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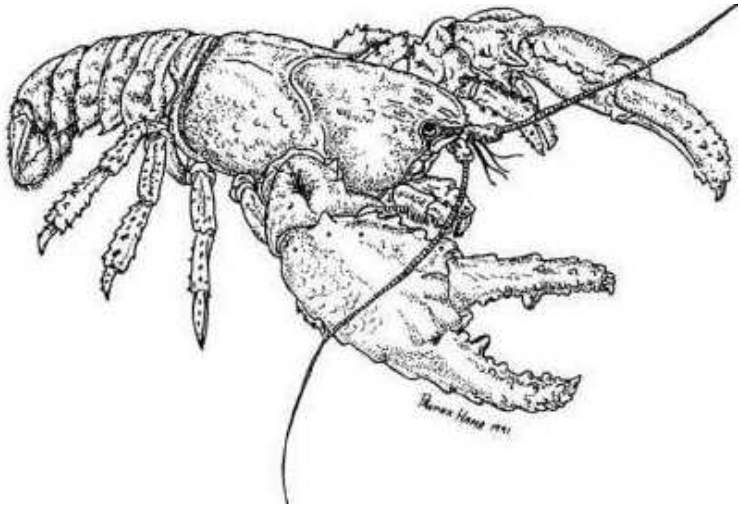

Damned Fauna

by **Sarah Lloyd**

Galaxias truttacius - Photo by John Simmons

Two stories dominated the media in Tasmania during the summer of 2016: the extensive bushfires and the 'energy crisis'. As a result of requests from members, the impacts of these events are described in Vol. 64 of *The Natural News*.

The fires received considerable media attention because they threatened lives and properties as they approached small towns and settlements in central north and northwest Tasmania. The destruction they wrought on the highland flora and karst system was only briefly discussed in the media.

The energy crisis and the low water levels in the lakes that supply electricity received almost daily media attention - at least until rain starting falling in mid-May. Issues outlined included the impact on the electricity infrastructure; the loss of production at two of the state's largest energy users: Bell Bay Aluminium and Norske Skog; the possibility of household power rationing; the expense involved in firing up the Bell Bay gas-fired power station and

importation of numerous diesel generators; and the environmental impact of using diesel to power the generators. There was almost no mention of the impact of falling water levels on the fauna in the hydro impoundments, especially in yingina/Great Lake and Arthurs Lake, which both support rare and threatened species.

yingina/Great Lake and Arthurs Lake

The 150 square kilometer yingina/Great Lake in Tasmania's central highlands is one of the largest natural bodies of freshwater in Australia. On December 4 1831 'protector' of Tasmanian Aborigines George Augustus Robinson described the lake and surrounding terrain as he and his party approach from the south:

> *'The Great Lake was not more than a quarter mile distant and in one part we could distinctly see the swans on the water ... Some of the natives from the south that had not before visited those parts, seemed struck with amaze on catching the first glimpse of this spacious water and called out, ironically, that it was the sea ... [it] had a fine appearance, and the strong northerly wind on the face of the water agitated the waters and the white foam gave it the appearance of the sea in miniature, together with the island and stony beaches and the surges of the waves breaking on the rocks.'*

Between 1910 and 1915 yingina/Great Lake changed irrevocably when the first dam was constructed on the Shannon River. Subsequent developments increased storage capacity and prevented the southward flow of water into the Derwent catchment, instead diverting it northward via the Great Western Tiers. The surface area increased from 11,330 to 17,612 hectares and drowned the series of separate lakes, shallow water and wetlands and their unique array of fauna. The Arthurs Lake impoundment was formed in 1963 following the construction of Arthurs Dam which inundated two natural water bodies - Sand Lake and Blue Lake - and Morass Marsh.

Lake habitats and threatened fauna

When full yingina/ Great Lake has a variety of habitats: extensive areas of emergent and submerged plants are associated with shallow and shelving shorelines; periodically inundated and exposed boulders and cobbles fringe the shores; and benthic (bottom) regions have fine grain sediment. These different habitats are favoured by different species, with some species using more than one habitat type depending on the stages of their life cycle.

Despite the considerable alterations to yingina/Great Lake it remains the centre of local endemism for several faunal groups including freshwater snails, galaxiid fishes, caddis flies and crustaceans with some species restricted to the lake and others also found in nearby water bodies. One species, the great lake caddisfly *Costora iena* that once inhabited weedy areas of the lake and its tributaries, is now listed as extinct. Other species listed as threatened or endangered include six freshwater crustaceans, (five isopods - yingina/Great Lake has the most diverse radiation of Phreatoicid isopods, a type of small shrimp, in the world - and one amphipod), two fishes (Shannon paragalaxias *Paragalaxias dissimilis* and Great Lake paragalaxias *P. eleotroides*), two snails (Great Lake snail *Glacidorbis pawpela* and Great Lake Hydrobiid snail *Beddomeia tumida*), several caddisfly species and a limpet. The Great Lake shrimp *Paranaspides lacustris*, although not listed on either the Commonwealth's Environment Protection and Biodiversity Conservation Act 1999 (EPBC) or Tasmania's Threatened Species Protection Act 1995 (TSPA), is included on the International Union for the Cnservation of Nature (IUCN) Red list of threatened species because of its high conservation significance. Arthurs Lake provides habitat for the endemic Arthurs paragalaxias *P. mesotes* and saddled galaxias *G. tanycephalus*, both of which are threatened.

Threats to the fauna include predation, especially from brown and rainbow trout; and loss of suitable habitat mostly though changing water levels caused either by drought or, since the Bass Strait Cable connected Tasmania to the rest of the country, by drawing down water to sell electricity to users on the Australian mainland.

