BEFORE THE CANTERBURY REGIONAL COUNCIL

IN THE MATTER OF: the Resource Management Act 1991

AND

IN THE MATTER OF: a submission on the Proposed Canterbury Land and Water Regional Plan Variation 2

EVIDENCE OF DR NICHOLAS REX DUNN

FOR DIRECTOR-GENERAL OF CONSERVATION

Dated 15 May 2015

Director General of Conservation

Private Bag 4715,

Christchurch 8140

Tel: (03) 371 3700

Counsel: Pene Williams

STATEMENT OF EVIDENCE OF NICHOLAS REX DUNN

INTRODUCTION

1. My full name is Dr Nicholas Rex Dunn.

2. I am appearing on behalf of the Director-General of Conservation. I am employed by the Department of Conservation (DOC) as a Freshwater Science Advisor in the Freshwater Section of the Science & Capability Group. I have held this role since September 2012. I was employed by the Department as a Technical Support Officer Freshwater in the Canterbury Conservancy between December 2010 and September 2012.

3. I hold a Bachelor of Science (Earth Sciences) degree from the University of Waikato where I majored in hydrology and soil science, and a Master of Science (Environmental Science) (First Class Honours) degree from the University of Canterbury, majoring in freshwater ecology and hydrology. I also hold a Doctor of Philosophy degree from the University of Otago, in which I investigated aspects of the influences of flow regimes on the ecology of non-migratory galaxias fishes.

4. Since 2003 I have been a Partner, with Dr Leanne O'Brien, in Ichthyo-niche, a research consultancy specialising in native galaxiid fishes and their habitats, particularly Canterbury mudfish. Dr O'Brien's PhD thesis focused on the conservation ecology of Canterbury mudfish (*Neochanna burrowsius*). Dr O'Brien and I have co-authored a number of publications and reports detailing Canterbury mudfish, their habitats, and conservation management.

5. As part of my current role at the Department of Conservation, I represent the Director-General of Conservation on the Hinds Drains Working Party. This Working Party was established under Recommendation 4.9 of the Ashburton Zone Committee's Zone Implementation Programme Addendum for the Hinds Plains Area (AZC 2014). The role of the Working Party is further explained on pages 26-27 of the

Section 42A report. Interim recommendations have been made to the Zone Committee, but further work is underway to establish final recommendations.

6. I have read the Environment Court's Code of Conduct for Expert Witnesses, and I agree to comply with it. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise.

7. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

- My evidence provides a native fish perspective on the matters raised in the Director-General's submission on Variation 2 of the Proposed Canterbury Land and Water Plan. Specifically, my evidence will address the following matters:The freshwater habitats and freshwater fish communities of the Hinds/Hekeao area, with particular regard given to Canterbury mudfish.
- The considerations required in terms of water augmentation and local scale mitigations/ resolution tools required to achieve the ecological targets and outcomes as outlined in the Ashburton Zone Implementation plan (ZIP) addendum. (Ecan 2014)

FRESHWATER HABITATS OF THE HINDS/HEKEAO PLAINS AREA

8. Historically, the freshwater habitats in the Hinds/Hekeao Plains Area were dominated by an estimated 30866 ha of predominantly swamp wetland (based on geospatial data provided by Ausseil et al. 2008).

9. Due to drainage for agricultural purposes, the current freshwater habitats of Hinds/Hekeao Plains Area are characterised by the Hinds River, which now drains to the ocean; the spring-fed drains in the lower catchment; the artificial Ashburton District Council stockwater race network; and approximately 100 ha of wetlands (29 ha on the coast, 69 ha in upper catchment, 2 ha on plains (ECan regional wetland layer as at 16 January 2015, sourced from Canterbury Maps, CC BY 3.0 Environment Canterbury Regional Council)).

FRESHWATER FISH COMMUNITIES IN THE HINDS/HEKEAO PLAINS AREA

10. In their summary of local scale mitigations Meredith & Lessard (2014a) state that "the impact of stream mitigations on ecological communities are an integral part of solution packages for subregional planning as part of the Land and Water Regional Plan". I agree and consider this requires consideration of the freshwater fish communities present in the Hinds / Hekeao Plains Area and in particular the requirements of Canterbury mudfish.

