Fish: A Background Paper Contributing to the Te Waihora/Lake Ellesmere: State of the Lake 2013 Technical Report No. 1.

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waihora ellesmere trust

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Fish

Te Waihora/Lake Ellesmere – State of the Lake 2013

Hamish G. Rennie (Lincoln University/Waihora Ellesmere Trust), Adrienne Lomax (Waihora Ellesmere Trust)

How will we know when we have achieved success?
Native fish populations and associated habitats are protected and restored

Context

A total of 47 species of fish have been recorded in Te Waihora/Lake Ellesmere and its tributaries. Some of these are long-term resident species tolerant of varying levels of salinity. Sixteen species are diadromous, meaning that they spend part of their life in the ocean. The lake supports important customary and commercial fisheries - key species are tuna/eels (shortfin), patiki/flounder (black, sand, and yellowbelly), and aua/yellow eyed mullet. The lake provides an important conduit for recruitment of diadromous fish to the Selwyn River and other tributaries. The lower reaches of the many waterways which flow into the lake provide important fish habitat (Hughey and Taylor et al. 2008).

The State of the fish populations

Selecting indicators for this report

The Whakaora Te Waihora (WTW) restoration programme has preliminarily identified the measure 'occurrence of selected native fish species' as an indicator of lake health. This may involve gathering data on the size, distribution and abundance of a range of indigenous species identified as being of particular importance. These species are likely to include tuna/longfin and shortfin eel, several species of pātiki/flounder, aua/yellow eyed mullet and inanga/whitebait. Other important species include the very abundant bullies and smelt, which are a food source for birds and larger fish. (N.B. the introduced brown trout, which is historically very significant, is discussed in a separate recreation report[1]).

Sources of data on the fish populations of Te Waihora and main tributaries

A number of studies have been undertaken in Te Waihora, both for the agencies tasked with managing the resources and by others, including university students. These studies have tended to focus on a particular research question and often only provide a snapshot at a point in time rather than indicating trends over time.

The Department of Conservation (DOC) has a role in monitoring fish species. Some studies have been carried out, but there is no on-going monitoring occurring. Surveys have indicated the presence of

[1] The trout fishery is discussed in the recreation section of Hughey, K.F.D., Johnston, K.A., Lomax, A.J., and Taylor K.J.W. (eds). 2013. Te Waihora/Lake Ellesmere: State of the Lake 2013. Waihora Ellesmere Trust Technical Report No.1. which is available from http://www.wet.org.nz/projects/2013-state-of-the-lake/

Rudd (*Scardinius erythrophthalmus*), and Catfish (*Ameiurus nebulosus*), both introduced pest species[2]. Goldfish (*Carassius auratus*) are also present in the lake, but are not officially a pest species. They were particularly evident in the summer of 2012/13 when the lake was open to the sea for an extended period and large numbers of goldfish sought refuge from the saline water by moving into the tributaries. Although not designated as pest, goldfish are likely to be impacting on the indigenous species by competing for food and habitat.

In 2011, a survey of the threatened Canterbury mudfish was carried out for DOC in the Te Waihora catchment. This indicated a possible new Canterbury mudfish catchment involving the drainage networks flowing into the lake and further survey work was recommended.

Local runanga have a strong interest in monitoring the indigenous fish, and the health of mahinga kai species is included in cultural health monitoring. Mahinga kai refers to interests in traditional food and other natural resources and the places where those resources are obtained. Ngāi Tahu are in the process of reviewing and implementing a monitoring framework for mahinga kai areas and species within the Te Waihora catchment.

The Ministry for Primary Industries (MPI) holds data on customary harvest from Te Waihora compiled by Ngāi Tahu from permits issued by lake kaitiaki (guardians). The MPI Annual review of Freshwater Fisheries 2011/12 notes that information available from customary reporting for eel stocks for Te Waihora suggests fulfilment for these stocks is stable or increasing. Fulfilment provides an indication of whether customary fishing needs are being met.

As the tuna/eels and pātiki/flounder are important commercial fisheries, the Ministry for Primary Industries collects a range of data on an on-going basis which provides the most reliable longitudinal data on the state of these fisheries.

Commercial fishing data collection

There are three main commercial fisheries in Te Waihora – tuna/eels, pātiki /flounder and aua /yellow-eyed mullet. These are all managed under the Quota Management System (QMS) by the Ministry for Primary Industries which aims to ensure sustainability of fish stocks.

The commercial eel monitoring programme, which collates data on size grades, species composition, and fine scale catch location from individual eel landings has been underway in the South Island since 2009-2010. The catch from each landing is sorted into species (shortfin and longfin) and then visually graded by size before weighing.

Catch Per Unit Effort (CPUE) is also analysed for tuna/long and shortfin eel and pātiki/flounder. For example, CPUE might be measured in terms of the weight of eels caught (catch) in relation to the number of net-days (i.e., the number of nets used and length of time each net is set). This measure can be used as a proxy for abundance, based on assumptions that the fish are easier to catch if there are

[2] Information on pest fish is included in a DOC leaflet http://www.doc.govt.nz/documents/about-doc/concessions-and-permits/conservation-revealed/pest-fish-freshwater-lowres.pdf

more of them and that changes in the timing of catch or locations used by fishers does not have a significant impact on the CPUE and that unreported catches are minimal or insufficient to affect the CPUE. Therefore, an increasing CPUE should indicate an increasing population and vice versa.

The MPI Annual review of Freshwater Fisheries 2011/12, noted above, covers tuna/eel fisheries (known as Group 1) and objectives and indicators have been identified in relation to use and environment.

Tuna (eels)

Te Waihora eel fishers use fyke nets and the fishery season runs from about October to March. The eel fishery of Te Waihora is almost entirely shortfin (*Anguilla australis*). Fishers actively return any longfin (*A. dieffenbachii*) caught to the water. Historically, the longfin only ever constituted about 1% of the Te Waihora eel catch (Beentjes, 2013, p.18).

