

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

**STATEMENT OF EVIDENCE OF SJAAN CLARE CHARTERIS BOWIE ON BEHALF OF
THE DIRECTOR GENERAL OF CONSERVATION**

1. INTRODUCTION

Qualifications and experience

- 1.1 My full name is Sjaan Clare Charteris Bowie. I am employed as a Technical Support Officer (Freshwater) by the Department of Conservation (the Department). My current work for the Department includes the conservation of native fish and invertebrates and their habitats. I have been working for the Department for 6 years.
- 1.2 I hold a Bachelor of Science in Zoology and Ecology, and a Masters of Science (Hons) in Ecology specialising in freshwater ecology, both from Massey University. My thesis involved studies of the reproductive biology and ecology of the diadromous galaxiids (shortjaw kokopu, banded kokopu, giant kokopu and koaro). I am an active member of the NZ Freshwater Sciences Society (previously known as the Limnological Society) and have published my freshwater research and work in national and international journals, and in internal and external reports. I have also presented papers at both local and international conferences.
- 1.3 I have undertaken a variety of specialist freshwater work throughout New Zealand for the Department, but most specifically within Canterbury, not limited to but including undertaking freshwater fisheries surveys, monitoring of threatened fish populations, management of key sites, processing freshwater transfer applications and undertaken assessments and presentation of technical information on Resource Management Act proposals.
- 1.4 Since 2002 I have been an active reporting member of the Mudfish Recovery Group which covers 5 mudfish species. I am also the recovery group leader (since 2002) and a reporting member of the non-migratory galaxiid recovery group (2004 onwards) which covers 9 recognised species and a further 6 taxa of uncertain status covering 11 conservancies. I have also been involved in several other national freshwater work programmes including being involved in determining the threat rankings for New Zealand's native fish and managing the development of the Department's Natural Heritage Management Systems for freshwater.
- 1.5 I acknowledge that I have read the Code of Conduct for Expert Witnesses (Environment Court Consolidated Practice Note 2006). I have complied with it when preparing my written statement of evidence and I agree to comply with it when I give

this oral evidence. This evidence is within my area of expertise, except where I state that I am relying on facts or information provided by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

- 1.6 In preparing this evidence I have read the evidence of Dr Allibone for Central Plains Water (CPW) and Dr Meredith's section 42A report.

2. SCOPE OF EVIDENCE

- 2.1 My evidence looks specifically at parts of the mudfish mitigation actions recommended by Dr Allibone and addresses the Department's status and work priorities associated with "The New Zealand mudfish (*Neochanna* spp.) recovery plan 2003-13" Department of Conservation 2003 (Mudfish Recovery Plan) and the Canterbury Conservancy's Conservation Management Strategy (CMS) (Department of Conservation 2000).

- 2.2 I discuss the current thinking on captive rearing for Canterbury mudfish, recent developments which have increased the knowledge in regard to the significance and status of the Waianiwaniwa Valley mudfish population, and give an overview of where DOC has been focussing its work on Canterbury mudfish conservation. I will also discuss points raised in reports by Dr Meredith. My evidence will not traverse issues concerning the effects on mudfish as a result of this particular proposal; these will be addressed in the evidence of Dr McIntosh.

Summary of evidence

- 2.3 The Waianiwaniwa River and Hororata Stream contain key mudfish populations which will be affected by the CPW proposal.
- 2.4 The overall long term recovery goal of the Mudfish Recovery Plan is "to maintain and improve the geographic range, habitat and genetic diversity".
- 2.5 In my view the loss and other impacts on key mudfish populations in return for translocation into fragmented and isolated locations, and captive rearing of mudfish is not consistent with this Recovery Group goal.