11. The Hinds River, the drains, and stock-water races which replaced the natural wetlands and associated waterways, now provide substitute habitats for a variety of migratory and non-migratory freshwater fish and macro-invertebrates (Table 1; Meredith & Lessard 2014b).

12. Migratory species are those that require passage to and from the marine environment to the freshwater environment to complete their life cycle. For non-migratory species there is no marine phase, with spawning and rearing occurring within the adult habitat. For migratory species, there are two major periods of downstream movement, viz. March – May, and October – November, and a period of upstream movement of August – October inclusive. Non- migratory species predominantly spawn in the September- November period. These periods represent the 'shoulder months' of the irrigation season. I note the proposed rule 13.5.27 regarding removal of fine sediment to enhance trout habitat. If this rule was restricted to the period between November to March, it would minimise any possible adverse effects on migratory and non-migratory native fish.

Table 1. Native freshwater fish and macroinvertebrates in the Hinds/Hekeao Plains Area as recorded in the New Zealand Freshwater Fish Database (NZFFD). Umbrella categories and conservation status from Goodman et al. (2014) and Grainger et al. (2014). Taonga species status from the Ngāi Tahu Claims Settlement Act 1998. Life history from McDowall (2000).

Common name	Species name	Umbrella category	Conservation status	Taonga species	Life history
Canterbury mudfish	*Neochanna burrowsius*	Threatened	Nationally Critical	Taonga	Non-migratory
Lamprey	*Geotria australis*	Threatened	Nationally Vulnerable	Taonga	Migratory
Longfin eel	*Anguilla dieffenbachii*	At Risk	Declining		Migratory
Torrentfish	*Cheimarrichthys fosteri*	At Risk	Declining	Taonga	Migratory
Koaro	*Galaxias brevipinnis*	At Risk	Declining		Migratory
Inanga	*Galaxias maculatus*	At Risk	Declining		Migratory
Canterbury galaxias	*Galaxias vulgaris*	At Risk	Declining		Non-migratory
Bluegill bully	*Gobiomorphus hubbsi*	At Risk	Declining		Migratory
Stokell's smelt	*Stokellia anisodon*	At Risk	Naturally Uncommon		Migratory
Yelloweye mullet	*Aldrichetta forsteri*	Not Threatened	Not Threatened		Migratory
Shortfin eel	*Anguilla australis*	Not Threatened	Not Threatened		Migratory
Upland bully	*Gobiomorphus breviceps*	Not Threatened	Not Threatened		Non-migratory
Common bully	*Gobiomorphus cotidianus*	Not Threatened	Not Threatened		Migratory
Freshwater crayfish/koura	*Paranephrops zealandicus*	At Risk	Declining		Non-migratory
Freshwater mussel	*Echyridella menziesii*	At Risk	Declining		Non-migratory

CANTERBURY MUDFISH (*Neochanna burrowsius*)

13. Canterbury mudfish under the New Zealand Threat Classification System (Townsend et al. 2008) has the highest conservation status for native freshwater fish in the Hinds/Hekeao Plains Area, of Threatened – Nationally Critical, based on the criteria that irrespective of size or number of subpopulations it has a very high (>70%) ongoing or predicted decline (Goodman et. al. 2014).

14. Furthermore, Canterbury mudfish has the three qualifiers of; Conservation Dependant, Range Restricted, and Sparse. Conservation Dependant means 'the taxon is likely to move to a higher threat category if current management ceases' (Townsend et al. 2008, p 28). The next highest classification is Extinct. Range Restricted means 'taxa confined to specific substrates, habitats or geographic areas of less than 1000 km^2' (Townsend et al. 2008, p 29). Sparse means 'taxa that occur

within typically small and widely scattered populations' (Townsend et al. 2008, p 30).

15. Canterbury mudfish are known to occur in sixteen river catchments from the south bank of the Ashley River to the south bank of the Waitaki River (NZFFD; O'Brien & Dunn 2007a).

    The total habitat area of Canterbury mudfish was estimated by O'Brien & Dunn (2012) as 24 ha across 69 then known habitat fragments. Of this habitat area, only 1.5 ha has some form of legal protection. A further 30 local populations were considered to have gone extinct since they were first recorded.