Tuna/shortfin eels

The South Island eel fishery was introduced into the Quota Management System (QMS) in 2000–01, with five Quota Management Areas. For eels, Te Waihora is within the ANG 13 Quota Management Area. The key Eel Statistical Areas (ESAs) are AS1, within the lake, and AS2 Te Waihora Migration offshore area. AS1 is split between Selwyn catchment (AS1A) and the lake excluding the migration area (AS1). Post-QMS, the shortfin showed trends of significantly increasing CPUE in the Te Waihora lake eel fishery (AS1).

Te Waihora catch sizes have been relatively stable over a number of years. There was a sharp drop in catch in 1994 when a minimum legal size for eels taken was introduced to the lake. This was set at 140 g increasing by 10 g a year to 220 g.

Prior to 2000 Te Waihora was managed as a controlled fishery with a capped catch limit of 136.5 t, fished by 11 permit holders. Following introduction into the QMS the Total Allowable Commercial Catch (TACC) was reduced to 122 t. In the first three years the TACC was under-caught by 11–43% and thereafter was 100% caught with the exception of 2010. Fisher numbers also declined as quota was purchased and aggregated.

One factor considered in working out CPUE is the number of net lifts, which showed a steep reduction from 1991 to 2006. This coincided with fishers progressively reducing deployment of large numbers of small fyke nets in favour of fewer larger nets. This is likely to be one of a number of factors contributing to the increase in CPUE. However, commercial fishers on the lake confirm that catches are noticeably better in recent years, consistent with the steep increase in CPUE (Beentjes &Dunn, 2013).

Table 1 shows the objectives and indicators used by MPI and table 2 shows whether or not the performance measures have been achieved.

Table 1. The objectives and indicators for the tuna/eel fishery from the MPI Annual Review of Freshwater Fisheries 2011/12

Group 1	
USE OBJECTIVES:	Secure social, economic and cultural benefits from each stock.
1. Trends in: ・・fulfilment of customary fishing authorisations ・・amateur participation rates ・・real quota value ・・overall benefits (where these can be determined cost effectively) are stable or increasing. 2. Rolling 5-year average Cost Recovery Levies (CRL)/Annual Catch Entitlement (ACE) value is not increasing.	
ENVIRONMENT OBJECTIVE (Stock Sustainability)**:**	Maintain adequate spawning biomass to provide for high levels of recruitment. Protect, maintain and enhance eel habitats.
1. Stock size (or agreed indicator) is at or above an established target reference level with at least a 50% probability. 2. Policy objectives for habitats of significance for the management of eel fisheries are met. 3. Relevant resource management policy and planning documents include objectives, policies, and rules that protect habitats of significance for the management of eel fisheries.	

Table 2. MPI Assessment for Group 1 (which uses the ANG 13 quota management area not Eel Statistical Areas)

stock	**Trend in Real Quota Value**	**Trend in Amateur Participation**	**Trend in Customary Authorisation Fulfilment**	**Trend in CRL/ACE value**	**Stock sustainability *performance measures***	**Habitats of significance for eel management**		**Policy objectives for effects of fishing on the environment**
						Policy objectives	**Resource management protection**	
ANG13	? Estimated quota value for 2008/09 was $10,652 per tonne.	? No amateur participation data for freshwater stocks.	☑ Consistent reporting of authorisations and catch. Stable fulfilment of authorisations between 2006 and 2012 (average 73%). Inability to fish according to tikanga.	☑ • Not enough ACE value information available. However, declining trend in cost recovery levies.	☑ • No target level set. However, CPUE series shows increase in shortfin abundance since introduction to the QMS up to 2006, then abundance relatively stable until 2010.	? Habitats of significance not yet determined. A number of areas closed to commercial fishing.	☑ • Areas of significance to Ngāi Tahu for eel fishing identified in Canterbury Coastal Plan.	☑ • Policy objectives for managing effects of fishing on the environment have not been determined. Fishing method impacts considered low. Regulated and voluntary measures in place to address biosecurity risks.

Symbol	Description
☑	Performance measure met *Information directly relevant to the performance measure is available and confirms the performance measure is met.*
☑	Likely performance measure met *Information directly relevant to the performance measure is not available but other information indicates performance is consistent with the performance measure.*
?	Insufficient information *Available information is insufficient to make an assessment relative to the performance measure.*
☒	Unlikely performance measure met *Information directly relevant to the performance measure is not available but other information indicates performance is not consistent with the performance measure.*
☒	Performance measure not met *Information directly relevant to the performance measure is available and confirms the performance measure is not met.*

Tuna/longfin eels

As noted above, currently the commercial fishers in Te Waihora release the longfins. It is also a legal requirement that any over 4kg are released. Unfortunately, there is currently no requirement to record the numbers of longfins released. However, work is underway to introduce a log book system which will enable this information to be collected in the future (Mike Beentjes (NIWA), pers. comm, 2013) . It is intended that this system will be in place in 2014.

Pātiki/flounder

Te Waihora is part of the FLA 3 Quota Management Area, which is divided into a number of statistical areas. Te Waihora is included in the statistical area 022 (Banks Peninsula-Canterbury Bight).

The bulk of the FLA 3 commercial catch (95%) is taken by inshore bottom trawl with about 5% from setnetting. Most of the setnetting catch is thought to be from Te Waihora/Lake Ellesmere, although it is not possible to determine the exact amount because the lake is included in reporting the Banks Peninsula-Canterbury Bight reporting area.

Annual landings of flatfish in FLA 3 fluctuate more than two-fold and have averaged about 1700 t since 1986–87. The TACC has never been exceeded. It was originally set high because flatfish growth is fast and recruitment is variable, and a high TACC allows fishers to take advantage of years of high abundance.

