

EFFECTS OF WATER INFRASTRUCTURE ON FRESHWATER TURTLES

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INTRODUCTION

With the Queensland government's current proposal to dam the mid-catchment of the Mary River, there are two major impacts of dams and weirs on freshwater turtles that need to be considered. Firstly the ecological affects and secondly the physical effects. Ecological effects include the effects on diet, reproduction and growth and these have been extensively studied. The physical effects on the turtles themselves are currently being investigated further.

There are 6 species of freshwater turtle in the Mary River catchment, of which 2 are regionally endemic to the area. The Mary River Turtle *Elusor macrurus* only occurs in the Mary River whilst the recently described Southern Snapping Turtle *Elseya albagula* occurs in two other catchments. The Mary River Turtle, Southern Snapping Turtle, Krefft's Turtle *Emydura macquarii krefftii* and Saw-shelled Turtle *Elseya latisternum* are considered river specialists and prefer river habitats. The two long-necked species, the Eastern Snake-necked Turtle *Chelodina longicollis* and the Broad-shelled Turtle *Chelodina expansa*, more commonly occur in ponds and will travel huge distances over land, between ponds, in search of better living conditions.

After receiving advice from relevant Queensland government agencies, the Coordinator General, noted legitimate environmental concerns over broad catchment and river management issues. The Queensland Environmental Protection Agency was commissioned in 2002 to survey the conservation biology of the Southern Snapping Turtle *Elseya albagula* with regards to the impacts of water infrastructure and general species management in the Burnett River catchment (Hamann et al 2004). Other studies have also noted severe physical impacts from dams and weirs.

STUDY RESULTS

Studies that were undertaken in the Burnett, Mary, Fitzroy and Kolan River catchments have identified the following ecological concerns

- Life history factors shared by Mary River Turtles and the *Elseya* species suggest they are detrimentally affected by

impoundments due to the loss of riffle habitats and the disappearance of food items such as aquatic plants (macrophytes), windfall fruits from riparian vegetation and some aquatic invertebrates. (Tucker 1999, Executive Summary)

- Due to the specific physiology and late maturation (20 years +) of Mary River Turtle *Elusor macrurus* and Southern Snapping Turtle *Elseya albagula*, these species are the most susceptible to disturbances associated with water management practices (Tucker 1999, Executive Summary; Thomson et al. 2006).
- Essential microhabitats used by turtles are lost in water impoundments including dams, weirs and barrages. (Tucker 1999, Executive Summary; Thomson et al. 2006).
- Impoundments make juveniles particularly vulnerable due to loss of sheltering sites, loss of important prey/food species and cooler water temperatures. (Tucker 1999, Executive Summary)
- The food chains of turtles are fundamentally different in lakes than in rivers. (Tucker 1999, Executive Summary)
- Turtles that rely on cloacal respiration (*Elusor* and *Elseya* species) are disadvantaged in the stratified, low-oxygenated, turbid water in impoundments. (Tucker 1999, Executive Summary)
- Large impoundments have a greater impact on turtle biodiversity than smaller impoundments. (Tucker 1999, Executive Summary)

Initial studies on the physical effects of dams and weirs on freshwater turtles suggest that

- Long-term studies need to be completed at existing water storages to completely understand how physical damage impacts on survivorship, reproduction and population structure of all species.

During the early stages of the two-year study by the Environmental Protection Agency (Hamann et al. 2004) some key concerns were identified

- Large numbers of turtles were being found with healed fractures at the foot of the weir in the plunge pool. This pool usually has a concrete or stone floor that the animals smash onto when they overtop the wall. The water in the plunge pool is often turbulent and turtles are abraded on the rocky substrate (See Figure 1)

- Physical impacts of impoundments on freshwater turtles have not been examined in detail.