16. Habitat loss is considered the greatest threat to the long term persistence of Canterbury mudfish (DOC 2003). The habitats of Canterbury mudfish were summarised by O'Brien & Dunn (2007b) as still or very slow-flowing, meandering, swampy streams with deep pools, seepage streams, spring fed streams, scour holes and stockwater races. The diverse range of habitats in which Canterbury mudfish are now found may be, in part, a consequence of the removal of the once extensive wetlands that covered the Canterbury Plains which has forced mudfish to occupy whatever habitat remains that they can tolerate (O'Brien & Dunn 2007b).

17. Another threat to Canterbury mudfish is the presence of other fish species (Cadwallader 1975; Eldon 1979). In their analysis, O'Brien & Dunn (2007b) found that of records in the NZFFD at that time, Canterbury mudfish were found alone in 60 % of records. Co-occurrence with migratory eels occurred at less than 7 % of records, and trout at less than 2 % of records. Meredith (1985) as summarised by O'Brien & Dunn (2007) considered that Canterbury mudfish have poor predator avoidance mechanisms, being generally intolerant of competition due their small size, lack of aggression, small mouth and low metabolic rate, all of which may reduce their potential to be dominant competitors. Moreover, O'Brien (2005) considered co-occurrence with eels was mediated by drying and low flow events that periodically eliminated eels. Thus, the persistence of Canterbury mudfish is

negatively related to the hydrological connectedness of their habitats to other sections of waterway and the ocean. Therefore, these traits of Canterbury mudfish need careful consideration when fish passage works and river mouth openings are being proposed.

CANTERBURY MUDFISH IN THE HINDS/HEKEAO PLAINS AREA

18. The Hinds/Hekeao Plains area contains 19% of known (extinct and extant) Canterbury mudfish habitat fragments (O'Brien & Dunn 2012). Seven Canterbury mudfish habitat fragments are recognised as remaining in the Hinds/Hekeao Plains area, totalling an estimated 0.84 ha of habitat (O'Brien & Dunn 2012).

19. Importantly, Canterbury mudfish are found in remnant habitat throughout the Plains area from near sea level to over 400 ml a.s.l; within the stock water races; cross cut secondary drains; small spring fed tributary streams along the mid main stem of the Hinds River and in tributaries of the North Branch Hinds River.

20. The Mid Canterbury Plains stockwater network, encompassing the Ashburton stockwater race network is listed as a key mudfish site, with the descriptor that it is unusual habitat, in the Department of Conservation's New Zealand mudfish (*Neochanna* spp.) recovery plan (DOC 2003).

21. In this sense (described in paragraphs 18-20), the Hinds/Hekeao Plains Area can be considered of high importance for Canterbury Mudfish.

22. For Canterbury mudfish, there is an acute need to protect remaining habitats. Parallel to this is the need to create new habitat, to ensure persistence of the species. To achieve this, the primary need is water to provide aquatic habitat, and a secondary need is the exclusion of aquatic predators.

23. I have read the evidence of Pam Guest, and consider that her proposed wording for inclusion into the introductory paragraphs of the proposed variation capture the issues relating to the habitat requirements of threatened species in the Hinds/Hekeao Plains Area.

WATER AUGMENTATION

24. Augmentation of the water resources of the Hinds/Hekeao Plains Area has been proposed by the Zone Committee and is provided for in the proposed variation by Policy 13.4.14. I see this approach to water resources management as likely to be beneficial in sustaining the life supporting capacity of freshwater ecosystems.

25. As discussed in Bower (2014) and the Section 42AECan report (R15/48, April 2015), many of the catchment-scale water quantity outcomes depend on the results of the various water augmentation projects, particularly Managed Aquifer Recharge (MAR) pilot programme and any future implementation of this tool. Thus, the success of achieving the environmental targets outlined by the local scale mitigation options (Meredith and Lessard 2014) (and the solutions package as a whole) in the lowland waterways and lower Hinds River and tributaries, are dependent on augmentation, particularly those that relate to the aquatic habitats of native freshwater fish.

