IN THE MATTER OF the Resource Management Act 1991

AND

IN THE MATTER OF Applications for resource consent by the Central Plains Water Trust and a notice of requirement for the designation of land by Central Plains Water Limited associated with the construction and operation of the Central Plains Water Scheme

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SUPPLEMENTARY EVIDENCE OF ANGUS RONALD MCINTOSH ON BEHALF OF THE DIRECTOR GENERAL OF CONSERVATION

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1. INTRODUCTION

Qualifications and Experience

1.1 My name is Angus Ronald McIntosh. My qualifications and experience and the basis on which I have prepared this statement of supplementary evidence are as set out in my evidence in chief of May 2008 and have not been repeated here.

Scope of evidence

1.2 I have been asked by the Department of Conservation (the Department) to comment on the revised proposals presented in supplementary evidence (Dr Richard Allibone) for mitigating impacts of the Central Plains Water Enhancement Scheme (CPWES) on Canterbury mudfish, *Neochanna burrowsius*.

1.3 My evidence addresses the following aspects of those proposals:

a. The objectives of any proposed mitigation for Canterbury mudfish

b. An evaluation of the general characteristics of the revised CPWES mitigation proposals for the Waianiwaniwa mudfish population

c. Factors affecting the success of CPWES Waianiwaniwa mudfish mitigation proposals

d. Protection of the Hororata mudfish populations

Summary of findings

1.4 Ecological science, and national and international biodiversity policy, supports the principle that threatened species should be conserved in their natural habitat (i.e, *in situ*). Only where there are substantial conservation gains through enhanced security of the population that offset the loss of biological integrity associated with artificial habitats should *ex situ* conservation be contemplated.

1.5 There is unacceptable risk associated with the proposal because the knowledge and expertise required to reliably create high quality Canterbury mudfish habitat does not exist and plans for acquiring the knowledge/expertise have not been presented.

1.6 Although the design of the revised proposal would improve some aspects of the security of the Waianiwaniwa population of Canterbury mudfish it falls short in other critical areas (independent water sources, population interconnection, spatial extent, protection in perpetuity, size of translocated population). Thus, it would not result in substantial conservation gains.

1.7 Details are still lacking on the mitigation plans for the Hororata Canterbury mudfish sites.

2. THE OBJECTIVES OF ANY PROPOSED MITIGATION FOR CANTERBURY MUDFISH

2.1 In accordance with general principles of conservation biology wherever possible, the Department of Conservation should aim to ensure the persistence of significant populations of rare species in their natural habitat (i.e. *in situ*). Only where the security of a population is threatened within natural habitat or where the security of a population is higher outside of those natural habitats should the Department look to secure a population outside of natural habitat (i.e., *ex situ*). These are

fundamental tenants of conservation biology because moving rare species and/or creating new habitat for them always involves risk. Moreover, the biological integrity of an *ex situ* population must always be less since it would be associated with human-created habitat. Thus, the mudfish recovery plan correctly prioritises the conservation of existing Canterbury mudfish natural habitat.

2.2 This view also reflects national and international policy on biodiversity. The third goal of the New Zealand Biodiversity Strategy is:

> "**Goal Three: Halt the decline in New Zealand's indigenous biodiversity.** Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified ecosystems in production and urban environments; and do what else is necessary to[:]
>
> Maintain and restore viable populations of all indigenous species and subspecies across their natural range and maintain their genetic diversity."

The explanation of this goal (p8) states:

> "Goal Three reflects a focus on natural habitats and ecosystems as a means of conserving species and the diversity within them. This is in keeping with the [International] Convention on Biological Diversity emphasis on conserving biodiversity in its natural surroundings (that is, *in situ* conservation)."

2.3 In so far as the Waianiwaniwa Valley population of Canterbury mudfish is concerned, the important characteristics of the population that make it significant, and that will contribute to its long term persistence are:

(a) the Wainiwaniwa Canterbury mudfish (i.e., groups of individuals) are from the northern genetic group;

(b) the Waianiwaniwa Canterbury mudfish are in interconnected waterways meaning that dispersal is possible (at least at high flow) between subpopulations and the subpopulations are associated with independent water sources, providing resilience if one is impacted;

(c) predatory fish (especially eels and trout) are rare (or effectively absent) in the valley allowing the mudfish to reach high densities and to have a stable population structure;

(d) large mudfish are present and mudfish densities are very high at some sites within the valley;

(e) these important sites (as opposed to degraded parts of the stream network) are associated with high quality stream habitat for mudfish that retain large amounts of water during low flows;

(f) some of the high quality habitat is adjacent to wetland remnants and contains aquatic macrophytes important for mudfish spawning, allowing mudfish to increase rapidly following any impact or disturbance; and

(g) the spatial extent of the subpopulations is wide (at least 20 km in length), meaning the populations are large and spread out. This also confers resistance and resilience to the population in the face of stochastic events.

