Ltd) 2023d: New Zealand Freshwater Fish Database (NZFFD). Administered by the National Institute of Water & Atmospheric Research Ltd, Wellington, New Zealand. https://nzffdms.niwa.co.nz (accessed 1 March 2023).

O'Brien, L.K.; Dunn, N.R. 2007: Mudfish (*Neochanna* Galaxiidae) literature review. *Science for Conservation 277*. Department of Conservation, Wellington, New Zealand. 88 p.

Olleycology Limited 2021: Shortjaw kokopu surveys. Memo to the Department of Conservation by Olleycology Limited, Nelson, New Zealand (unpublished; DOC-6757347). 12 p.

Orchard, S. 2021: Spotlight surveys for migratory whitebait species in 15 rivers on the South Island's West Coast. Waterlink Report WL21062. Prepared for the Department of Conservation by Waterlink Limited, Christchurch, New Zealand. 27 p.

Pingram, M.A. 2009: A review of available information relating to Action 7.2 of the nonmigratory galaxiid recovery plan 2003–2013: to determine dune lakes galaxias spawning habitat and timing. Department of Conservation, Whangarei, New Zealand (unpublished; DOCDM-422234). 26 p.

Raal, P. 2015: Determining the efficacy of physical and herbicide control measures for monkey musk (*Mimulus guttatus* L.) at key non-migratory galaxiid locations in the Upper Waitaki. Department of Conservation, Wellington, New Zealand (unpublished; DOC-2320098). 14 p.

Ravenscroft, P. 2014: Alpine galaxias survey, Manuherikia River, December 2014. Coastal Otago Area Office, Department of Conservation, Dunedin, New Zealand (unpublished; DOCDM-1522538). 23 p.

Ravenscroft, P.; Bowie, S.; Nelson, D. 2010: Lowland longjaw galaxias (*Galaxias cobitinis*) management plan. Coastal Otago District Office, Department of Conservation, Dunedin, New Zealand (unpublished; DOCDM-542701). 60 p.

Richardson, J. 2008a: Catchments of New Zealand (07/04/08). National Institute of Water & Atmospheric Research Ltd, Hamilton, New Zealand. 47 p.

Richardson, J. 2008b: New Zealand freshwater fish database user guide. NIWA Client Report: HAM2005-033. National Institute of Water & Atmospheric Research Ltd, Hamilton, New Zealand. 31 p.

Roberts, C.D.; Stewart, A.L.; Struthers, C.D. 2015: The fishes of New Zealand. Te Papa Press, Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand. 2008 p. (Vol. 1: S1–S256; vol. 2: 1–576; vol. 3: 577–1152; vol. 4: 1153–1748.)

Robertson, H.A.; Ausseil, A.-G.; Rance, B.; Betts, H.; Pomeroy, E. 2019: Loss of wetlands since 1990 in Southland, New Zealand. *New Zealand Journal of Ecology 43*: 3355–3364.

Rolfe, J.; Makan, T.; Tait, A. 2021: Supplement to the New Zealand Threat Classification System manual 2008: new qualifiers and amendments to qualifier definitions, 2021. Department of Conservation, Wellington, New Zealand. 7 p.

Rolfe, J.R. 2019: Decisions from 2019 technical review of NZTCS. Department of Conservation, Wellington, New Zealand (unpublished; DOC-5890296). 4 p.

Rowe, D.K.; Champion, P.D.; de Winton, M.D. 1999: Lake management trials for dwarf inanga (*Galaxias gracilis*) and a rare plant (*Hydatella inconspicua*) in Northland dune lakes. NIWA Client Report: DOC90202. National Institute of Water & Atmospheric Research Ltd, Hamilton, New Zealand. 77 p.

Rowe, D.K.; Chisnall, B.L. 1995: Conservation status of dwarf inanga (*Galaxias gracilis*) and recommendations for its future management. *NIWA Science & Technology Series No. 24*. National Institute of Water & Atmospheric Research Ltd, Hamilton, New Zealand. 55 p.

