

## **Appendix 8: Fisheries Research**

This paper outlines additional research that would be useful in the restoration of the fisheries in the Waikato River. It addresses major information gaps in the biology of several species. This appendix should be read in conjunction with Appendix 5: Tuna and Appendix 6: Whitebait. Those appendices identified the need for research specifically related to restoration actions whereas this appendix deals with more fundamental gaps in our understanding of the river fisheries.

### **1. Lamprey**

Historically piiharau (lamprey) were harvested en route to their spawning grounds in New Zealand rivers, including the Waikato River. Today, piiharau are rare in the Waikato River and most other New Zealand rivers. Reasons for this decline are unknown but not related to overharvest. The construction of dams that block upstream migrations is clearly a factor causing a decline in abundance in this species in some rivers, but not all and, therefore, cannot explain the nationwide decline of this species. Habitat degradation related to changed land use is likely to be a major factor, but until more is known about the freshwater habitats of piiharau, this cannot be proven. Restoration actions to restore the species will only be effective if the factors causing a decline can be clearly identified. Therefore research is required to identify the spawning habitat of lamprey and to determine more about the ecological requirements of the ammocoete larval stage. Identification of spawning grounds would be possible using new tagging technologies but this study would need to be carried out in a small river for logistical reasons. Identification of key factors limiting ammocoete larvae could be carried out in the Waipa River, as the larvae are widespread in this system.

### **2. Freshwater mussels**

Kaakahi/kaaeo (freshwater mussels) still occur in the Waikato River and in the riverine lakes where large stocks once occurred. Restoration of this species (and of kooura (freshwater crayfish)) in the lakes will be dependent on the restoration of water quality and substrate composition in these environments. However, in the river, restoration of kaeo/kaakahi will require a targeted programme to determine the location of remaining populations coupled with research to identify factors that are limiting or reducing the physical habitat and the recruitment of juveniles to it.

### **3. Tuna stocking**

Restoration of tuna fisheries in the reservoirs involves the trap and transfer of elvers from the base of the Karaapiro Dam into the reservoirs. At present, this operation is working but there is a large loss of elvers related to either their small size (i.e., vulnerability to predation) or to current stocking practice (i.e., the location and abundance) which will severely limit the scope and effectiveness of tuna stocking to restore the fishery. Research is therefore required to determine the relative success of different stocking practices for elvers.

#### **4. Tuna production**

Tuna feed heavily on terrestrial foods in flooded marginal land, much of which has been lost through channelisation and flood protection works. However, the value of flood plains for tuna production is unknown. Studies using carbon isotopes are required to determine the proportion of tuna muscle contributed by terrestrial as against aquatic prey to identify the importance of flood plains for tuna production.

#### **5. Pest fish control**

Pest fish control is fundamental to the restoration of the fisheries and lakes in the Waikato River. At present, few tools (e.g., netting, rotenone, electric fishing) are available for this. Knowledge of when and where to apply them, and to what species, is lacking. As a consequence, current control is relatively ineffective. Although it is now well established that pest fish in general are impacting on the rivers ecology, there is a lack of knowledge on the causes of the impact and on the life history vulnerabilities of the species. Additional research would provide better evidence-based management, targeting the problem species and specific life stages of the pest fish.

#### **6. Whitebait fishery**

A major factor influencing the whitebait fishery in the Waikato River is the West Coast marine environment. Better knowledge of how marine conditions (especially water temperature, food supply and current movements) affect whitebait survival and distribution off the Waikato Coast is required to help inform river-based management. At present, the lack of such information means that the results of river-based management schemes cannot be assessed and may, therefore, be in vain. New approaches such as the extraction of life history and temperature data from otoliths and RNA (ribonucleic acid) typing mean that this is now possible.

#### **7. Lake restoration and fisheries**

One of the major information gaps involved in fishery restoration in the lakes, is the change in food webs and how this has affected the native fish species. Fisheries experts in the Study team think that food rather than habitat (or predation) may now be the major limiting resource for native fish (tuna and whitebait). If the main pest fish species that compete with native species for food cannot be eradicated and/or sustainably controlled, then partial recovery of native fish may be possible through the installation of artificial reefs, wave barriers and other in-lake structures. Such structures would need to provide an increase in food that cannot be readily accessed by pest fish. A risk is that they may provide more advantage to juvenile pest fish than to native fish species. Research is therefore required to determine the design and viability of such structures for native species' enhancement. This would be required if lake restoration measures cannot remove or eradicate the pest fish species.