Changes to River Flows
Are Having a 'Damming' Impact on Platypuses

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The semi-aquatic platypus (*Ornithorhynchus anatinus*) is a much-loved Australian iconic mammal, dependent on freshwater rivers and streams along the continent's east for foraging, breeding, and nesting. The conservation status of the platypus is of concern, with evidence of declines across its range but with critical gaps in baseline data which would allow accurate assessment of numbers and trends. In South Australia, the platypus is listed as Endangered, given it is all but gone from the mainland and exists as a small, introduced population on Kangaroo Island. In 2016, the platypus was listed as Near Threatened by the International Union for Conservation of Nature Red List of Threatened Species. However, in early 2021, the platypus was formally listed as Vulnerable under the threatened species status in Victoria, given mounting evidence of declines and an uncertain future. Declines are primarily attributable to land clearing, particularly of riparian vegetation, erosion of earthen banks, increased sedimentation, as well as crayfish netting, pollution, disease, and predation by invasive species.

The distribution of the platypus also overlaps extensively with Australia's most regulated rivers, where we have built dams. Although dams are assumed to be detrimental to platypus populations, little was known about how river regulation and alteration to flows impact their abundances and movements. Dams pose formidable barriers which can limit the movements of platypuses and affect genetic relationships. Dams and river regulation of flows can also alter the composition and extent of riparian vegetation, leading to stream bank erosion and impacting habitat for platypuses by reducing available areas for burrows in riverbanks. Increased sediment load and deposition can also produce 'sand slugs', filling pools in rivers, destroying critical foraging habitats, and undermining critical refugia for platypuses during droughts. Abstraction of water and resultant reductions in flow volumes also increases the drying of rivers, while shifts in the seasonality of flows can impact platypus breeding and the availability of their macroinvertebrate prey.

To understand the impacts of dams and river regulation on platypuses, researchers from the Platypus Conservation Initiative at the Centre for Ecosystem Science, University of New South Wales, undertook surveys over three years, spanning across three regions in New South Wales and Victoria – the Upper Murray Rivers, Snowy Rivers, and Border Rivers. In each region, platypuses were surveyed above and below large dams and in adjacent unregulated rivers, comparing captures, demographics, abundances, and densities. Recent research published in the scientific journal *Aquatic Conservation* summarises the findings that large dams can significantly impact the downstream

Above: Key platypus (*Ornithorhynchus anatinus*) habitat.

An adult female platypus (*Ornithorhynchus anatinus*) captured on the Snowy River.

A platypus (*Ornithorhynchus anatinus*) ready for release after processing.

abundances of platypuses. Platypuses in the Mitta Mitta River in the Upper Murray Rivers region were significantly impacted by the alteration of flows from the Dartmouth Dam. Capture rates downstream of the dam were substantially lower when compared with captures upstream and on the adjacent unregulated Ovens River. Additionally, downstream of the dam, the sex ratio was biased towards males, with no female platypuses captured.

The low abundances and biased demographics in the Mitta Mitta River downstream of Dartmouth Dam likely reflect the considerable alteration of flows by the dam. Flows in the Mitta Mitta River downstream of the dam have increased over the summer months to meet downstream irrigation demands. The increase has resulted in long periods of constant high flows during water transfers, with periods of low flows when the dam water is stored. The high flows over the summer months coincide with the season when platypus eggs and puggles are inside burrows (November-March), potentially resulting in increased juvenile mortality by drowning or premature displacement from burrows. These changes to flow regimes can also alter the composition of macroinvertebrates, the exclusive prey of platypuses. Macroinvertebrate diversity and abundances have declined, and composition has changed on the Mitta Mitta River downstream of Dartmouth Dam, likely contributing to the impacts on the abundances and demographics of this platypus population.

While the dam significantly impacted platypus populations in the Mitta Mitta River in the Upper Murray Rivers regions, this was not the case in the Snowy or Border Rivers regions, where the extent of river regulation was less severe. In the Snowy Rivers region, similar capture rates upstream and downstream of the Jindabyne Dam, on the Thredbo and Snowy Rivers, probably reflect the restoration of the river and increased flows on the Snowy River for over a decade, implemented to mimic the natural flow regime. These flows have significantly improved riverbanks, channel depth, and the overall health of the river. Additionally, temperature control works have likely also improved conditions for macroinvertebrates and platypuses. Similarly, in the Border Rivers region, there were no differences in capture rates upstream or downstream of the Pindari Dam on the Severn River, compared to the unregulated Tenterfield Creek. Dam operations on the Severn River have