Rowe, D.K.; Chisnall, B.L. 1996: Ontogenetic habitat shifts by *Galaxias gracilis* (Galaxiidae) between the littoral and limnetic zones of Lake Kanono, New Zealand. *Environmental Biology of Fishes 46*: 255–264.

Rowe, D.K.; Chisnall, B.L. 1997: Environmental factors associated with the decline of dwarf inanga *Galaxias gracilis* McDowall in New Zealand dune lakes. *Aquatic Conservation: Marine and Freshwater Ecosystems 7*: 277–286.

Rowe, D.K.; Hicks, M.; Richardson, J. 2000: Reduced abundance of banded kokopu (*Galaxias fasciatus*) and other native fish in turbid rivers of the North Island of New Zealand. *New Zealand Journal of Marine and Freshwater Research 34*: 547–558.

Rutledge, M.J.; Clayton-Greene, J. 2012: The Tarndale bully 15 years on – how's it doing? Poster presentation. P. 113 in: Beyond the limits – New Zealand Freshwater Sciences Society Conference, 3–7 December 2012, Dunedin, New Zealand.

SCRCC (Soil Conservation and Rivers Control Council) 1956: Catchments of New Zealand. Soil Conservation and Rivers Control Council, Wellington, New Zealand. 131 p.

Shelley, J.J.; David, B.O.; Thacker, C.E.; Hicks, A.S.; Jarvis, M.G.; Unmack, P.J. 2020: Phylogeography of the Cran's bully *Gobiomorphus basalis* (Gobiiformes: Eleotridae) and an analysis of species boundaries within the New Zealand radiation of *Gobiomorphus*. *Biological Journal of the Linnean Society 130*: 365–381.

Smith, P.J.; McVeagh, S.M. 2005: Genetic analyses of carp, goldfish, and carp–goldfish hybrids in New Zealand. *DOC Research & Development Series 219*. Department of Conservation, Wellington, New Zealand. 20 p.

Snelder, T.; Biggs, B.J.F.; Weatherhead, M. 2004: New Zealand River Environment Classification user guide. ME Number 499. Ministry for the Environment and National Institute of Water & Atmospheric Research Ltd, Wellington, New Zealand. 145 p.

Stats NZ 2023: Regional Council (generalized) geospatial dataset as at 28/11/2022. Statistics New Zealand, Wellington, New Zealand. https://datafinder.stats.govt.nz (accessed 29 March 2023).

Stokell, G. 1938: A new species of the genus *Galaxias*, with a note on the second occurrence of *Galaxias burrowsii* Phillipps. *Records of the Canterbury Museum IV*: 203–208.

Tabak, J.F. 2021: Assessment of migration barriers in the eastern Otago region: perched road culverts, climbing galaxiids and non-migratory galaxiid conservation. Unpublished MSc thesis, University of Otago, Dunedin, New Zealand. 87 p.

Thacker, C.E.; Geiger, D.L.; Shelley, J.J. 2023: Two new cryptic species of the freshwater fish genus *Gobiomorphus* (Gobiiformes: Gobioidei: Eleotridae) in New Zealand. *New Zealand Journal of Marine and Freshwater Research 57*: 119–135.

Townsend, A.J.; de Lange, P.J.; Duffy, C.A.J.; Miskelly, C.M.; Molloy, J.; Norton, D.A. 2008: New Zealand Threat Classification System manual. Department of Conservation, Wellington, New Zealand. 35 p.

Townsend, C.R.; Crowl, T.A. 1991: Fragmented population structure in a native New Zealand fish: an effect of introduced brown trout? *Oikos 61*: 347–354.

Warburton, M.L. 2016: Migratory movements of torrentfish (*Cheimarrichthys fosteri*, Haast 1874). Unpublished PhD thesis, University of Otago, Dunedin, New Zealand. 156 p.

Warburton, M.L.; Easton, R.R.; Closs, G.P. 2023: Freshwater migratory movements in a widely distributed New Zealand amphidromous fish *Cheimarrichthys fosteri*. *New Zealand Journal of Marine and Freshwater Research 57*: 191–206.

