

**Before the Hearing Panel appointed by Canterbury  
Regional Council**

*In the matter of:* the Resource Management Act 1991

**and**

**In the matter of** a number of applications to take and use water from the upper  
Waitaki catchment.

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**Statement of evidence of Peter James Ravenscroft**

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**Dated:** 16 September 2009

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## Brief of Evidence of PETER JAMES RAVENSCROFT

### **Introduction**

- 1 My full name is Peter James Ravenscroft.
- 2 I am employed by the Department of Conservation (the department), Otago Conservancy, and have been employed by the department since 1987. I have experience in a wide range of conservation disciplines, but principally have been involved in freshwater related issues.
- 3 I have twenty years freshwater experience and have an extensive knowledge of rivers throughout both Otago and the MacKenzie country. Since 2002 I have been supervising the Otago Conservancy's freshwater operating team. The team's main focus has been on determining the ecology and how to conserve the population of lowland longjaw galaxias located in North Otago. I have also completed extensive presence/ absence indigenous fish surveys of many of the tributaries in the Upper Waitaki catchment.
- 4 I am currently a member of the Department's Non-migratory Galaxiid Recovery Group. This group is made up of people with knowledge of non-migratory galaxiids and with an interest in their conservation. The purpose of the group is to review progress in the implementation of the New Zealand non-migratory galaxiid fishes recovery plan (Department of Conservation 2004) and to recommend to the Department any changes which may be required as management proceeds. The group includes departmental expertise along with external members including, university researchers, NIWA and representation from iwi.
- 5 I was the only Department of Conservation representative on a six person panel responsible for assessing and classifying the threat status of New Zealand Freshwater fish species against their risk of extinction using the New Zealand Threat Ranking System. This panel included university researchers, NIWA and Regional Council expertise and a freshwater environmental consultant.

### **Scope of Evidence**

- 6 My evidence will address the following fisheries issues in the Upper Waitaki River Catchment:
  - A description of the indigenous fish species recorded in these waterways.

- The Life histories and habitats of the: Lowland longjaw galaxias and Bignose galaxias
- The implications for these species and their habitat under the proposed management regime.

7 In preparing my evidence I have read the following reports:

1. GHD Summary report dated August 2009-09-16
2. Dr Brian Coffey and Associates, Accumulated effects of nutrient runoff; Selected stream survey, Dated April 2008.
3. Dr Adrian Meredith, Section 42A Officers report

8 I have read the Code of Conduct for Expert Witnesses contained in the Environment Court's Practice Note 2006. I have complied with the code when preparing the following evidence and agree to comply with it when giving evidence before the hearing commissioners.

### **Indigenous Freshwater Fish**

9 Fourteen fish species (nine native and five introduced) are recorded in the New Zealand Freshwater Fish Database (NZFFD, 30th June 2009) as being present in the Upper Waitaki River catchment. (Refer Table 1 attached)

10 When I refer to the Upper Waitaki River catchment I am referring to the section from Lake Benmore Dam to the headwaters.

11 Thirty nine indigenous fish species, including all Evolutionary Significant Units (ESU), are found throughout New Zealand. An ESU is a reproductively isolated group of populations displaying distinct genetically evolutionary characteristics (Ling et al 2001) Of these thirty nine fish, twenty-seven species have been ranked as being either threatened or at risk of extinction.

12 The threat of extinction ranking for these species (along with many others) has been determined by the department, using the New Zealand Threat Classification System. This is national system, led by the department and uses objective criteria and information drawn from a wide range of experts to rigorously assess and classify the risk of extinction faced by New Zealand fauna and flora. (Hitchmough, 2007)

13 In June, 2009 the panel reviewed the threat status of New Zealand freshwater fish species. The threat statuses of individual species referred to in my paragraph below are those recommended by panel. At this stage the recommendations are in draft form and are yet to be peer reviewed and published. However, it's unlikely that there will

be any significant changes from the Draft recommendations report to the finalised report.