Additionally, project staff investigated the incidence of turtle damage at other weirs and dams within the Burnett catchment. During the survey the following was witnessed

- Numerous dry turtle carcasses were found on the stream margin, downstream of the dam walls (Hamann et al. 2004 Chapter 13). (See Figure 2)
- During the operation of the fish lock at Ned Churchward Weir a loud crunch was heard. An adult male *Elseya albagula* was then seen swimming from the fish lock into the plunge pool. It was hand caught and found to have severe fractures (See Figure 3).
- During a light flow that overtopped the dam wall, at least seven turtles and one Eastern Water Dragon *Physignathus lesueurii* were seen going over the dam wall and were fractured on impact with the concrete footings at the bottom (Hamann et al. 2004).
- The incidence of severely fractured and dead turtles coincided with major or sudden water release from the weirs or overtopping of the weir walls. This was especially true for structures with a stepped design i.e. Bucca Weir (Hamann et al. 2004).
- Physical barriers impeding turtle movement prevent locally depleted populations from being replenished by immigration from nearby areas (Hamann et al. 2004).
- Severe, non-fatal injuries greatly reduced the reproductive output of individual turtles causing a total loss of egg production for at least two consecutive breeding seasons (Hamann et al. 2004).

SUMMARY

For the full impacts of water infrastructure on freshwater turtles to be understood, long-term monitoring needs to be undertaken in catchments with existing water infrastructure and compared to areas with no water infrastructure. In addition, stepped wall designs should be avoided and all impact mitigation techniques need to be carefully designed to ensure they do not compound the physical injuries received by the turtles within the storage and adjacent areas.

It is essential that any future structures incorporate a 'turtleway' to mitigate population fragmentation and if designed properly would be the safest and most effective way to allow turtle movement up and down stream.



Figure 1. Healthy turtles were released into the plunge pool at Ned Churchward weir. Six weeks later they were recaptured with fresh abrasions from the turbulent water at the foot of the wall.



Figure 2. Turtle carcasses collected from the stream margin, downstream of Ned Churchward Weir 18-25 September 2003.

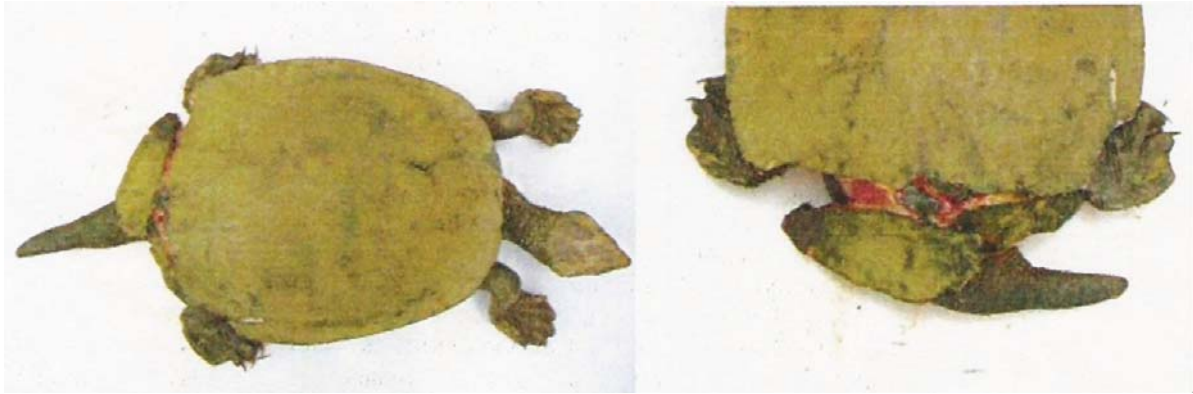


Figure 3. Male Southern Snapping Turtle fractured during operation of the fishlock at Ned Churchward Weir, 20 January 2003.



Figure 4. Fatal injuries sustained when turtles overtopped a dam wall. Found in the plunge pool of the stepped Bucca Weir, March 2003.

REFERENCES

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