The flatfish species in the lake include black flounder (*Rhombosolea retiaria*), yellowbelly flounder, (*R. leporina*) and sand flounder (*R. plebeia*). The lake eel fishers switch to setnetting for flatfish in the winter months when eels are not vulnerable to capture. Black flounder have a limited distribution and tend to be confined to brackish estuaries. The Te Waihora black flounder fishery is the largest in New Zealand for this species. Yellowbelly flounders and sand flounders are found coastally and within estuaries throughout New Zealand. The sand flounders make up only a small proportion of the flatfish setnet catches in Te Waihora.

The setnet CPUE analyses show large fluctuations in the annual CPUE indices with no clear trends, and wide confidence limits around the indices, reflecting the small number of participants (around seven) in the fishery.

Since 1987 the lake has been opened to the sea every year between one and six times, with the length of opening varying from 3 to 97 days. This allows inward flow of ocean water at high tide, and presumably facilitates the recruitment of fish species into the lake and migration out of the lake. It is unknown if black flounder, which is confined to brackish waters, exhibits any spawning-related migration in or out of the lake when the lake is open. Therefore the lake opening regime may be less important for this species than for other species.

There are large annual fluctuations for all three lake flatfish populations which is typical of a fast growing, short-lived species. Abundance in the lake of the yellowbelly flounders and the sand flounders is likely to be dependent on conditions off the coast and on the timing of lake opening, which will determine recruitment success into the lake. However, the black flounder abundance may be controlled by environmental factors within the lake (Beentjes & Manning, 2010).

Other important species

No recent data for aua/yellow eyed mullet, inanga/whitebait, bullies and smelt are readily available. Aua/Yellow eyed mullet has had commercial and recreational importance, but biomass estimates are not available and the most recent stock assessment in 2010 notes it is not known if the catch is sustainable.

Pressures on fish populations of Te Waihora and its tributaries

There are many different factors that influence freshwater fish communities in Te Waihora, but the main pressures are most likely to be associated with recruitment and habitat.

Lake openings and recruitment

Recruitment of juvenile fish into Te Waihora is essential for maintaining a healthy and abundant fish community. This is particularly true for diadromous fish that recruit into the lake each year. For example, flatfish catches have previously been suggested to be significantly related to the length of lake openings during the August-November period 3 years earlier (Taylor 1996), but this is not supported by findings from Jellyman & Smith (2008). The lake can be opened to the sea mechanically (depending on lake level), but different fish recruit during different times of the year (Appendix 2), making it difficult to choose the optimum times to open the lake. It appears probable that the area (near Taumutu) of Kaitorete Spit through which the lake is artificially opened to the sea is often closed at key times for recruitment of particular species and consequently those fish are unable to access the lake on a consistent basis. This makes robust interpretation of CPUE data difficult.

Loss of habitat

Different fish may prefer different habitats and areas in Te Waihora. For example, analysis of a survey in the summer months of 1995 found that bottom dwelling fish (e.g., common bully and shortfin) abundance was widespread and differences in abundance distribution probably represented bed

sediment characteristics (and a few large eels at Hart's Creek) (Figure 1). In contrast free-swimming fish (e.g., inanga) distribution reflected wind driven current patterns and the presence of shelter (Glova and Sagar, 2000).