14 Of the twenty species of fish either at threat or at risk of extinction in New Zealand the following five are present in the upper Waitaki:

- a) Lowland longjaw galaxias (*Galaxias cobitinis*), categorised as being Nationally Critical, (this is the highest category of species at risk of extinction).
- b) Upland longjaw galaxias (*Galaxias prognathus*), categorised as being Nationally Vulnerable, (this is the third highest category of species at risk of extinction).
- c) Bignose galaxias (*Galaxias macronasus*) categorised as being Nationally Vulnerable, (this is the third highest category of species at risk of extinction).
- d) Longfin eel (*Anguilla dieffenbachii*), categorised as being At Risk and Declining
- e) Koaro (*Galaxias brevipinnis*), categorised as being At Risk and Declining

15 Table One appended to this evidence provides a list of the native fish species recorded in the New Zealand freshwater Fish Database, (NZFFD, 30 June 2009) as being present in the Waitaki catchment. The table includes their scientific and common names along with their threat of extinction. The list also notes exotic fish species recorded on the database.

#### **Native Fish Life Histories and their Management Implications (Waitaki River)**

16 There are numerous small creeks and spring-type systems scattered throughout the Upper Waitaki. Many springs are associated with either river terraces or other depression type springs.

17 The majority of indigenous fish species of conservation concern are now restricted to small creeks and springs systems principally due to competition and predation from introduced sports fish e.g. trout.

#### **Slide One Upper Waitaki Irrigation NZFFD**

18 I now wish to discuss the significance of the populations of lowland longjaw galaxias and bignose galaxias that are recorded in the upper Waitaki.

## Lowland Longjaw Galaxias

- 19 Of the fourteen fish species recorded in the upper Waitaki catchment, eight are native species. The lowland longjaw galaxias (longjaw) is New Zealand's most threatened indigenous fish, being ranked as 'Nationally Critical'. This places it in the same level of threat classification as the Kakapo. My evidence will focus on the importance of longjaw habitat but is also relevant to other fish species and their respective habitats.
- 20 There are seven known populations of longjaw, six of these in the Waitaki catchment, five in the Upper Waitaki catchment, and a further population in the Hakataramea River. The seventh and the largest population are in the Kauru River, which is a tributary of the Kakanui River in North Otago. There are differences in genetics between the Waitaki populations and Kauru populations. The Waitaki populations are considered to be a sister fish and a separate ESU, (New Zealand non-migratory galaxiid fishes recovery plan 2003 -13).
- 21 Maintaining as many of a species viable ESU s is important as it provides for wide genetic variation within the overall population. This is commonly known as a wide gene pool. The wider the gene pool, the more resilient the species is to ecological changes.
- 22 Longjaw galaxias have been recorded from five locations in the Upper Waitaki catchment, these being Ahuriri River, Fraser River, Ruataniwha wetlands, Edward River and Ohau River.

### **Slide Two** Upper Waitaki Irrigation lowland longjaw

- 23 It is believed that population of longjaw associated with the Ohau River are now locally extinct in the spring system., which I will return to later on in my evidence.
- 24 Little has been written on the basic ecology of the longjaw. To gain a better understanding of the upper Waitaki populations, the department undertook monitoring of three populations; a spring in the Fraser River, another in the Ruataniwha wetlands, and a further population in the Edward River, monitoring commenced in 2005 and 2004 respectively. I supervise the team involved in the monitoring and the figures I refer to are the results from this work.

### **Slide Three** Upper Waitaki Irrigation Ruataniwha

- 25 The longjaw is a slender pencil shaped non-migratory galaxiid, which attains a maximum length of 75mm. It has specialised habitat needs and lives for the majority of its one year adult life amongst and below the substrate, moving between surface

and groundwater flows. These interstitial spaces provide a corridor between surface and sub-surface water.