26. My view is that MAR could be beneficial for freshwater ecosystems, but at present it is not a proven tool in the Hinds/Hekeao Plains Area (Section 42A report, page 32). Furthermore, MAR will not provide increased base flows to freshwater ecosystems above the Rangitata Diversion Race (RDR). If MAR does not achieve the intended outcomes in terms of increased base flows in the spring fed drains, or is not implemented in a timely manner, then additional Targeted Stream Augmentation (TSA) to specific habitats will be required to sustain the life supporting capacity of freshwater ecosystems, and supply existing irrigation schemes.

27. TSA is already occurring in the area, in the form of the Eiffleton Irrigation Scheme, and the Purata Farms (formerly Synlait Farms) Waitai Canterbury mudfish restoration site. The Eiffleton scheme pumps groundwater into three drains from where it is abstracted for irrigation use, while at the same time providing instream habitat for shortfin and longfin eel; torrent fish; inanga; upland, common, and bluegill bully; and Canterbury mudfish. The Waitai site is specifically designed to

provide water to the Canterbury mudfish habitat which also contains freshwater mussels and freshwater crayfish. During the low-no flow conditions that have occurred over the last year, this scheme and site have provided much of the remaining aquatic habitat between the Hinds and Ashburton rivers.

28. Thus TSA is a proven tool in this catchment and has a beneficial effect on freshwater communities, as outlined in paragraphs 26 and 27, and should be further considered for ecological enhancement throughout the catchment.

HABITAT ENHANCEMENT

29. Biodiversity and local scale interventions are covered by Meredith & Lessard (2014 a,b), in section 9 of the ZIP Addendum (AZC 2014), and are provided for, to an extent by Policy 13.4.15 of the proposed variation. However, few restoration activities have specific rules associated with them. There is also uncertainty as to whether these non-statutory interventions will be achieved, despite the critical need for them to protect freshwater ecosystems, including the habitats of threatened species in the Hinds/Hekeao Plains Area.

30. As part of my role on the Hinds Drains Working Party I am involved in work to determine waterway by waterway plans to manage and improve among other things ecosystem health, address minimum flows, and in-stream and habitat restoration including fish passage. However, the Working Party has a limited geographical range, meaning the planning to meet environmental targets and outcomes may not necessarily be achieved across the whole area covered by the proposed variation. This point needs to be considered by Canterbury Regional Council in its implementation of the plan and solutions package framework.

31. An issue that needs careful consideration is the effect of MAR to increase the base flow in the lowland drains. I understand this is addressed in the augmenting groundwater or surface water rules 13.3.35-37 of the proposed variation. A consequence of this maybe changes to water velocities, habitat availability, and

habitat connectedness, and the effect that these may have on members of the fish communities within the various waterbodies.

32. Habitat form needs to be considered on a waterway by waterway basis, with consideration of species present and the water velocity, depth and substrate requirements they need. As in terms of habitat connectedness, these changes have the potential to bring predator and prey species into contact, which is of particular concern for Canterbury mudfish as discussed in paragraph 17. Furthermore, introduced salmonids (trout) are also known to predate on a variety of native fish species (McDowall 1990, 2006). The appropriate installation or removal of fish passage barriers needs careful consideration, likewise the appropriateness of river mouth openings with the potential to allow migratory predatory species into waterbodies to where access has previously been absent or serendipitous, such as across the gravel beach in high sea conditions.

33. Increasing water quantity and quality alone may not necessarily create suitable habitat for native freshwater fish. Ideally instream habitat is created or restored.

34. In respect to sediment removal from streams it was the consensus of the Hinds Drains Working Party that this activity would be limited to tributaries of Hinds and Ashburton rivers. This was designed to avoid enhancing and/or establishing trout habitat in drains that contain high ecological values for indigenous species.

35. Thus a range of mitigation and restoration tools are required to achieve the ecological outcomes outlined in the Ashburton ZIP addendum.

CONCLUSIONS

36. Augmentation is required to ensure the life supporting capacity of freshwater ecosystems are sustained, particularly those containing threatened species such as Canterbury mudfish in the Hinds/Hekeao area. Protection and rehabilitation of freshwater ecosystems is required but care is required that habitat form and the potential effects of predation are also considered.

37. A range of restoration methods are required, that may not necessarily be rule, to achieve the ecological outcomes sought in the ZIP Addendum.

Nicholas Rex Dunn

15 May 2015

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