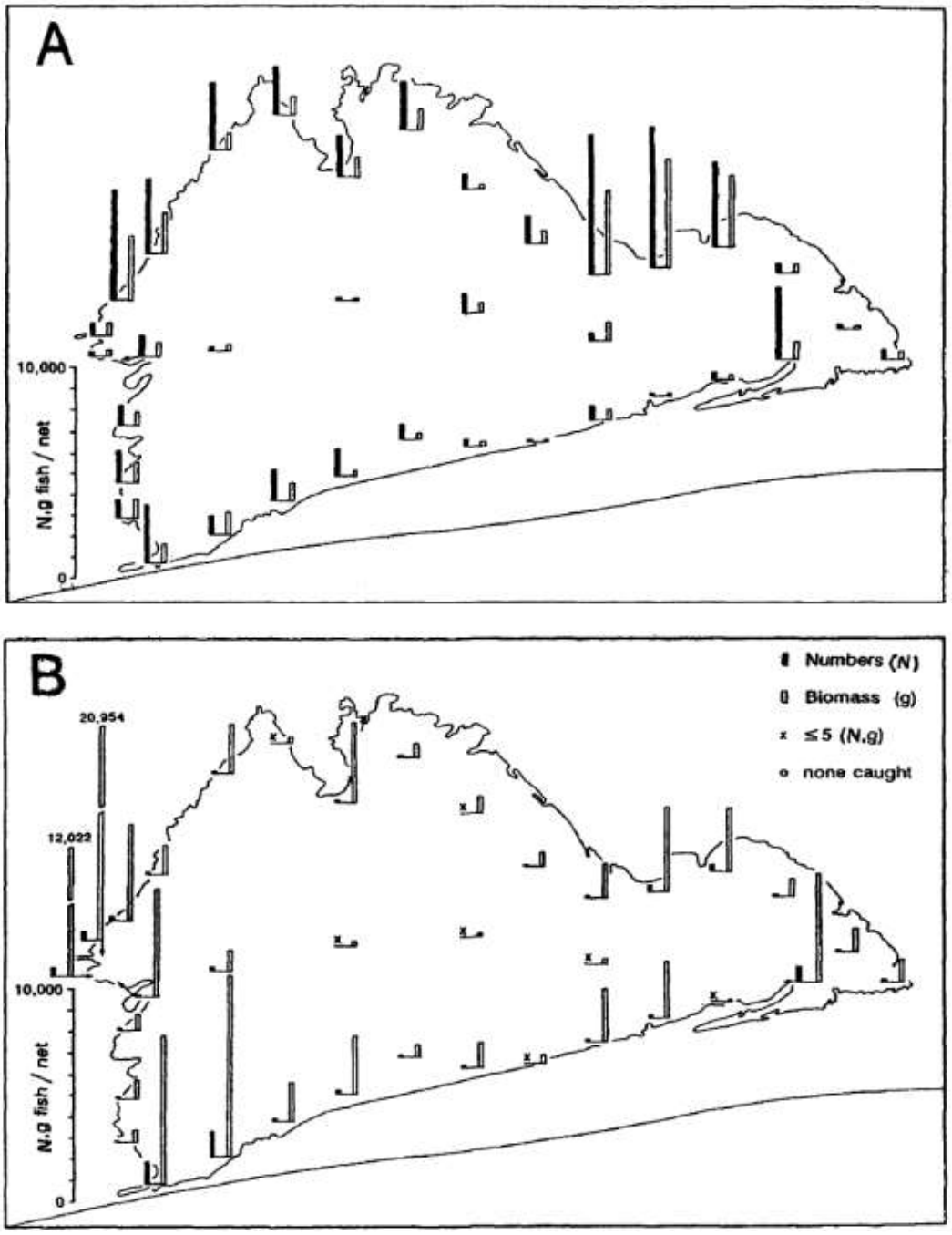

Figure 1. Abundance of common bullies (Map A) and shortfins eels (Map B) in Te Waihora in summer months 1995 (Glova & Sagar 2000: 518).

Figure 2 shows that the reserve area around Harts Creek supports a population with a larger proportion of big shortfins compared to the non-reserved area at Timberyard Point (Jellyman, 2012). No longfins were recorded as present around Timberyard Point, but this is probably associated with differences in habitat.

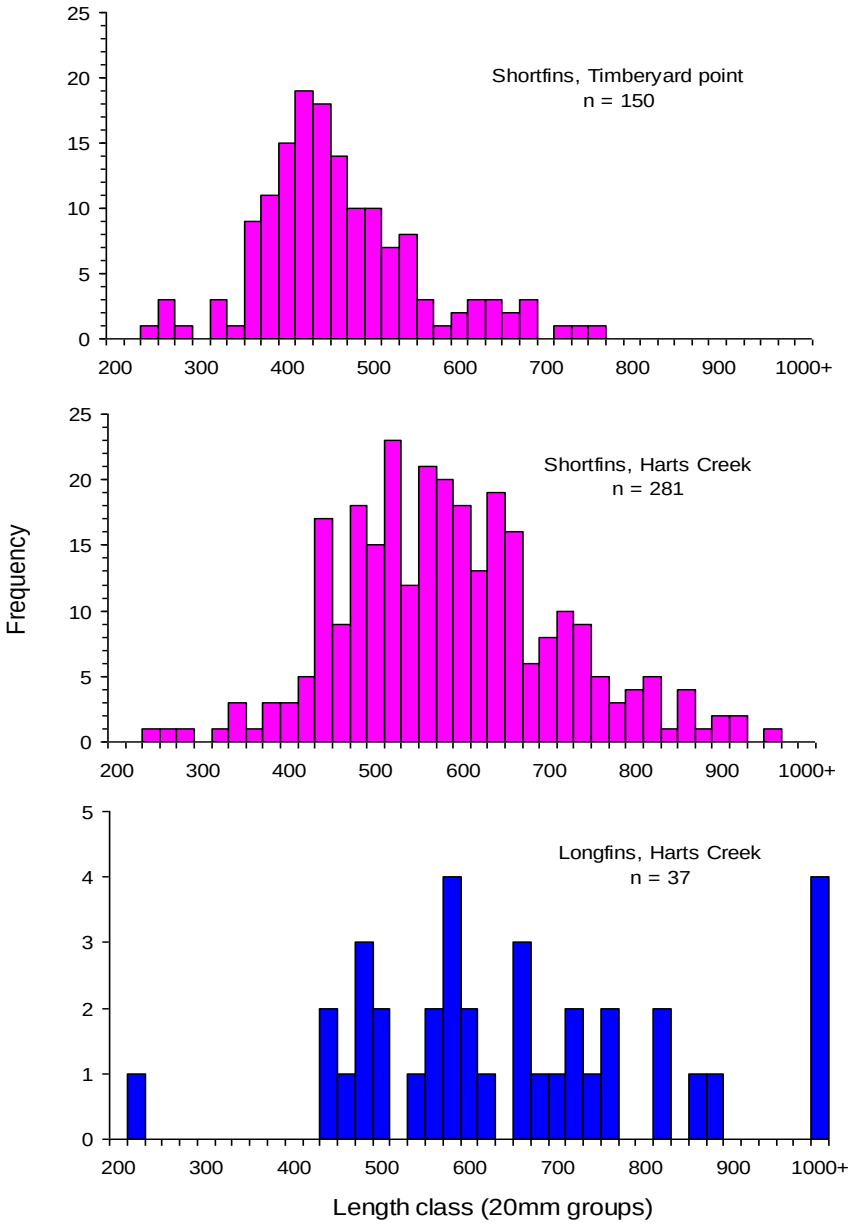

Figure 2. Length-frequency of eels in Timberyard Point (non-reserved) and Harts Creek (reserve) (Jellyman 2012).

Responses – protecting and restoring indigenous fish populations and their habitat

See appendix 5. for details of some of the specific responses in place for Te Waihora

Input responses

Restrictions and permits

Responses can include closing specific areas to all or some types of fishing, restrictions on gear which is permitted, and restricting access to fish.

For Te Waihora, Ngāi Tahu have identified areas within the lake as kōhanga (recreational and customary fishing only) - see Appendix 4. There are also fisheries regulations restricting the use of nets at river mouths Figure 3), and on the type of gear to be used. Permits are required for customary fishing, administered by Tangata Tiaki, and commercial fishers require a commercial fishing permit and access to annual quota of fish to catch.

Figure 3: Areas (within dotted circles) where using any nets for catching finfish are prohibited by fisheries regulations (Map courtesy of Ministry of Primary Industries)

Habitat Management

Responses involving protecting and restoring habitat include managing the lake level, rules to protect water quality and water quantity, riparian improvements including the provision of shade which will improve in-stream habitat health, and undertaking pest control programmes.