Water Ways Consulting Ltd 2018: Assessment [of] the distribution and potential water temperature limitation on the distribution of the alpine galaxias (Manuherikia). Report Number: 57-2018. Prepared for the Department of Conservation by Water Ways Consulting Ltd, Dunedin, New Zealand. 44 p.

Water Ways Consulting Ltd 2020: Rangitata River catchment upland longjaw galaxias (*Galaxias prognathus*) survey 2020. Report Number: 84-2019A. Prepared for the Department of Conservation by Water Ways Consulting Ltd, Dunedin, New Zealand. 32 p.

White, R.S.A. 2016: The influence of drought on *Neochanna apoda* metapopulation persistence under global warming and land-use change. Unpublished PhD thesis, University of Canterbury, Christchurch, New Zealand. 139 p.

White, R.S.A.; Stoffels, R.J.; Whitehead, A.L. 2022: State and trends of New Zealand's freshwater fishes to support the 2022 Threat Classification. NIWA Client Report No: 2022105CH. Prepared for the Department of Conservation by the National Institute of Water & Atmospheric Research Ltd, Christchurch, New Zealand. 90 p.

Wilderlab 2022: Species name change for Koi carp in Aotearoa. *The Extract August 2022*. Wilderlab NZ Ltd, Wellington, New Zealand. www.wilderlab.co.nz/campaigns/view-campaign/EtL7ZyPQOL7Rn-ocsQ6tI2jZVYzvYpD2ORL9sLbtCjQCeTLiFRNZh__ftwlJGbE8_YL9Di5dwn-NhzAVMfverBpRHCb6cacW (accessed 24 March 2025).

Williams, E.; Crow, S.; Murchie, A.; Tipa, G.; Egan, E.; Kitson, J.; Clearwater, S.; Fenwick, M. 2017: Understanding taonga freshwater fish populations in Aotearoa-New Zealand. NIWA Client Report No: 2017326HN. Prepared for Te Wai Māori Trust by the National Institute of Water & Atmospheric Research Ltd, Hamilton, New Zealand. 228 p.

Wylie, M.J.; Closs, G.P.; Damsteegt, E.L.; Lokman, P.M. 2016: Effects of salinity and temperature on artificial cultivation and early ontogeny of giant kokopu, *Galaxias argenteus* (Gmelin 1789). *Aquaculture Research 47*: 1472–1480.

Wynne-Jones, J.; Gray, A.; Hill, A.; Heinemann, L. 2014: National panel survey of marine recreational fishers 2011–12: harvest estimates. *New Zealand Fisheries Assessment Report 2014/67*. Ministry for Primary Industries, Wellington, New Zealand. 139 p.

Appendix 1

Phylogenetic arrangement of taxa assessed in this report

The valid scientific names (excluding indeterminate taxa), authorities and phylogenetic arrangement of taxa assessed in this report or recognised as being present in New Zealand are presented below in accordance with Eschmeyer's Catalog of Fishes, as at 14 March 2025 (Fricke et al. 2025). Taxa, including undescribed entities with recognised tag names, are then arranged alphabetically within genera. Taxa with the status 'affinis' (aff.) have been placed below their parent taxon.

References

Fricke, R.; Eschmeyer, W.N.; Van der Laan, R. (Eds) 2025: Eschmeyer's Catalog of Fishes: genera, species, references. California Academy of Sciences. http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp (accessed 14 March 2025).