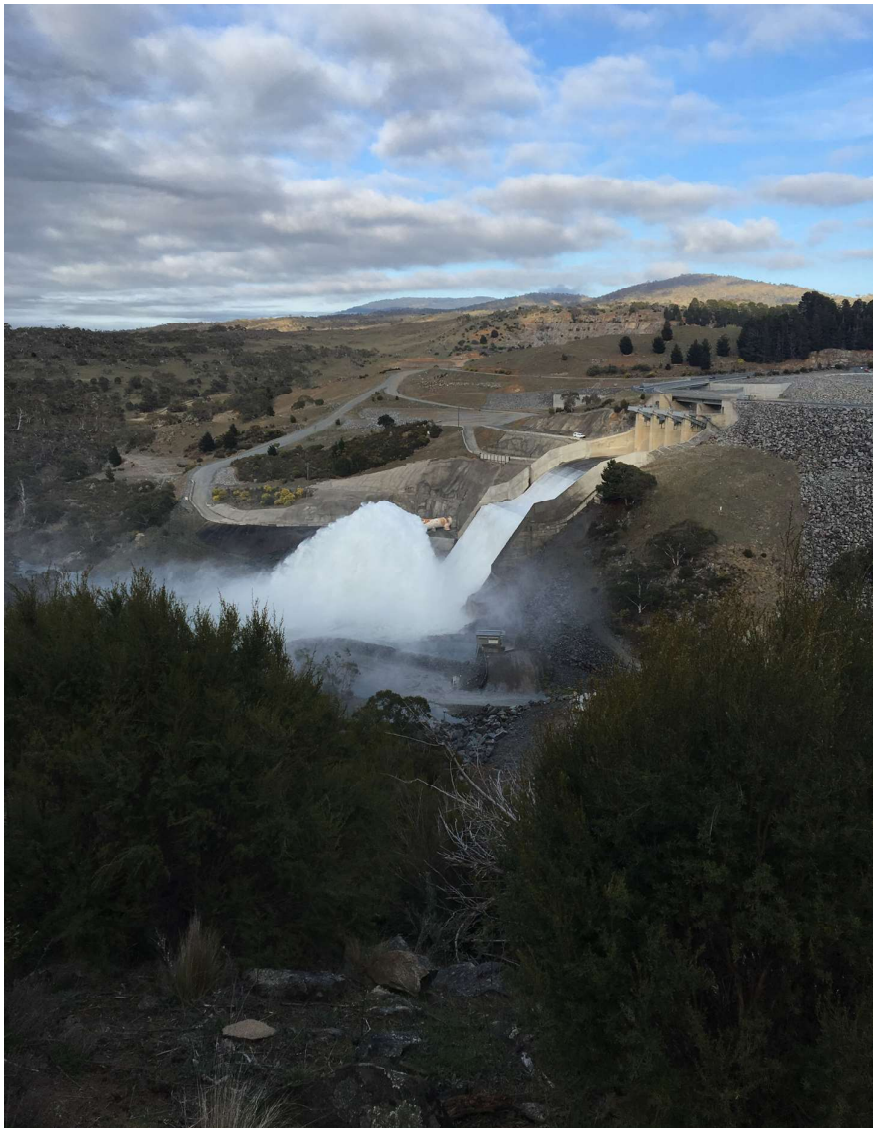
not reversed the seasonality of flows as they have on the Mitta Mitta River, and temperature differentials were also relatively low.

The research from the Platypus Conservation Initiative suggests that improving the flow regimes on regulated rivers can improve conditions for platypuses downstream of dams. On the Snowy River, environmental flows have improved the downstream river health, suggesting that such releases are essential. The Platypus Conservation Initiative has also tracked the movements of fifteen platypuses on the Snowy River during a large environmental flow release to determine if there was any impact of these flows on the platypuses movement. Research published in the scientific journal *Freshwater Biology* concludes that the environmental flow release did not affect platypuses movement, home range, or the number of detections. Foraging duration did increase after the flow, possibly associated with increased prey availability. However, juvenile numbers on the Snowy River were low compared to other rivers in the area. In addition, the timing of the first emergence of juveniles from their burrows may suggest that the timing of large spring environmental flows may be detrimental for early breeding attempts by platypuses, possibly inundating nests.

The research has shown that some large dams and associated river regulation can detrimentally impact platypus populations, but improved management of flows can possibly mitigate these impacts and are critical to sustaining platypuses downstream of dams. Poorly timed flows on other rivers can impact platypus breeding success, which is particularly concerning for the many regulated Australian rivers that have shifted flowing regimes from spring to summer, such as on the Mitta Mitta River. Maintaining the timing and volume of flows are highly important for platypus breeding success and the survival of juveniles. However, there are likely synergistic impacts of isolation and fragmentation affecting the long-term viability of these platypus populations.

The future conservation of platypus populations depends on limiting the regulation of rivers across their range and improving the flow management from large dams, and managing the many other threats affecting them. If we get this right, platypus could be a flagship species for healthy rivers.

Setting a fyke net to capture platypuses.



A flushing flow from the Jindabyne Dam, Snowy River.