

The Environmental Impacts of Dams on the regionally Endemic Turtles of the Mary River

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The Mary River currently supports six species of freshwater turtle. Many of these are widespread in other drainages but two of the species, the Mary River Turtle (*Elusor macrurus*) and the Southern Snapping Turtle (*Elseya albagula*) are endemic to the region. Indeed, the Mary River Turtle is only found in this drainage, the Southern Snapping Turtle is also found in the Burnett and the Fitzroy drainages.

The Mary River Turtle (*Elusor macrurus*) was described by Cann & Legler (1994) it is a monotypic genus representing a very old lineage of turtles that has all but disappeared from the evolutionary history of Australia. It is one of Australia's largest species of turtles. Specimens in excess of 50cm carapace length have been recorded. Adult Mary River turtles have an elongated, streamlined carapace that can be plain in colour or beautifully patterned. Overall colour can vary from rusty red to brown and almost black. The plastron varies from cream to pale pink. The skin colouration is similar to that of the shell and often has salmon pink present on the tail and limbs. The iris can be pale blue. The species utilises bimodal respiration and are therefore capable of absorbing oxygen via the cloaca whilst underwater, however they do regularly come to the surface to breathe. A unique feature of *Elusor* is the tail, which in males, can measure almost two thirds of the carapace length. The tail has haemal arches, a feature lost in all other modern turtles. It is probably a derived feature but its function is not understood. Another unique feature is the exceptionally long barbels under the mandible. Proportionately, the Mary River turtle has the smallest head and largest hind feet of all the species within the catchment, which contributes to its distinction of being the fastest swimmer. This species is currently listed as endangered under Queensland and Federal legislation, plus the International conservation body, IUCN, lists it as endangered on the IUCN Redlist.

The Southern Snapping Turtle (*Elseya albagula*) was described by Thomson et al. (2006) from the Mary, Burnett and Fitzroy drainages. Although *Elseya* is a relatively large genus it also represents an ancient group of reptiles with a significant fossil history in Australia. This is particularly true of the Queensland *Elseya* and is most evident in this species which in the current theory of relationships would be among the oldest surviving species (Georges & Thomson, 2006). It also is a very large species of Chelid and is slightly larger than *Elusor* with one 54cm and one 56cm female now measured. These sizes make it second only to the Mata Mata of South America as the largest species of Chelid turtle (Austro-South American Side Neck) in the world. In other words it is a true relic of the

Australian megafauna. They are sexually dimorphic with males being considerably smaller than females. The carapace is oval to slightly elongated and, in adults, is typically charcoal to black in colour. The adult plastron is predominantly charcoal to black but can often be patterned with cream and black. The name *albagula* is derived from the white colouration, commonly seen on the throat of adult females. Hatchlings and juveniles are highly serrated, keeled and variable in colour. They are incredibly patterned with mottling and marbling ranging from cream to black. Also capable of cloacal breathing, this species can absorb oxygen efficiently from the surrounding water. The description of this species came out in July this year, as such, until this happened it has not been possible to have it assessed for threatened status. It is now in the process of being listed as endangered both at Federal and International levels.

Within the Mary River the Southern Snapping Turtle has been found from the upper reaches of the river down to the freshwater brackish interface. While the Mary River Turtle has not been found throughout the river, the search effort by researchers has not covered the entire system. However, it is known to occur in the Mary River between Tiaro and Gympie, in the upper catchment at Kenilworth (Flakus 2002) and within the Traveston, Coolabine, and Cambroon areas (Latta & Latta, 2006). It is important to note that few freshwater turtle surveys have been conducted in the Mary River between Gympie and Kenilworth to describe the population structure, of either the Mary River or the Southern Snapping Turtles in this section of the river. Regardless of incomplete surveys within the Mary River drainage, the data that is available for both species indicates that populations are strongly biased towards adults, and that most adults breed every year (Tucker 1999; Limpus et al. 2002; Flakus 2002). These are worrying signs because this data implies that survival of eggs and/or the recruitment of hatchlings is poor. Both species reach maturity at around 20 years and the lack of juvenile turtles suggests that these threats have been occurring for decades. One of the priorities for developing management incentives for these two turtle species is to conduct systematic surveys in the Mary River and tributaries between Gympie and Conondale, to determine population structure and stability.

The Mary River and Southern Snapping Turtles are river turtles and like many species of river turtles rely on a suite of river characteristics such as riffle zones, rapids and flowing rivers that are not impounded. They also rely on the constant remodelling of the river banks that take place in seasonal fluctuations on the river. Both species are omnivores but at different stages of life the percentage of plant and animal food changes. As adults they largely eat vegetation and fruit. Hence, it is important that their habitat has healthy growth of riparian vegetation that produces fruits they can eat, for example native figs.

The Southern Snapping Turtle is found throughout the rivers in which it occurs however it is usually absent in areas of still water impounded by dams (Thomson et al., 2006). The species, as a cloacal breather, is intrinsically vulnerable to the effects of dams because of the loss of the riffle zones and rapids on which it relies to oxygenate the water (Legler and Georges 1993; Fitzgibbon 1998). Less is known about the impacts of dams and weirs on the Mary River Turtle, however it is not generally found within impounded areas (Tucker 1999; Mark Hamann and Craig Latta personal observations). The dams also have the effect of dividing or fragmenting populations because they cannot be easily travelled over by the turtles. Hence impoundment structures can impede the gene flow for

the species causing a loss of diversity. In the description of the species it was suggested that the Southern Snapping Turtle was a sensitive indicator of riverine health (Thomson et al., 2006).

On the Burnett River, in the wake of the building of the Paradise Dam, a turtle hatchery was developed. At this stage it is too early to tell if they have had any success because a nesting season has not been completed and eggs that have been placed into the hatchery are still incubating. A successful hatchery program must not just be about obtaining eggs and hatching them; there is more to it than this. For a hatchery program to work effectively there must be suitable riverine habitat to release hatchlings into; and hatchlings must have a better chance of survival than if nothing was done. Moreover, the incubation environment should be designed and managed so as not to compromise embryo development, hatchling phenotype, health or physical condition. Whether the Burnett River, with its loss of flows and few riparian zone management programs, is viable habitat for the species is not known and it will take years of monitoring to determine this. The hatchlings must be monitored, at least to determine immediate survival in the river, and it would be preferable to monitor them until they reach maturity. In long lived species such as the Mary River or Southern Snapping Turtles, this may take two decades or more. Hence, any use of this method on the Mary River would be another attempt of an untested process.

In summary, experience from the world of sea turtles where hatcheries are commonly used to protect sea turtle clutches, shows us that hatcheries are expensive to set up, expensive to run/maintain and it is exceedingly difficult to measure success on a short term (<10 years). Another factor in the ultimate success of a hatchery program is the long term funding of the project. A hatchery could conceivably cost in the order of \$500k to set up and then between \$100k and \$200k per year to run and maintain; especially if staff are hired to maintain it. This, over a generation of turtles equates to considerable expenditure. Whilst it is topical and highly rated, it will no doubt continue to receive funding but what happens 10 years down the track? Charismatic species such as Sea Turtles can only sometimes enjoy very long term funding and even this is rare. A ten year program may give the turtles another generation of survival but what then? If the species can no longer breed in the wild, because of the effects of the dam, then they will still not be breeding in 10 years. If funding runs out, we are back to where we started. In other words, a hatchery program may in the long term be nothing more than a temporary Band-Aid solution to a wider problem (e.g. Frazer 1992), and that problem is the loss of usable habitat for the turtles and distraction from the real issues of riparian zone management and predator control.

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