2.4 The Waianiwaniwa Valley population is the largest and most significant population of this 'Nationally Endangered' species. The fish have persisted in this habitat despite:

(a) there being little legal protection for the mudfish habitat;

(b) the presence of predators probably only being prevented by low flows in the lower main stem river and by poor water quality in the streams; and

(c) the mudfish being affected by poor water quality and stream habitat in some parts of the valley.

2.5 These characteristics in 2.4 do increase the vulnerability of the population, but do not detract from its significance.

2.6 My criteria for assessing any mitigation proposal are therefore that it would need to substantially improve on the characteristics of the current significant population that exists in natural habitat to enhance the security of the species and to offset the loss of biological integrity associated with *ex situ* conservation and the risks of translocation.

3. AN EVALUATION OF THE GENERAL CHARACTERISTICS OF THE REVISED CPWES MITIGATION PROPOSALS FOR THE WAIANIWANIWA MUDFISH POPULATION

3.1 The proposal is complex, involving a number of critical steps, (e.g successful collection, captive rearing and housing of artificial habitat, translocation into created habitat and ensuring a sustainable population within a created habitat) , and all of which must be accomplished for the proposal to be successful. I start by evaluating the overall design of the new proposal.

3.2 Assuming for a start that the mudfish habitat envisioned in the artificial waterways with water pumped from the reservoir could be successfully constructed and populated with mudfish as proposed, would it provide a significant Canterbury mudfish population that was more secure than the present one and offset the loss of biological integrity?

3.3 The length of habitat is close to that estimated to be currently occupied by mudfish in the valley, but to enhance security and to offset the loss of biological integrity any proposal should contain more length of habitat. I know of no scientific basis for evaluating how much more, but it would need to be substantial.

3.4 Three separate artificial waterways are envisioned. However, the three waterways would not have independent water supplies and would not be connected at the downstream end so mudfish can disperse (as I understand the proposal). Thus, it does not replicate a stream network.

The lack of independent water supplies is a serious problem because it means all the mudfish would be vulnerable to any unpredicted deleterious event occurring in the reservoir whether it be an accidental oil spill, a toxic algal bloom or just low dissolved oxygen levels.

3.5 The protection of the population would be enhanced by the monitoring and physical barriers for predators proposed.

3.6 The habitat of the created population needs to have legal protection to improve upon the security of the current population's habitat. The level of legal protection for the created habitat is not clear at present.

3.7 If high quality habitat could be created in similar proportions to that currently in the Waianiwaniwa Valley, high density populations would presumably result, and these would be at least as extensive as those currently occurring.

3.8 Unlike a natural stream network, the artificial channels would require pumping and it would not have wetlands or oxbows, and the mudfish would require ongoing monitoring and management (e.g, predator removal operations). No mechanism has been proposed to ensure these continue in perpetuity.

3.9 Finally, the number of fish proposed for transfer to the races is very small. The figure of three to four hundred was mentioned in oral evidence by Dr Allibone. I am not an expert in population genetics, but I would have thought a number one to two orders of magnitude higher would have been appropriate. Canterbury mudfish are thought to have reduced genetic diversity because of past population bottlenecks (Davey et al 2003). Severe consequences of going through population bottlenecks (of the size of 300-400 individuals) have been observed in New Zealand native birds (Briskie and Mackintosh 2004). Significantly, some of the deleterious consequences of population bottlenecks in New

Zealand birds have even been associated with translocations of small numbers of individuals (Jamieson et al. 2006).

3.10 The fate of the mudfish remaining in the natural waterways of the Valley after the dam construction also remains unresolved.

3.11 My evaluation of the characteristics of the *overall design* of the revised proposal, as currently presented, is therefore that it does not enhance the security of the mudfish population and would not offset the loss of biological integrity associated with *ex situ* conservation. The biggest problem is the lack of independent water supplies being delivered to the channels. Other issues include the length of habitat created, the loss of connected wetland habitat, no connection at the downstream end of the races to allow dispersal, formal legal protection of the habitat, a mechanism to provide resources to ensure a continuity of mudfish management and a population genetics evaluation (of an expert in that field) of the appropriate number of mudfish to transfer (and from where in the valley) to ensure no loss of genetic diversity.