For Te Waihora, the National Water Conservation Order was amended in 2011. Changes now allow management for the habitat of indigenous fish, and for significance in relation to tikanga Māori in respect of Ngāi Tahu history, mahinga kai and customary fisheries. Discharges to water and water takes are regulated through the Resource Management Act 1991 and associated planning mechanisms, and riparian restoration projects around the lake margin and in key tributaries are expected, over time, to lead to an improvement in the in-stream and lake edge habitat quality.

Research

Increased knowledge of the fish populations will assist management. Specific research currently underway includes trials on the re-establishment of macrophyte beds (which were largely destroyed by

the 1968 Wahine Storm) and artificial habitat creation in the lake, and investigations of fish restocking/recruitment and a review of fisheries management, particularly in the kōhanga areas.

Aquaculture
The development of aquaculture can, in some locations, be considered as a response to pressure on indigenous fish populations as farming fish may remove some pressure from the wild populations. This has been considered for Te Waihora/Lake Ellesmere but is not currently under investigation.

Fisheries management output responses
Output responses include restrictions placed on fishing activities, such as limiting the size of fish which can be taken, the numbers, the tonnage and the species.

As noted above, fishing activities in Te Waihora are subject to a range of restrictions through the Quota Management System, and the regulation of recreational and customary fishing. In addition, in Te Waihora, commercial fishers release any longfin eels caught

Discussion

Management options
Based on current knowledge, protecting favoured habitat areas is one approach to preserving fish abundances in the lake, and may have benefits for the population structure. This is evident in Figure 2 which shows that the reserve area around Harts Creek had a higher proportion of larger shortfins than the non-reserved area around Timberyard Point. Tagging studies have revealed that fish do not move large distances, suggesting that localised eel reserves will directly benefit the populations (Jellyman, 2012).

For protecting the habitat of freshwater fish populations of the lake in general, it is necessary to correctly identify key habitat preferences of the different fish species and explore opportunities for artificial or natural habitat enhancements. This may include re-establishing macrophyte beds which were lost as a result of the Wahine storm in 1968.

Satisfactory recruitment of diadromous fish will depend on the management of the lake opening. Identifying the preferred opening regime will depend on on-going research to accurately quantify the recruitment patterns of freshwater fish and the effects of lake openings at different times.

Recommendations

Although there is good data available on different aspects of the fish populations and their habitats, there is a clear need for a coherent, consistent and integrated monitoring programme which gathers data on the size, distribution and abundance of key species. Regular monitoring of pest species and their impact on indigenous fish and habitat would also be beneficial. All data gathered should be publicly accessible.

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Thanks to Shannan Crow and Mike Beentjes from NIWA who supplied information for this report.

Appendix 1

A total of 47 species of fish have been recorded from Te Waihora and its tributaries. Lists of species recorded from the lake have been provided by numerous researchers in the past, but the most comprehensive list (Jellyman and Smith 2008) is reprinted here (Table 1). Most long term resident species in the lake are euryhaline and tolerant of varying levels of salinity i.e. tuns/eels, pātiki/flounder, smelt, inanga/whitebait, common bullies. Exceptions would be some of the marine species that occasionally arrive in the lake during a period of extended opening. Out of the freshwater/estuarine species, 16 of these fish are diadromous, meaning that they spend part of their life in the ocean (e.g., inanga/whitebait), while the remaining fish are all non-diadromous and live their entire lives within freshwater. Eight are exotic species and five are sport fish (as defined in the Freshwater Fisheries Regulations 1983).

Table 1:Fish species recorded from Te Waihora/Lake Ellesmere.
(S) = sport fish, (X) = exotic, Y = a diadromous species, Y^1 indicates can be voluntarily non-diadromous, Y^2 indicated usually non-diadromous but can also have sea-run stocks, ? = status uncertain, * = recorded, ** = often found, *** = common.

Common name	Scientific name	Diadromous species	Te Waihora	Selwyn catchment
Freshwater/estuarine species				
Yelloweye mullet	*Aldrichetta forsteri*	Y	***	*
Shortfin eel	*Anguilla australis*	Y	***	***
Longfin eel	*Anguilla dieffenbachii*	Y	**	**
Goldfish (X)	*Carassius auratus*		**	*
Torrentfish	*Cheimarrichthys fosteri*	Y	*	*
Giant kokopu	*Galaxias argenteus*	Y	?	
Koaro	*Galaxias brevipinnis*	Y	*	
Banded kokopu	*Galaxias fasciatus*	Y	*	
Inanga	*Galaxias maculatus*	Y	**	*
Canterbury galaxias	*Galaxias vulgaris*			**
Lamprey	*Geotria australis*	Y	*	*
Upland bully	*Gobiomorphus breviceps*			***
Common bully	*Gobiomorphus cotidianus*	Y^1	***	**
Giant bully	*Gobiomorphus gobioides*	Y	*	*
Estuarine triplefin	*Grahamina sp.*	Y	*	
Canterbury mudfish	*Neochanna burrowsius*			*
Common smelt	*Retropinna retropinna*	Y^1	**	*
Black flounder	*Rhombosolea retiaria*	Y	***	
Koura	*Paranephrops spp.*			*
Perch (X), (S)	*Perca fluviatilis*		*	*
Brook char (X), (S)	*Salvelinus fontinalis*			*
Brown trout (X), (S)	*Salmo trutta*	Y^2	*	**
Rudd (X)	*Scardinius erythrophthalmus*		*	
Catfish (X)	*Ameiurus nebulosus*		?	
Tench (X), (S)	*Tinca tinca*		*	
Chinook salmon (X), (S)	*Oncorhynchus tshawytscha*	Y	*	
Marine species				
Kahawai	*Arripis trutta*		*	