- 26 Due to the longjaw specialised habitat requirements. Upper Waitaki longjaws galaxias are found in greater densities towards the head of the spring where the water exits from the ground.
- 27 At these locations the substrate is 'clean' – absence or limited algae biomass and limited sediment present and the substrate particles are loosely compacted. Both of these components create wider interstitial spaces – this corridor between the substrate allows for ease of access to and from surface and subsurface flows.

**Slide Four** Lowland longjaw

The loss of the corridor to the hyporheic zone by an increase in either periphyton, macrophytes or sedimentation levels has the potential to cause the localised extinction of this species. as it is within this zone that the lowland longjaw galaxias seeks refuge, feeds, and spawns.

**Slide Five** -Longjaw spawning site

**Slide Six** - longjaw habitat .

- 29 In 2003, three individual longjaws were recorded from a spring associated with the Ohau River. Since this time the department has conducted extensive surveys without recording another longjaw.
- 30 The site of the original recording has silted up and now is more of a wetland than spring. This transition from a spring to wetland probably has been taking place over a greater period than over the time monitoring has occurred, 2003 onwards.
- 31 This infilling process has covered the bed with a cover of silt allowing the establishment of macrophytes and in the process clogging the interstitial spaces between particles and a subsequent removal of habitat and has presumably caused localised extinction.
- 32 This process appears to be occurring at the monitoring site at Ruataniwha ponds where there is a notable increase in-stream macrophytes – monkey musk (*mimulus gattus*). Monkey musk is a green fleshy plant with yellow flowers that grows within wetted areas in stable streams and along stream banks. Monkey musk generally dies back during winter and in the process creates its own organic compost. This compost has shown to clog the interstitial spaces within the bed of the Ruataniwha spring.

- 33 In August 2002, there was a complete absence of monkey musk towards the head of the spring, today however the spring is now choked. Monitoring in 2004 recorded 20 longjaws with further monitoring showing a steady decline. In 2008 we recorded only one longjaw.
- 34 The longjaw populations are generally confined to spring type habitats but can and do radiate out from these. For example a few expatriates have been recorded in the main stem of rivers such as the Ahuriri and Fraser Rivers. Within these larger water bodies the longjaw are generally found in riffle type habitats, where the water percolates through the stones. Adult longjaws tend to occupy shallow water that is <.001m in depth and water velocities of 0.1metres per second

#### Bignose Galaxias

- 35 Bignose galaxias (*Galaxias macronanus*) are endemic to the MacKenzie country with 18 known populations. Their distribution extends from the Otamatapaio River near the township of Omarama to Edward River towards Burkes Pass

#### **Slide Seven** Upper Waitaki Irrigation Bignose

- 36 The fish is at risk of extinction with a threat ranking of ‘Nationally Vulnerable’.
- What is known about this species has come from limited monitoring conducted by the department at sites previously mentioned, the Fraser River, Ruataniwha and Edward River
- 37 The Bignose galaxias is a slender pencil shaped non-migratory galaxiid, which attains a lengths of < 85mm, and possibly lives for up to three years. It appears to have specialised habitat needs, and although these are not well understood the species has only been found to occur in spring type systems.

#### **Slide Eight** Bignose

#### **Slide Nine** Bignose

- 38 Spawning has only been recorded from one site, the Ruataniwha ponds and occurs in July / August. Here small 1.8mm diameter eggs were laid 500mm deep within the up-welling at the head of spring. For these fish to access this spawning site they require clear interstitial spaces

#### **The implications for these species and their habitat under the proposed management regime Water Quality/flows and potential impacts**

- 39 Nutrients, which are essential for the growth of algae and other plants, are considered beneficial up to a point. However, if alga growth becomes excessive due to an over

supply of nutrients particularly Nitrogen and Phosphorous, the quality of the river or lake ecosystem deteriorates. (State of the Environment Report Surface Water Quality in Otago, Otago Regional Council, 2007)

