

# Continuing threats to lungfish

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Populations of the Australian lungfish, *Neoceratodus forsteri*, are under threat because of the creation of water impoundments over natural rivers and because of recent flooding events in their few remaining habitats. Lungfish of the Brisbane River system, considered by the Queensland Government to be a translocated population, are likely to have always been in this river. Considering the problems faced by this species in any of the habitats where it is currently living, whether from drought, flood or the creation of water impoundments, it does not matter if these fish belong in the Brisbane River or if they were placed there in 1896 as part of a program to preserve them. There are now so few suitable environments for lungfish in southeast Queensland that they should be conserved wherever they are found.

The Brisbane River system is large, and effectively divided into regions by dams and weirs. Lungfish have been recorded from all of the freshwater parts of the river, although for many years all have been adult fish. Lungfish spawned annually in the river, and in some years spawning was prolific. They could still be spawning in the Upper Brisbane River, though dredging and other such activities have damaged this part of the river. Spawning in the Lower Brisbane River, below Wivenhoe reservoir, continued in most seasons until the drought reduced flows in the river to exceptionally low levels. By 2005, lungfish had stopped spawning in areas of the lower Brisbane where they had spawned for many years. After the floods in the last two years, all the potential spawning sites have been cleared of shelter for the young and food for any stage of the life cycle. Damage is particularly significant close to the spillway from Wivenhoe reservoir.

Spawning has occurred in reservoirs in the past, for example in Enoggera Reservoir for many years, and in 2009 in Lake Wivenhoe. However, incidences of spawning may not be followed by recruitment of juveniles to the adult population. In Enoggera, there was nowhere to shelter eggs and young after water hyacinth was cleared in 1974, and the young did not survive. The adult population became very old, and Brisbane Forest Park rangers have told me that lungfish are now extinct in Enoggera Reservoir. Department of Primary Industries staff were warned in that lungfish had stopped spawning in Enoggera Reservoir, and the adult population was very old. Unfortunately, no action was taken to save them.

Lungfish laid eggs in many places along the shores of Lake Wivenhoe in 2009. It is unlikely that this spawning event in Lake Wivenhoe produced viable young. Attempts to raise some of these eggs in captivity, by methods that have always worked in the past, failed. Many of the eggs were unfertilised, because the fish simply shed them into the water instead of carrying out a normal spawning activity. The survivors had abnormal skin development and some had no vents, blocked intestines and mouths that would not close. They were unable to feed, or even to keep the skins clean, and

all died when the yolk supply ran out.

Some dead lungfish were recovered from the upper parts of Lake Wivenhoe after a flood in the winter of 2009. These fish were all adults, and had not been feeding well for many months. Examination of the teeth of these specimens suggests that they were old fish, not perhaps as old as the fish of Enoggera Reservoir, but still old fish. None were sub-adult or juvenile. It is unlikely that any young lungfish have been recruited to the adult population in Wivenhoe Reservoir since it was built, although some may have entered the reservoir from the Upper Brisbane River.

The flood of 2011 would have carried away any old or sick fish from lake Wivenhoe, and taken them out to sea if any survived the journey over the spillway. Flooding has also removed any macrophytes and most of the submerged *Callistemon* roots from the river banks, so there are no places for eggs to be attached, and no shelters for newly hatched fish. Although I would hesitate to say that the lungfish of the Brisbane River system, or any other flood affected environment, are all destroyed already, they are old fish, and many have been affected by trying to live in the water impoundments, where food supplies for lungfish are poor. Worse, there were only traces of spawn (six inviable eggs from two sites) in Wivenhoe Reservoir in 2010, and no spawn has been found there in 2011. Spawning has also been absent from the Lower Brisbane River in 2010 and in 2011, in places where lungfish spawning used to be prolific. This year we have visited seven sites, all used for spawning by lungfish in the past, and no eggs have been found.

Lungfish are survivors, and long lived. It is possible that they may recover from recent events and from the creation of water impoundments, and young fish will be recruited to the population in the future. However, a combination of no recruitment, ageing adults and poor or absent spawning is an ominous sign for a species with such a restricted distribution.

It is true that the Queensland Government, SEQwater, Queensland University and the Australian Rivers Institute have recovery plans and projects in hand to rescue, protect and preserve lungfish in their natural environments. However, to ensure survival of the species, it may be important to create a lungfish reserve, with a carefully restored river margin, or a lake with permanent macrophytes and shallow water on the shores, protected in some way from the effects of flood. Lungfish need help now, or the species may become extinct.