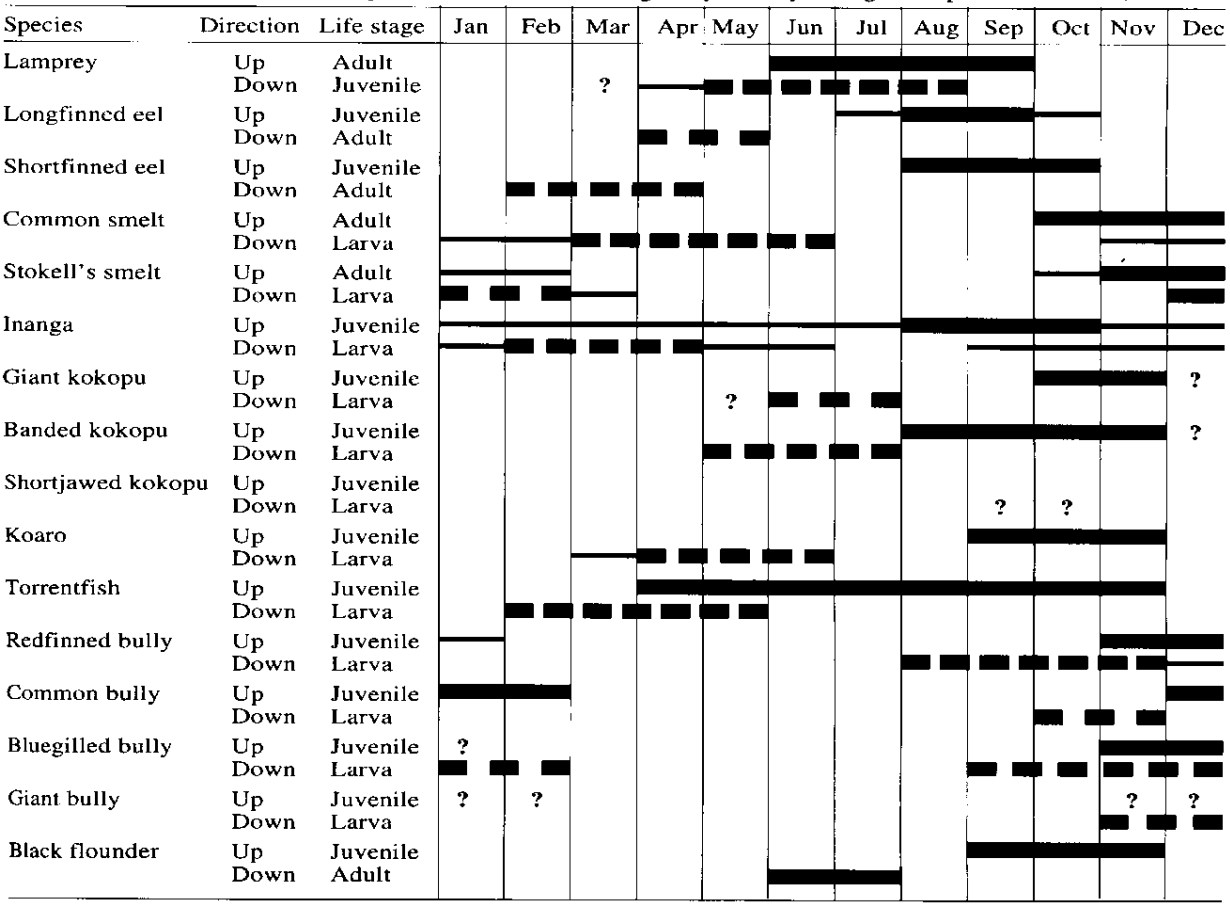
Yellowbelly flounder	*Rhombosolea leporina*		***	
Sand flounder	*Rhombosolea plebeia*		***	
Greenback flounder	*Rhombosolea tapirina*		*	
Common sole	*Peltorhamphus novaezelandiae*		*	
Sprat	*Sprattus antipodum*		*	
Hake	*Merluccius australis*		*	
Sand stargazer	*Crapatalus novaezelandiae*		*	
Estuarine stargazer	*Leptoscopus macropygus*		*	
Sand eel	*Gonorynchus gonorynchus*		*	
Red cod	*Pseudophycis bachus*		*	
Basking shark	*Cetorhinus maximus*		*	
Rig	*Mustelus antarcticus*		*	
Elephant fish	*Callorhynchus milli*		*	
Spiny dogfish	*Squalus acanthias*		*	
Skate	*Raja nasuta*		*	
Globefish	*Contusus richei*		*	
Spotty	*Pseudolabrus celidotus*		*	
Warehou	*Seriolella brama*		*	
Red gurnard	*Chelidonichthys kumu*		*	

This is a high level of biodiversity and the lake also contains some threatened species. Threat status of freshwater fishes is assessed every 2-3 years and the process and guidelines can be found here http://www.doc.govt.nz/getting-involved/consultations/closed/archive/new-listing-of-threatened-status-of-new-zealand-freshwater-fish/