- 40 An increase in present level algae or macrophytes or sedimentation which reduces interstitial spaces in springs or small creeks that either longjaw or bignose galaxiids occupy is likely to have an adverse effect.
- 41 It is considered that 3-6 times the median flows will flush periphyton and coarse sediment from the bed in low flows or regulated river systems (Biggs, Close 1989; Clausen, Biggs1997). However spring type systems generally receive more stable flows and potentially may not receive sufficient water velocities to scuff algae nor shift sediment from the stream bed.
- 42 Flow variability and movement of bed sediments can have profound effects on stream ecosystems. Stable, spring-fed streams are subject to few floods, and the fish and plants that live in such streams are often unable to develop similarly or even to survive in less stable environments (Pg 133 Beca 2008. Draft Guidelines for the Selection of Methods to Determine Ecological Flows and Water levels).
- 43 Water level height recordings from the Fraser River spring and the main stem of the Fraser River that the department monitors would support this. The data we have recorded is limited in that, that it has only been recording for a period of 9 month. These loggers are located 250metres apart.
- 44 The data shows that during the nine month period from June 2008 and February 2009 that water flows within the spring reached levels that were 3 times greater than the median flow, yet at the same corresponding time the main-stem of the Fraser River received four such events.

**Slide Ten** Flows recorded at the Fraser River

- 45 This would suggest that at this location and potentially at other springs, if these environments experienced an increase in periphyton, macrophytes or an increase in sedimentation they are unlikely to receive sufficient flows that will clean them.
- 46 GHD Water quality report (Summary) (Pg 46) noted that the model will not ensure the protection of other unstudied receiving environments such as springs and small streams, nor does it ensure that all parts of the lake receiving environments will be maintained at or below an Oligotrophic state. (Cumulative Water Quality Effects of Nutrients from Agricultural Intensification in the Upper Waitaki Catchment. Summary Report Draft. May 2009)

47 As individual small creeks and spring-type systems have not been studied as part of this application it is difficult to properly assess the likely impacts to these receiving environments. This in-turn makes it very difficult to assess the likely impacts to in-stream values.

### **Conclusion**

48 The long term survival of the lowland longjaw galaxias and the bignose galaxias are largely dependent on the specialised spring-type habitats which both species occupy. Given their high risk of extinction any loss in their respective habitat will in my opinion be significant and pose a serious risk to the ongoing survival of these species.

49 It is thought that historically both species were more widely distributed within the Upper Waitaki, however this habitat is now occupied by sports fish. There is already considerable pressure on these species and any potential changes to water quality through land intensification and flow impact to in-stream habitat can only add to the overall concern.

50 Any water management regime applied in the Upper Waitaki River catchment and its tributaries should in my view provide for the needs of indigenous fish species, particularly those which I have identified in my evidence as being at significant risk of extinction.

### **References**

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**Table 1: Fish species present in the Upper Waitaki River catchment**

<b>Scientific Name</b>	<b>Common Name</b>	<b>Threat of Extinction ranking</b>	<b>Native/Introduced</b>
<i>Anguilla dieffenbachii</i>	Longfin eel	At Risk and in Decline	Native
<i>Galaxias cobitinis</i>	Lowland longjaw galaxias	Nationally Critical	Native
<i>Galaxias brevipinnis</i>	Koaro	At Risk and in Decline	Native
<i>Galaxias macronasus</i>	Bignose galaxias	Nationally Vulnerable	Native
<i>Galaxias prognathus</i>	Upland longjaw galaxias	Nationally Vulnerable	Native
<i>Galaxias vulgaris</i>	Canterbury galaxias		Native
<i>Gobiomorphus breviceps</i>	Upland bully		Native
<i>Gobiomorphus cotidianus</i>	Common bully		Native
<i>Oncorhynchus mykiss</i>	Rainbow trout		Introduced
<i>Oncorhynchus nerka</i>	Sockeye salmon		Introduced
<i>Salmo trutta</i>	Brown trout		Introduced
<i>Salvelinus fontinalis</i>	Brook char		Introduced
<i>Oncorhynchus tshawytscha</i>	Chinook Salmon		Introduced