

## APPENDIX

### 3 | Potential Issues for Threatened Fish Related to the Construction of a New, Enlarged Cotter Dam

As part of the review of water supply options, Lintermans (2004c) has reviewed the potential issues, benefits and knowledge gaps for threatened fish related to the construction of a new Cotter Dam.

Potential *issues* for threatened fish include:

1. Threatened fish issues may place some constraints on dam operation (timing and rate of change of water levels). **(Moderate)**
2. Increase in reservoir size will facilitate expansion of existing alien fish species in the Cotter Reservoir (Oriental Weatherloach, Eastern Gambusia, Goldfish) that prefer slow or still water habitats. **(Minor)**
3. Increase in open water area may facilitate increase in the trout population, known predators of Macquarie Perch. **(Moderate)**
4. Increase in reservoir size may facilitate increase in piscivorous bird population (cormorants), known to prey on Macquarie Perch during spawning runs out of Cotter Reservoir. **(Moderate)**
5. Increase in reservoir size will destroy by inundation, critical Macquarie Perch spawning habitat immediately upstream of the current Cotter Reservoir. **(Minor:** providing replacement habitat available and accessible above new reservoir.)
6. Projected maximum storage level of the enlarged reservoir may end in area containing minor barriers to fish movement that will prevent Macquarie Perch spawning. **(Minor:** manipulation of drown-out flows may be able to alleviate this problem.)
7. During the filling phase, existing macrophyte beds in Cotter Reservoir (important habitat for adult Macquarie Perch) will be flooded and it is likely that new macrophyte beds will not establish for several years. Fluctuating or prolonged lowering of water levels once the reservoir is established will adversely impact on fringing macrophyte beds in the expanded Cotter Reservoir. **(Moderate)**
8. Fluctuating or prolonged lowering of water levels once the expanded reservoir is established, may adversely impact on edge boulder habitat in Cotter Reservoir (important habitat for juvenile Macquarie Perch). **(Moderate)**
9. Depending on sediment loads, an expanded reservoir may destroy existing habitat of Two-spined Blackfish in the section of Cotter River to be impounded. There are no blackfish in Cotter Reservoir, which contains a high level of sedimentation, but abundant blackfish in Bendora Reservoir in which sedimentation is low. **(Minor)**
10. Reduction in flows below Cotter Dam may compromise program of re-establishing connectivity between Murrumbidgee River and Paddys River fish communities. **(Moderate)**
11. Reduction in flows may impact on the small population of Macquarie Perch in the lower Cotter and lower Paddys rivers. **(Moderate)**
12. Reduction in flows will compromise attempts to re-introduce Two-spined Blackfish populations below Cotter Dam. **(Minor)**

There are some potential *benefits* to fish populations from the construction of a large Cotter Dam, namely:

1. An enlarged Cotter reservoir will provide a substantially larger water body for the population of nationally threatened Macquarie Perch. A larger reservoir may provide additional food resources, as well as an increased abundance of edge habitats. A deeper reservoir may provide additional refuge from aerial predation, as well as enhanced thermal refuge from high summer water temperatures.
2. Construction of an enlarged reservoir will provide opportunities to enhance habitat quality for

Macquarie Perch (through the addition of boulder piles or other edge-structure prior to filling). This capacity to enhance or provide additional habitat may significantly offset some of the issues associated with this option.

3. An enlarged reservoir would drown-out some existing movement barriers for Macquarie Perch that are currently limiting upstream movement from Cotter Reservoir. Currently there is a significant barrier approximately 2.5 km upstream of the impounded waters of Cotter Reservoir. The barrier is approximately 2 metres high, and would be submerged by the proposed reservoir.
4. There would be no requirement for provision of fish passage facilities at the dam wall, as the dam serves as an important barrier to the upstream invasion of alien fish species such as Carp and Redfin Perch. It is important that the integrity of the barrier posed by the existing dam wall is maintained during construction of the new dam wall.
5. There may be an opportunity during the construction program to rehabilitate degraded stream reach below Cotter Dam (mechanically reduce armouring) and reintroduce blackfish to this stretch of river.
6. The ability to harvest water from Cotter Reservoir may facilitate the release of additional flushes from Bendora Reservoir under drought conditions, as additional flushes can be captured in Cotter Reservoir and still used for potable supply. Such flushes would provide additional environmental benefits for the aquatic communities between Bendora and Cotter reservoirs by moving sediment accumulations and drowning out small natural barriers to fish movement.
7. Construction of a larger reservoir may potentially facilitate access to an alternative spawning stream for Macquarie Perch (Condor Creek), but a preliminary field inspection indicates that some remedial work would be required to facilitate fish passage past barriers on the creek immediately upstream of the junction with the Cotter River.
2. There is no knowledge of the ecological requirements and little knowledge of the distribution of *Euastacus crassus* or *E. rieki*.
3. There is a need to determine spawning cues for Macquarie Perch (an investigation of the role of water temperature, flow and day-length).
4. There is a need to clarify the spawning season of Macquarie perch and extent of the river being utilised for breeding (larval survey).
5. There is a need to identify location and characteristics of Macquarie perch spawning sites.
6. Impacts of fluctuating reservoir water levels and river flows on spawning movements of Macquarie Perch need investigation.
7. Swimming capacity of different life-stages of Macquarie Perch (to enable assessment of potential instream barriers) need investigation.
8. There is a need to make an inventory of, and map potential instream barriers to Macquarie Perch movement, and the behaviour and water velocities over these barriers under different flow volumes
9. Movement patterns of sub-adult and juvenile Macquarie Perch in both reservoir and riverine habitats need investigation.
10. There is a need to investigate and quantify cormorant predation on spawning migrations of Macquarie Perch.
11. There is a need to investigate and carry out trials with habitat enhancement in reservoirs (snags and boulder habitat) to enable adequate supply of habitat across fluctuating reservoir levels.
12. Options for augmentation of fish passage past 'natural' barriers in the river channel caused by low flow need investigation.
13. Methods for restoring habitat below Cotter Dam as part of dam augmentation (if Cotter Reservoir enlargement is selected as the preferred option) need investigation.
14. With expanded reservoir size, changes in population levels of alien species such as Oriental Weatherloach, Goldfish, and Eastern Gambusia need investigation.
15. With expanded reservoir size, changes in population levels of predatory trout species need investigation. This includes quantification of predation levels on Macquarie Perch and the life-stages involved.

The review of fish impacts from future ACT water supply options highlighted a number of *knowledge gaps* that need to be addressed. These are:

1. There is little known of the movement requirements of freshwater crayfish (both Murray River Crayfish and *Euastacus crassus*).

16. Techniques for facilitating rapid development of fringing macrophyte beds in new or expanded reservoirs need investigation.
17. There is a need to monitor deposition of sediment in new or expanded reservoirs and monitor changes in abundance and distribution of Two-spined Blackfish in inundated areas.
18. There is a need to investigate and carry out trials of translocation strategies for establishing new sub-populations of Macquarie Perch. Such investigations should consider the numbers, timing and life-stages of fish to be used in the establishment trials.
19. Laboratory trials are required to test susceptibility of Two-spined Blackfish to EHN virus.
20. Field investigations are required on the exposure to and impacts of EHN virus on Macquarie Perch, in particular, to determine if there is serological evidence that ACT populations of Macquarie Perch have been exposed to the virus.