3. THE MUDFISH RECOVERY PLAN GENERAL OVERVIEW

- 3.1 The long term Mudfish Recovery Plan goal is to maintain and improve the geographic range, habitat and genetic diversity of all mudfish species. To achieve this the plan has 5 main objectives which are:
- a. Protect and Manage habitats with key mudfish populations.
 - b. Monitor key mudfish population trends.
 - c. Identify and advocate for the protection and sustainable management of all mudfish habitat.
 - d. Maintain and increase populations of all mudfish species.
 - e. Involve Iwi in the implementation of this recovery plan.
- 3.2 Within each of those objectives it identifies priority actions that need to be undertaken. To assist prioritisation of all the actions within the plan each action is given a level. Level I actions will secure from extinction, level II will maintain genetic diversity and level III will increase security further. Level I actions are considered to be the most critical in an effort to secure the Canterbury mudfish from extinction. Level I actions therefore take priority over any other actions.
- 3.3 Appendix 1 of the Mudfish Recovery Plan provides 7 criteria for defining the key mudfish populations. The key populations are selected with the aim of preserving large populations or habitats, key scientific sites, maintaining geographic range of species, as well as the genetic and biological diversity within each mudfish species. The appendix identifies key Canterbury mudfish populations including (8) Hororata Stream and (12) Waianianiwa River.
- 3.4 A Mudfish Recovery Group consisting of people (external experts and internal DOC staff) with knowledge of the mudfish was established “*to review progress in the implementation of the Mudfish Recovery Plan and to recommend to the Department any changes which may be required as management proceeds*” (Department of Conservation 2003).

4. SIGNIFICANCE AND STATUS OF THE MUDFISH IN CPW PROPOSED AFFECTED AREA

- 4.1 Two of the key Canterbury mudfish populations are affected by the Central Plains Water proposal - Hororata Stream and Waianiwaniwa River. Hororata Stream was identified as a key mudfish population as it was “*a long term research site*”, and Waianiwaniwa River as it is “*one of the three largest populations of mudfish within any evolutionary significant unit*” (Appendix 1; Department of Conservation 2003). An “*evolutionary significant unit*” is a reproductively isolated group of populations displaying unique evolutionary characteristics (Ling et al 2001).
- 4.2 In 2007, the Department contracted Leanne O’Brien and Nicholas Dunn to undertake a preliminary sub-population assessment of Canterbury mudfish (O’Brien & Dunn 2007a). From their analysis of known records and using aerial photographs they found that there are currently only 15 sub-populations (catchments) of Canterbury mudfish, and within these sub-populations there are 81 known naturally occurring “*habitat fragments*” i.e. specific sites with mudfish. Specific sites with mudfish are distinguished by having separate water sources, or separated by some sort of barrier e.g. a stretch of water not considered suitable for Canterbury mudfish (O’Brien & Dunn 2007a).
- 4.3 Of these 81 specific sites, mudfish are considered extinct or likely extinct in 12, threatened in 13, vulnerable in 22, 11 sites are protected in some form or being restored (5 within Crown Land, 1 Covenant, 5 being restored) and 23 are of unknown status (O’Brien & Dunn 2007a). Therefore this analysis shows that many sites that have Canterbury mudfish are currently facing multiple threats and are vulnerable. The Waianiwaniwa mudfish are included in the sites at risk because the CPW proposal places 7 mudfish sites at risk from the proposed reservoir creation. Note this does not include threats posed to the mudfish sites downstream of the reservoir (O’Brien & Dunn 2007a). Further the mudfish sites within the Waianiwaniwa catchment are one of the most continuous of groupings of known sites in contrast to the majority of the 81 mudfish sites which are relatively small.
- 4.4 In addition to information presented in Dr McIntosh’s evidence (paragraph 1.8) and the criteria identified in paragraph 4.1, O’Brien and Dunn (2007a & c) provides further information to support the identification of these two mudfish catchments as

significant key populations for Canterbury Mudfish that require protection. This includes information on:

- Abundance - In the analysis of all Canterbury mudfish sites, those within the reservoir proposed area (Cairn Hill Stream, Tara Stream, Bush Gully Stream and Waianiwaniwa River) and within the downstream possible impacted area (Selwyn Water Race and Haldon Pastures Spring) are within the top 15 sites of Canterbury mudfish with the highest catch per unit effort (CPUE) and large fish. CPUE gives an indication of how abundant mudfish are at the site and indication of the population size (O'Brien and Dunn 2007a). Therefore 6 out of the top 15 mudfish sites are under threat as a result of the CPW proposal. This analysis represented the first basic assessment of Canterbury mudfish specific sites against one another.
- Size - Large fish, especially large females, have important consequences for population dynamics, principally because fecundity increases with size. The maximum length of fish caught is an important attribute of a population as it gives an indication of the survival and growth rate of the fish present (O'Brien and Dunn 2007a). In addition, populations containing large females may produce a greater number of offspring, which increases the chance that some will survive, than a similar sized population of small fish (O'Brien & Dunn, 2007c). Of the top 15 sites noted above, four out of the 6 mudfish sites under threat from CPW proposal have large fish present (O'Brien and Dunn 2007a).
- Natural stream populations – ie, the Waianiwaniwa River, Tara Stream, Bush Gully Stream, are rare. Nearly a quarter of known Canterbury mudfish sites consist entirely of water race or drain habitat, while in total 30 sites contain some amount of channelised habitat (O'Brien & Dunn 2007a).
- Source Populations- The upstream mudfish sites within the Waianiwaniwa and Hororata are likely to act as source populations to areas downstream and so protection of these natural habitat source populations is critical to future survival (paragraph 163 – Dr Meredith). As stated by Dr Meredith (paragraph 160, 161) Canterbury mudfish produce large numbers of eggs compared to other species of mudfish found in New Zealand (O'Brien & Dunn, 2007c), and this is likely to be a reproductive strategy that allows rapid repopulation of depleted sites. O'Brien (2005) has found that during flooding and wet seasons

individuals can move within catchments between otherwise isolated habitats. O'Brien and Dunn (2007c) concluded historically Canterbury mudfish would have moved throughout the large wetlands on the Canterbury plains. Although extensive fragmentation has occurred in the last 100 years this may not have eliminated the movement of individuals between mudfish sites (O'Brien and Dunn 2007c). Therefore I agree with Dr Meredith's statement that the Waianiwaniwa sites are likely to act as a source population which is distributed downstream by floods.

5. DEPARTMENT'S RECOVERY PROGRAMME -CANTERBURY MUDFISH

5.1 Since the development of the Mudfish Recovery Plan the Canterbury Conservancy has made progress and completed many actions within the plan. The department has focused its efforts on the following actions (which relate to the key objectives listed in 3):

- Action 1.5 managing and restoring key sites ;
- Action 1.4 & 3.6 seeking protection and working with landowners to protect sites;
- Action 2.2 establishing monitoring at a minimum of three key populations;
- Action 2.3 revisiting known mudfish locations;
- Action 3.1 identifying new mudfish populations;
- Action 3.2 advocating through regional plans and resource consents for the protection of mudfish habitat.

5.2 Full lists of all actions completed and/or in progress are reported annually to the Recovery Group (2003-2007). The majority of these actions are level I actions i.e. aimed at securing Canterbury mudfish from extinction

5.3 When taking the Mudfish Recovery Plan into consideration it is important to be aware it is considered by the Department to be a "work in progress". That is because, as noted in section 3 above, each year the Mudfish Recovery Group meets to discuss new information, assess progress to date and reprioritise accordingly. This ensures that the Mudfish Recovery Programme is considered in the light of the latest information. For example new information has raised questions about the

effectiveness of translocations and captive rearing as methods of achieving the long term goal for Canterbury mudfish. Therefore the actions associated with translocations and captive rearing are definitely secondary to actions on protecting the existing known sites. I discuss the issues with translocation and captive rearing further in section 7 and 8. However when interpreting the Mudfish Recovery Plan it is important not to take it in isolation from the progress made by the Department and the Mudfish Recovery Group's annual assessments.