Chara beds

Among the significant habitats in yingara/Great Lake are the algal beds known as either 'shrimp' or 'Chara' beds. They are formed of *Chara* and *Nitella* 'stonewort' algae and were first detected during surveys in the 1970s but are known to have existed at least since the 1960s - and probably earlier. The beds are generally between 10 and 20 cm high with some reaching 30 cm. They are not only vulnerable to wave action, being only present on the sheltered shores protected from moderate to strong north-westerly and westerly winds, but also to declining water levels. There was a significant loss of 68% of Chara habitat between 1999 and 2001 though 'dewatering' and exposure on the shoreline.

A 2001 study, which confirmed the presence of the Chara beds identified in earlier studies, provided more information about their extent and importance to the fauna of the lake. They were found to have a significantly more diverse and abundant macroinvertebrate fauna than other benthic habitats on the lake slopes and are important habitat for the Shannon galaxias. The Great Lake shrimp and six of the seven yingina/Great Lake phreatoicids show a preference for the Chara bed habitat. They are also of major importance for sustaining the lake's trout fishery. The beds have some ability to move when water level changes, but these fluctuations are probably too rapid for the beds to respond. Even if they do reestablish it is likely that the fauna will be negatively impacted through displacement, predation and a reduction in food.

Hydro priorities

In a paper 'Hydro power generation and the ecology of threatened fish species in Great Lake' Hydro's priorities are outlined:

> *'the lakes are managed primarily for generating electricity; however, there are also recreation, irrigation, water supply and environmental health considerations.'*

The paper describes the challenges posed by the prolonged below-average rainfall when water levels were reduced from 80% to 17% in the decade between 1997 and 2007. However, it was not until 2009 as a result of concerns about the impact of decreasing water levels on the threatened fishes that a three-year study was initiated. The only other studies on the fauna of the lake (two in 1987 and one in 1988) concentrated on the trout fishery. A study in 1983 looked at the macrobenthic fauna in yingina/Great Lake, Arthurs Lake and Lake Sorrell.

Galaxiid fishes

Fishes in the Galaxiidae family (e.g. *Paragalaxias* and *Galaxias* spp.) are scaleless small fish between 40–270 mm long with a dorsal fin placed well back on their bodies. Most are short-lived species with a lifespan of less than three years. They have a Gondwanan distribution with fifteen species occurring in Tasmania, of which eleven are endemic.

Tasmania's eleven threatened galaxiids (including ten endemics) that are listed on either (or both) the EPBC 1999 and TPSA 1995 are restricted to one or two water bodies or their associated streams and most have been affected to a

greater or lesser extent by Hydro impoundments. For instance, the Lake Pedder Galaxias *G. pedderensis* was unable to persist in its natural habitat after Lake Pedder was dammed. Fear is held for the long term survival of a translocated population in Lake Oberon because of the low genetic diversity - only 34 fishes were moved.

The Central Plateau in Tasmania is regarded as a hotspot of fish endemism in Australia because of the presence of seven endemic non-migratory galaxiid species in the lakes and lagoons. Despite this there has only been one in-depth study of one of these fishes, the golden galaxias *G. auratus* that inhabits Lakes Crescent and Sorell. That study found that reduced water levels and unseasonal fluctuations could limit the breeding success because of loss of breeding habitat and loss of cues that initiate spawning such as rising water levels as a result of rain. Their short life cycle means that a failure to breed in one year could have a significant impact on their population and consecutive failures could be catastrophic.

The factors that threaten the golden galaxias are likely also to affect the other threatened galaxiids. Most are now restricted to artificially controlled waterbodies and fluctuations in water levels influence the availability and condition of different habitats. For instance, the littoral areas (i.e. around the shore) are used by many fishes at some stage of the life cycle either for spawning or during their juvenile phase, so falling water levels are likely to be a major threat to some species. Furthermore, because fish play an important ecological role within lakes, anything that threatens their existence also threatens the structure of the food webs and therefore many other species.

Fluctuations in the water levels also effect water quality. Wind on shallow water can cause suspension of sediments and increased turbidity. Increased sediment on benthic substrates can have a negative impact on the eggs of some species and it can also cause a reduction in the growth and abundance of macrophytes (i.e. water plants) because less light can penetrate the water. Some fish species can experience respiration problems because suspended particles clog their gill filaments.

Conclusion

At the beginning of June 2016 the water level in yingina/Great Lake was 16.97 m. below full having risen barely one meter after the heavy rain in mid-May; the 'flood catastrophe' in early June (aka 'stormageddon') raised the water a further metre and by the end of July the level was 15.21 metres below full. In contrast, many of the other hydro impoundments were well above the spill threshold by mid-May. This illustrates that the highland lakes are much more vulnerable to droughts than lowland lakes because they have relatively small catchments and get most of their water from precipitation. Therefore, frequent droughts associated with El Niño, along with increased use for water (e.g. for irrigation) and global climate change are likely to have an adverse impact on much of the fauna in the lakes.

The impact of falling water levels on the fishes finally made the news in early June after documents obtained through the Right to Information Act revealed that an internal Hydro memo from January blamed native fish egg and adult deaths during the spawning season on 'water level management' or a 'combination of high draw-down rates and low lake levels'. In the documents, Hydro scientists found retreating water levels left native fish and their eggs stranded on dry land and caused the deaths of underwater plant and invertebrate species. One document listed extinction as a worst-case scenario resulting from the dewatering of eggs.

It is clear that like threatened terrestrial fauna, the threatened species in the lakes are a low priority for this government.

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