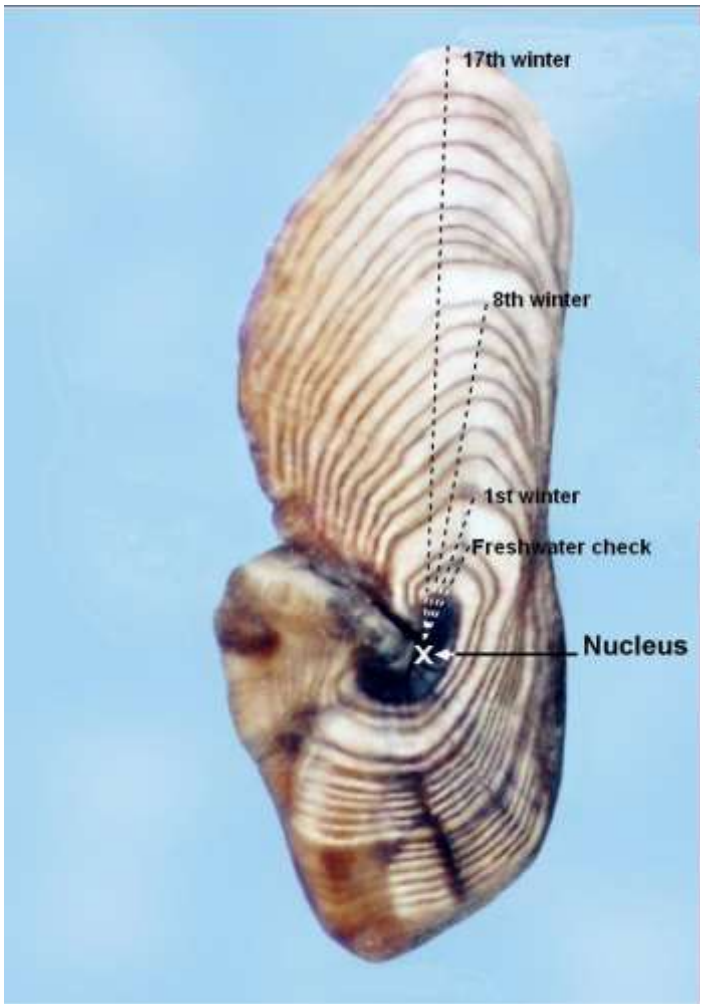
Appendix 2

From R. M. McDowall (1995) Seasonal pulses in migrations of New Zealand diadromous fish and the potential impacts of river mouth closure, New Zealand Journal of Marine and Freshwater Research, 29:4, 517-526.

Table 2 Summary of migration periods of New Zealand's diadromous freshwater fish species (▬ probable main periods of migration; ■ ■ ■ periods of less intense migratory activity; ? migration period uncertain).



Appendix 3. Sectioned otolith and yearly growth bands. Photo taken by Greg Kelly

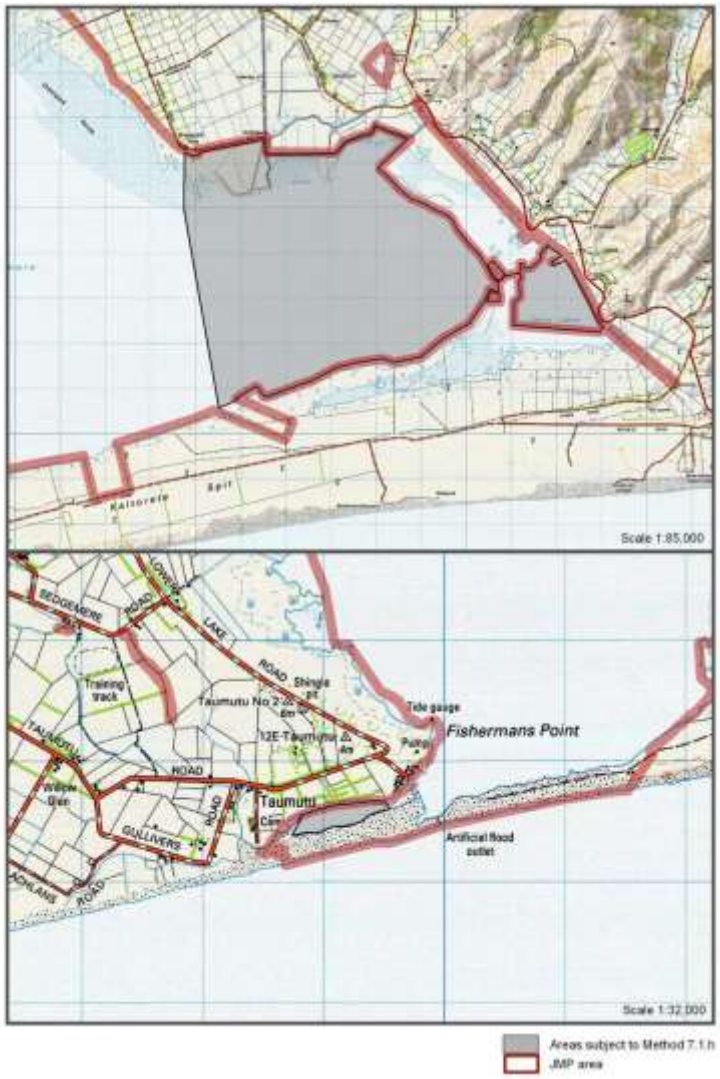


Appendix 4 Kōhanga areas

Ngāi Tahu have identified an area within Kaituna Lagoon at the eastern end of the lake, and a smaller area near Taumutu as a kōhanga (recreational and customary fishing only).

Section 7.1 from the Te Waihora Joint Management Plan states:
Ngāi Tahu and the Department [of Conservation], *the latter to the extent that land administered by the Department is involved, will manage the two areas identified on Figure 13 as customary and recreational use areas and/or kōhanga by controlling the placement of fishing nets, associated stakes and anchors, or other commercial activities where they would be in contact with the Ngāi Tahu lakebed.*

The fee simple title ownership of the lake bed lies with Ngāi Tahu and it is this which provides the basis of protection for Te Waihora. For further information see Nigel Scott's evidence to the Water Conservation Order hearings in 2011 http://ecan.govt.nz/publications/Plans/lake-ellesmere-wco-applicant-evidence-nigel-scott-010611.pdf



Map 1. Te Waihora kōhanga (recreational and customary fishing only) (Source: Te Waihora Joint Management Plan – Department of Conservation & Te Runanga o Ngai Tahu.

Appendix 5 Responses – protecting and restoring indigenous fish populations and their habitat

In this Appendix we have provided some of the more relevant regulations and references to planning documents as at 8th November 2013 to illustrate the range of responses to protecting and restoring indigenous fish populations and their habitat. This appendix sets out most of the relevant regulations and notices governing fishing. It is not intended as a legal guide and no reliance can be placed on information set out below in any legal actions. Relevant fish regulations (to which you should refer directly) include: the Freshwater Fisheries Regulations 1983 (and associated Anglers Notices), Fisheries (South-East Area Amateur Fishing) Regulations 1986, Fisheries (Commercial Fishing) Regulations 2001 and the Fisheries (South-East Area Commercial Fishing) Regulations 1986.