6. THE MUDFISH RECOVERY PLAN AND THE CPW MITIGATION PLAN

6.1 Dr Allibone has developed the CPW Mudfish Mitigation Plan (CPW Mitigation Plan) on behalf of CPWT (Allibone 2008a). Dr Allibone's evidence states that he has drawn *'heavily on the New Zealand Mudfish Recovery Plan...'* (Para 15 supplementary evidence), and that the mitigation proposed by CPW undertakes all the actions required in the Mudfish Recovery Plan. He suggests the measures he proposes will off-set the loss of mudfish habitat within the dam footprint and other possible impacts on downstream mudfish populations below the reservoir. The CPW Mitigation Plan refers to the objectives in the mudfish recovery plan (e.g. Action 4.2 "undertake captive rearing of mudfish").

6.2 I wish to make a couple of points:

- First the majority of actions in the Mudfish Recovery Plan that are relied on (i.e. captive rearing) are actually subordinate to the primary objective of retaining existing mudfish populations and their habitats.
- Second that the CPW scheme itself is contrary to that primary objective because it would destroy the Waianiwaniwa habitat and its mudfish, and may also impact on the Hororata mudfish sites downstream of the reservoir.

The following paragraphs will explain these reasons further.

6.3 While the mitigation measures suggested in the CPW Mudfish Mitigation Plan, do generally align with actions as identified in the Mudfish Recovery Plan, they fail to take into account the priorities that have been assigned to each action for each species (see paragraph 3.2 for an explanation of priority levels in the plan). The Mudfish Recovery Plan identifies Level I (highest priority and those actions that will

secure Canterbury mudfish from extinction) to be those actions associated with protecting and managing key mudfish populations and identifying and advocating for the protection and sustainable management of all mudfish habitat (Department of Conservation 2003). Actions such as creating new habitat, undertaking translocations and captive rearing are generally Level II priority. These level II actions are associated with maintaining and increasing populations of all mudfish species. Both level I and II actions are suggested within the CPW Mudfish Mitigation Plan, however there is a focus on Level II actions predominately.

6.4 In simple terms the primary objective of the Mudfish Recovery Plan is to maintain key mudfish sites, and subsequently to expand populations by translocation and captive rearing. What Dr Allibone is proposing is that secondary priority actions of translocation and captive rearing can replace the protection of existing populations and their habitats. In effect what Dr Allibone is suggesting is that translocation and captive breeding along with a few other mitigation actions will compensate for the loss of the Waianiwaniwa mudfish habitat and population and impacts on the Hororata mudfish.

6.5 In my view undertaking translocation and captive rearing as proposed would not actually maintain or increase populations of Canterbury mudfish which is the main objective of these actions in the recovery plan. On the contrary the actions suggested in the CPW mudfish mitigation plan would actually result in a net loss of mudfish and impacts on two key sites. This proposal will therefore go against several Level I priority actions identified as being necessary to recovery and secure mudfish from extinction and the overall objective of the plan *“to maintain and improve the geographic range, habitat and genetic diversity”*

6.6 In addition, there are in my view further problems associated with captive rearing and translocations that will suggest CPW proposals are problematic. These aspects will be discussed in detail in the following paragraphs.

7. CAPTIVE REARING

7.1 One of the proposals for mitigation that Dr Allibone suggests in order to off-set the loss of the existing Waianiwaniwa mudfish habitat is to provide a captive rearing facility for holding Waianiwaniwa Valley mudfish during the creation of new wetlands

and for breeding additional mudfish for translocation. The CPW Mudfish Mitigation Plan states “*that to date there are no captive rearing facilities for Canterbury mudfish and that the pursuit of Objective 4 is limited by the lack of captive rearing facility*”. I disagree as captive rearing facilities do exist they just could not cope with the captive rearing requirements of the CPW proposal. Cadwallader (1975), Eldon (1979a), Gay (1999), O’Brien (2005) all have documented captive spawning of Canterbury mudfish (O’Brien & Dunn 2005). In addition there are two examples of long-term captive management projects undertaken for Canterbury mudfish. Canterbury mudfish have been maintained in a large (>1000L) tank and a small boggy pool known as Lake Eldon on the NIWA Christchurch campus since the mid 1980s (Eldon 1989, 1993). The University of Canterbury also has an outdoor facility in which Canterbury mudfish have successfully reproduced since 1999 (O’Brien 2005). Also in 2007 the local Mahaanui DOC office have created a pond where Canterbury mudfish from Canterbury University have been transferred into (they seem to be doing well so far).