CLASS	ORDER	SUBORDER	FAMILY	SUBFAMILY	GENUS AND SPECIES	COMMON NAME (ENGLISH)
Petromyzonti	Petromyzontiformes		Geotriidae Gill 1893		*Geotria australis* Gray 1851	lamprey
Actinopteri	Anguilliformes	Anguilloidei	Anguillidae Rafinesque 1810		*Anguilla australis* Richardson 1841	shortfin eel
					Anguilla dieffenbachii Gray 1842	longfin eel
					Anguilla reinhardtii Steindachner 1867	Australian longfin eel
	Cypriniformes	Cyprinoidei	Cyprinidae Rafinesque 1815	Cyprininae Rafinesque 1815	*Carassius auratus* (Linnaeus 1758)	goldfish
					Cyprinus rubrofuscus Lacepède	koi carp
			Xenocyprididae Günther 1868		*Ctenopharyngodon idella* (Valenciennes 1844)	grass carp
					Hypophthalmichthys molitrix (Valenciennes 1844)	silver carp
			Tincidae Jordan 1878		*Tinca tinca* (Linnaeus 1758)	tench
			Leuciscidae Bonaparte 1835	Leuciscinae Bonaparte 1835	*Leuciscus idus* (Linnaeus 1758)	orfe
					Scardinius erythrophthalmus (Linnaeus 1758)	rudd
	Siluriformes	Siluroidei	Ictaluridae Gill 1861		*Ameiurus nebulosus* (Lesueur 1819)	brown bullhead catfish
	Salmoniformes	Salmonoidei	Salmonidae Cuvier 1816	Salmoninae Cuvier 1816	*Oncorhynchus mykiss* (Walbaum 1792)	rainbow trout
					Oncorhynchus nerka (Walbaum 1792)	sockeye salmon
					Oncorhynchus tshawytscha (Walbaum 1792)	Chinook salmon
					Salmo salar Linnaeus 1758	Atlantic salmon
					Salmo trutta Linnaeus 1758	brown trout
					Salvelinus fontinalis (Mitchill 1814)	brook char
					Salvelinus namaycush (Walbaum 1792)	mackinaw

Continued on next page

Appendix 1 continued

CLASS	ORDER	SUBORDER	FAMILY	SUBFAMILY	GENUS AND SPECIES	COMMON NAME (ENGLISH)
Actinopteri (continued)	Galaxiiformes		Galaxiidae Müller 1845	Galaxiinae Müller 1845	*Galaxias anomalus* Stokell 1959	central Otago roundhead galaxias
					Galaxias argenteus (Gmelin 1789)	giant kokopu
					Galaxias brevipinnis Günther 1866	koaro
					Galaxias cobitinis McDowall & Waters 2002	lowland longjaw galaxias (Kakanui River)
					Galaxias aff. *cobitinis* “Waitaki”	lowland longjaw galaxias (Waitaki River)
					Galaxias depressiceps McDowall & Wallis 1996	Taieri flathead galaxias
					Galaxias divergens Stokell 1959	dwarf galaxias (West Coast)
					Galaxias aff. *divergens* “northern”	dwarf galaxias (Marlborough, Nelson, North Island)
					Galaxias “dune lakes”	dune lakes galaxias (Kai Iwi lakes)
					Galaxias eldoni McDowall 1997	Eldon’s galaxias
					Galaxias fasciatus Gray 1842	banded kokopu
					Galaxias gollumoides McDowall & Chadderton 1999	Gollum galaxias
					Galaxias gracilis McDowall 1967	dwarf inanga (North Kaipara Head dune lakes)
					Galaxias macronasus McDowall & Waters 2003	bignose galaxias
					Galaxias maculatus (Jenyns 1842)	inanga
					Galaxias “Nevis”	Nevis galaxias (Nevis River)
					Galaxias “northern”	northern flathead galaxias (Marlborough, Nelson, West Coast)
					Galaxias paucispondylus Stokell 1938	alpine galaxias (Canterbury, Marlborough)
					Galaxias aff. *paucispondylus* “Manuherikia”	alpine galaxias (Manuherikia River)
					Galaxias aff. *paucispondylus* “Southland”	alpine galaxias (Southland)
					Galaxias “Pomahaka”	Pomahaka galaxias (Pomahaka River)