4. FACTORS AFFECTING THE SUCCESS OF THE CPW WAIANIWANIWA MUDFISH MITIGATION PROPOSAL

4.1 The success of the proposed mitigation for the Waianiwaniwa rests on being able to create, and maintain in perpetuity, high quality mudfish habitat in the artificial waterways. There is some knowledge of the habitat requirements of Canterbury mudfish and their general ecology that can be used to guide the habitat creation. However, there is a dearth of expertise on, and examples of, native fish habitat restoration and translocation in New Zealand. Nothing like this has ever been even attempted before with native fish in New Zealand. I also know of no examples of native fish habitat creation and translocation on this scale from overseas.

4.2 The water race and captive populations of Canterbury mudfish are only partially relevant to whether habitat creation and translocation are likely to succeed. The fact that mudfish do exist in some water races is testament to the adaptability of the fish and does demonstrate potential to create populations. However, none of the water race or captive populations that I know of have characteristics close to that of the Waianiwaniwa valley population (as described in 2.3 above). Moreover, many of the water race populations probably only exist as metapopulations supported by immigrants from (headwater) source populations elsewhere, as implied by Dr Meredith in his supplementary evidence.

4.3 Fish sometimes exist in high densities in various water races around the country, but that does not demonstrate that habitat can be reliably created in a water race/artificially created waterway for a particular species of fish. Moreover, the evaluation of the success of mudfish translocation attempts presented in my previous evidence indicates the success rate of Canterbury mudfish translocations is low.

4.4 That does not automatically mean future translocation attempts will fail. Indeed there may be some good reasons why previous attempts have failed and the successful recovery of Canterbury mudfish populations rests at least partially on successful creation of new populations. However, it is my contention that the knowledge and expertise to reliably create high quality Canterbury mudfish habitat that will result in dense populations does not currently exist.

4.5 The experts on Canterbury mudfish could come together to discuss the characteristics of high quality habitat and how it should be constructed, but even given habitat created to their specifications there would still be no certainly of success. The gradients, water clarity, pool depths, current velocities, temperatures etc. etc that are required for Canterbury mudfish could be talked about, but the reality is many of these are not reliably known. Moreover, given the low success rate of Canterbury mudfish

translocations so far (described in previous evidence), it is likely that another, unidentified, factor is affecting translocation success. That could be an association with wetland habitats in the riparian zone, for example. Some of the Waianiwaniwa high density populations are in stream habitats associated with natural wetland remnants and that *may* be important in some way.

4.6 Overall, the proposal for the mitigation of the loss of the Waianiwaniwa population falls substantially short of my criteria because it does not enhance the security of the population or sufficiently offset the loss of biological integrity associated with *ex situ* conservation.

4.7 Advancing the proposed mitigation plan for the Waianiwaniwa population to the point where it would meet my criteria would involves: (a) redesigning the proposal to solve the issues outlined in section 3.0, (b) carrying out a demonstration that high quality Canterbury mudfish habitat can reliably be created on the scale proposed, and (c) the preparation of a management plan for the valley population that (as recognised by peer review) will ensure the persistence of the Waianiwaniwa mudfish population.

4.8 Demonstration of successful habitat creation would require a pilot study or trial that created a substantial piece of habitat (e.g., 1 km) from scratch that contained dense subpopulations (i.e., CPUE >7) containing large fish and resulting in ongoing recruitment and stable population dynamics over a number of seasonal cycles.

5. PROTECTION OF THE HORORATA MUDFISH POPULATIONS

5.1 Protection of the Hororata mudfish populations and their habitat is also still important as outlined in the revised proposal. The measures proposed require some quantifiable goals (e.g., number of km of habitat covenanted) backed by resources to ensure those goals are achieved.

5.2 Mudfish habitat in the Hororata area is particularly vulnerable. For example, mudfish habitat has been destroyed in recent months at the Mitchell's Road mudfish site. This illustrates the inherent vulnerability of these mudfish habitats and highlights the need for more specific details in the mitigation proposals. The need for these details was also mentioned in my previous evidence.

Angus R. McIntosh

20 August 2008

RERERENCES

Davey, M. L., L. K. O'Brien, N. Ling, and D. M. Gleeson. 2003. Population genetic structure of the Canterbury mudfish (*Neochanna burrowsius*): biogeography and conservation implications. New Zealand Journal of Marine and Freshwater Research **37**:13-22.

Briskie, J. V., and M. Mackintosh. 2004. Hatching failure increases with severity of population bottlenecks in birds. Proceedings of the National Academy of Sciences, USA **101**:558-561.

Jamieson, I. G., G. P. Wallis, and J. V. Briskie. 2006. Inbreeding and endangered species management: Is New Zealand out-of-step with the rest of the world? Biological Conservation **20**:38-47.