Commercial Fisheries

Under the Fisheries (South-East Area Commercial Fishing) Regulations 1986, a commercial fisher is restricted to set nets that in total do not exceed 1,500m in length, and cannot take eels from the arm of the lake near Taumutu (or streams running into that arm), or take eels less than 220g in weight, and must have escapement tubes of at least 25mm inner diameter in specified parts of their fyke net. There are some special seasonal, eel size and gear restrictions relating to an area designated as the 'male shortfin eel migration area'. These are not detailed here. That area is defined as (Regulation 2(1):

> *male short-finned eel migration area* means those waters of Lake Ellesmere (Te Waihora) lying between a straight line drawn from the site of a marker pole situated at approximately 43°50.58'S and 172°24.94'E to the site of a marker pole situated at approximately 43°50.66'S and 172°22.06'E and a straight line drawn from the site of a marker pole situated at approximately 43°51.44'S and 172°22.25'E to the site of a marker pole situated at approximately 43°51.37'S and 172°22.28'E

More generally, the Fisheries (Commercial Fishing) Regulations 2001 include restrictions on net mesh size (25mm for yellow eyed mullet, 85 for mullet, 100 for all other fish in the Lake), a minimum fish length of 25cm for flatfish, no eels weighing over 4kg can be taken, various types of net (e.g., lampara and Danish seine) are not allowed to be used in the Lake or rivers and nets cannot extend across a river or stream channel more than a quarter of the width of the river, etc.

Sport Fish regulations

Freshwater Fish regulations (note: Sport Fish (see Appendix 1for these species) are controlled under the Freshwater Fisheries Regulations 1983 by the Fish and Game Council primarily through Anglers Notices issued under section 26R(3) of the Conservation Act 1987). There are no indigenous sport fish in the Lake or its catchment, consequently we have not set out the regulations or Anglers Notices here. That information can be found in Notices issued in the New Zealand Gazette or at: http://fishing.fishandgame.org.nz/content/freshwater-fishing-regulations.

Recreational Amateur Fisheries

General:

There are restrictions on net mesh sizes for taking particular species. In some cases the minimum mesh sizes for set nets are different from the minimum sizes for other nets such as drag nets.

- The minimum mesh size for eel fyke nets or traps is 12 mm.

General netting restrictions

- No person may set or possess more than one drag net, set net, fyke net, or any other type of net at any one time.
- Nets must be hauled by hand.
- Any net or nets used either individually or jointly must not extend across more than one-quarter of the width of any river, stream, channel, bay or sound.
- No person may set or use a baited net (except fyke nets).
- Nets must not be staked (except fyke nets).
- No net may be used in a way that causes fish to be stranded by the falling tide.
- Each end of a set net must have a surface float that is marked clearly, legibly and permanently with the fisher's initials and surname. A phone number is also useful. Only one float is required for fyke nets.

Drag net restrictions

- Drag nets must not exceed 40 metres in length.
- Total warp length must not exceed 200 metres.
- The minimum mesh size for drag nets is 100 mm.

Set net restrictions

- Only one set net is allowed to be used from, or be on board any vessel. (An additional net is allowed for bait fishing if it is less than 10 metres long and has a mesh size of 50 mm or less).
- Set nets must not exceed 60 metres in length.
- A set net must not be set within 60 metres of another net.

Flatfish set net means a net that:

- is equal to or less than 9 meshes deep
- has a monofilament diameter equal to or less than .35mm
- has a mesh size equal to or greater than 100mm
- is anchored at each end
- does not exceed a total length of 60 metres

There are no area restrictions on amateur fishing other than those relating to the river mouth restrictions on netting (identified in Figure 3 above) and described in regulation 6(1) of the Fisheries (South-East Area Amateur Fishing) Regulations 1986:

> Fisheries (South-East Area Amateur Fishing) Regulations 1986
>
> 5. Net mesh size restricted at Lake Ellesmere
> No person shall use for taking finfish, other than herring, a net having a mesh of less than 100 mm in the waters of Lake Ellesmere.
>
> 6 Use of nets restricted at and near Lake Ellesmere
> (1) No person shall—
> (a) use any net for taking finfish in any river or stream flowing into Lake Ellesmere other than a net used in accordance with the Freshwater Fisheries Regulations 1983, or any District Anglers Notice for the time being in force:
> (b) use any net for taking finfish in the waters of Lake Ellesmere lying within an arc of a circle having a radius of 1.2 km around the centre of the mouth of—

(i) the Irwell River:
(ii) Harts Creek:
(iii) the Selwyn River:
(iv) No 2 Drain:
(v) the Halswell River— the points where that circular arc meets the shore of the lake being indicated in each case by posts painted with alternate black and yellow bands, such bands being approximately 30 cm in height, each such post being surmounted by a triangular plate, painted yellow.

(2) For the purposes of this regulation, the mouth of any river or stream shall be the place where the waters of the river or stream meet the waters of the lake and, in any case where a river or stream has more than 1 mouth, shall include every outlet of the river or stream and the shore of the lake between those outlets.

Furthermore, under Clause 3A(3): No person may, on any day, take or possess more than 30 fish from Lake Ellesmere of the following species found in the Lake: flatfish, red gurnard or lamprey, nor more than 30 fish of any combination of species.

Planning responses

The Te Waihora/lake Ellesmere Water Conservation Order 1990 (amended 2010) sets limits on the level of the lake at which it can be artificially opened to the sea to allow water drainage. Various provisions in the New Zealand Coastal Policy Statement, the Canterbury Regional Council's Regional Coastal Environment Plan, its Regional Policy Statement, Natural Resources regional Plan, and proposed Land Use Regional Plan provide protection to the natural environment and habitats of fish through constraints on changes in water quality and quantity and the effects of activities. Underpinning these provisions are the general requirements of the Resource Management Act 1991 in relation to water quality and avoiding, mitigating or remedying adverse effects caused by activities on the environment.