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Appendix 1 continued

CLASS	ORDER	SUBORDER	FAMILY	SUBFAMILY	GENUS AND SPECIES	COMMON NAME (ENGLISH)
Actinopteri (continued)	Galaxiiformes (continued)		Galaxiinae Müller 1845 (continued)	Galaxiinae Müller 1845 (continued)	*Galaxias postvectis* Clarke 1899	shortjaw kokopu
					Galaxias prognathus Stokell 1940	upland longjaw galaxias (Canterbury)
					Galaxias aff. *prognathus* "Waitaki"	upland longjaw galaxias (Waitaki River)
					Galaxias pullus McDowall 1997	dusky galaxias
					Galaxias "southern"	southern flathead galaxias (Otago, Southland)
					Galaxias "species D"	Clutha flathead galaxias (Clutha River)
					Galaxias "Teviot"	Teviot flathead galaxias (Teviot River)
					Galaxias vulgaris Stokell 1949	Canterbury galaxias
					Neochanna apoda Günther 1867	brown mudfish
					Neochanna burrowsius (Phillipps 1926)	Canterbury mudfish
					Neochanna diversus Stokell 1949	black mudfish
					Neochanna heleios Ling & Gleeson 2001	Northland mudfish
					Neochanna rekohua (Mitchell 1995)	Chatham Island mudfish
	Osmeriformes	Retropinnoidei	Retropinnidae Gill 1862	Retropinninae Gill 1862	*Retropinna retropinna* (Richardson 1848)	common smelt
					Stokellia anisodon (Stokell 1941)	Stokell's smelt
				Prototroctinae Hubbs 1952	*Prototroctes oxyrhynchus* Günther 1870	grayling
	Gobiiformes	Gobioidei	Eleotridae Bonaparte 1835	Eleotrinae Bonaparte 1835	*Gobiomorphus alpinus* Stokell 1962	Tarndale bully
					Gobiomorphus basalis (Gray 1842)	Cran's bully
					Gobiomorphus breviceps (Stokell 1939)	upland bully
					Gobiomorphus cotidianus McDowall 1975	common bully
					Gobiomorphus dinae Thacker, Geiger & Shelley 2023	Dinah's bully
					Gobiomorphus gobioides (Valenciennes 1837)	giant bully
					Gobiomorphus hubbsi (Stokell 1959)	bluegill bully
					Gobiomorphus huttoni (Ogilby 1894)	redfin bully

Continued on next page

Appendix 1 continued

CLASS	ORDER	SUBORDER	FAMILY	SUBFAMILY	GENUS AND SPECIES	COMMON NAME (ENGLISH)
Actinopteri (continued)	Gobiiformes (continued)	Gobioidei (continued)	Oxudercidae Günther 1861	Gobionellinae Bleeker 1874	*Gobiopterus semivestitus* (Munro 1949)	glass goby
			Gobiidae Cuvier 1816	Ptereleotrinae Bleeker 1875	*Parioglossus marginalis* Rennis & Hoese 1985	dart goby
				Gobiinae Cuvier 1816	*Acentrogobius pflaumii* (Bleeker 1853)	Asian goby
					Arenigobius bifrenatus (Kner 1865)	bridled goby
	Carangiformes	Pleuronectoidei	Rhombosoleidae Regan 1910		*Rhombosolea retiaria* Hutton 1874	black flounder
	Cyprinodontiformes	Cyprinodontoidei	Poeciliidae Bonaparte 1831	Poeciliinae Bonaparte 1831	*Gambusia affinis* (Baird & Girard 1853)	gambusia
					Phalloceros caudimaculatus (Hensel 1868)	caudo
					Poecilia latipinna (Lesueur 1821)	sailfin molly
					Poecilia reticulata Peters 1859	guppy
					Xiphophorus hellerii Heckel 1848	swordtail
	Mugiliformes		Mugilidae Jarocki 1822		*Aldrichetta forsteri* (Valenciennes 1836)	yellow-eye mullet
					Mugil cephalus Linnaeus 1758	grey mullet
	Blenniiformes	Blennioidei	Tripterygiidae Whitley 1931	Tripterygiinae Whitley 1931	*Forsterygion nigripenne* (Valenciennes 1836)	estuarine triplefin
	Perciformes	Percoidei	Percidae Rafinesque 1815	Percinae Rafinesque 1815	*Perca fluviatilis* Linnaeus 1758	perch
	Labriformes	Uranoscopoidei	Cheimarrichthyidae Regan 1913		*Cheimarrichthys fosteri* Haast 1874	torrentfish