- 7.2 Indeed in 2002, Canterbury Conservancy reported to the Mudfish Recovery Group that Action 3.3 “*to undertake captive rearing*” had been completed due to Canterbury mudfish being kept successfully at NIWA Christchurch since the mid 1980s (Department of Conservation, 2002). The Recovery Group recommended that the captive rearing be continued to provide a backup and a resource for translocations if required and appropriate.
- 7.3 The CPW Mudfish Mitigation Plan also refers to the CMS (Department of Conservation, 2000), and the actions the Conservancy will undertake for Canterbury mudfish, including one action to “establish captive mudfish populations for conservation purposes”. From the above information it is clear that there are already “*established captive mudfish populations for conservation purposes*” and therefore the facility proposed by CPW is not necessary to achieve this. In my view of greater importance is another statement in the CMS “*Its few remaining habitats are a high priority for protection*”.
- 7.4 Dr Allibone’s supplementary evidence (paragraph 16) suggests the mudfish rearing facility could provide benefits to mudfish management across Canterbury. However the Mudfish Recovery Group in 2006 concluded that captive rearing should only be encouraged in the context of a specific translocation and made the comment that “fry” are not the limiting factor so there is no need for breeding facilities as fry can be harvested, grown on and then released (Department of Conservation 2006)

7.5 Throughout the world, captive breeding has brought many species back from the brink of extinction. In New Zealand, it is being used to increase population sizes, maintain genetic variability and as a source of translocation stock of threatened endemic fauna (O'Brien & Dunn 2007c). For Canterbury mudfish it is now well known that they are not threatened by low numbers but threatened by habitat loss, degradation and fragmentation (O'Brien 2005).

8. TRANSLOCATIONS

8.1 In 2007, the Department contracted Leanne O'Brien and Nicholas Dunn to undertake an assessment of the success/failure of all translocations to establish a viable population of Canterbury mudfish (translocation of several individuals) (O'Brien & Dunn 2007b). Of the sixteen translocations attempted, only six are known to have been successful with populations that still persist today (O'Brien & Dunn 2007b)

8.2 I agree with the quote from O'Brien & Dunn (2007c) - "Despite considerable effort, few new mudfish populations have been established. This emphasises the need to focus on the protection of habitats that currently contain mudfish" (I note Dr Meredith refers to this quote also – paragraph 165). Therefore in my opinion captive rearing of some of the Waianiwi mudfish and attempting to translocate these fish into fragmented isolated locations is not adequate mitigation

8.3 Furthermore the transfer of live aquatic life from or into freshwater requires approval from either the Department of Conservation (new species into new waters) or Ministry of Fisheries (species into waters where it already occurs) and possibly also from Fish & Game.

9. CONCLUSIONS

9.1 I therefore agree with Dr Meredith's and Dr McIntosh conclusions that the destruction of the unique natural Waianiwi River mudfish and possible impacts on the Hororata Stream mudfish appears unjustifiable and unable to be adequately compensated.

9.2 A lot has been learnt about Canterbury mudfish in the last few years, like the fact that Canterbury mudfish produce large numbers of eggs and fry (so fish are not the limiting factor) and therefore captive rearing is not a priority and the priority is seen to therefore be to identify, protect and restore natural Canterbury mudfish locations. This is also reflected in the Mudfish Recovery Plan that identifies the highest priority actions required to secure Canterbury mudfish from extinction are associated with protecting and managing mudfish populations, while other actions associated with translocations and captive rearing are of lesser priority and are needed to maintain genetic diversity and increase security further.

S Bowie

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