

Re-establishment of Native Freshwater Fishes in Bull Creek



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Freshwater Fish Research



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The report is available at:

www.scieng.murdoch.edu.au/centres/fish/curres/Freshwater.html

Background

Bull Creek is a perennial, urban stream located in the City of Melville and is a tributary to the Canning River. The catchment has been largely altered for urban development (i.e. housing) and receives a considerable amount of storm-water runoff. Substantial effort has been made recently to re-habilitate the riparian zone of Bull Creek through weed eradication (particularly blackberry control) and native re-vegetation programs. The Melville City Council recognised the need to extend this rehabilitation effort to include the instream aquatic fauna and thus a fish re-establishment program was implemented; the details of which are described in this report.

Bull Creek was known to previously be dominated by the introduced Eastern Mosquitofish *Gambusia holbrooki* (Figure 1). This North American species can rapidly establish in aquatic systems as it is tolerant of a wide range of environmental variables (such as temperature and salinity), breeds in the first year of life and can produce multiple batches of live young over an extended breeding period. It is now widespread throughout south-western Australia and was long introduced to control mosquitoes (Morgan *et al.* 2004). It is known to be detrimental to the small, endemic fish species in the region as it competes for resources (such as food and habitat) and is very aggressive through such behaviour as fin-nipping (Gill *et al.* 1998).

The Eastern Mosquitofish population in Bull Creek had since been replaced by the One-spot Livebearer (also known as Leopardfish or Speckled Mosquitofish) *Phalloceros caudimaculatus* (Figure 1). The mechanism by which this species replaced the Mosquitofish is unknown (but the One-spot Livebearer may have out-competed it for resources or it may have been a genetic mechanism such as hybridisation). The diet of the One-spot Livebearer is omnivorous consuming a wide range of food including detritus (Maddern 2003). It is likely to not be as an effective midge and mosquito controller as a number of native fishes that are known to consume large amounts of insect larvae and pupae and therefore act as excellent pest midge and mosquito controllers. The One-spot Livebearer is a small poeciliid native to the central-eastern seaboard of South America, from Brazil (approximately Rio de Janeiro southwards), Uruguay and Paraguay (Rosen and Bailey 1963). One-spot Livebearers have not demonstrated the same agonistic behaviour as Eastern Mosquitofish towards native south-western Australian fishes (in particular the fin-nipping of Western Pygmy Perch *Edelia vittata*) (see Gill *et al.* 1999, Maddern 2003).



Eastern Mosquitofish (previous inhabitant)

One-spot Livebearer (current inhabitant)

Figure 1 The two species of introduced fishes previously found in Bull Creek. N.B. Eastern Mosquitofish is no longer present.

Of the native fishes endemic to south-western Australia, the common Western Pygmy Perch and Western Minnow *Galaxias occidentalis* (Figure 2) are particularly prolific consumers of insects and as they are found in nearby tributaries of the Canning River system it is likely they were historically present in Bull Creek. It is known that the Nightfish *Bostockia porosa* (that is often found with the above two species in other aquatic systems) inhabited the system at least up until the 1980's. Therefore, from both a

conservation and mosquito-control perspective, the re-introduction of small, freshwater endemic fish such as the Western Pygmy Perch and Western Minnow into Bull Creek was seen as advantageous.



Western Minnow

Western Pygmy Perch

Figure 2 The two native fish species stocked into Bull Creek.

The other dominant aquatic species in Bull Creek was known to be the native freshwater crayfish the Gilgie *Cherax quinquecarinatus* with a population with a density of $\sim 1/m^2$ (Beatty *et al.* 2005). This widely distributed species (\sim Moore River to Albany) occupies almost the entire range of freshwater habitats found in the region. It is able to occupy seasonally inundated systems by burrowing into the water table and is being tolerant of low oxygen and relatively extreme water temperatures. As with other freshwater crayfishes, it would also likely feed on benthic detritus and invertebrate larvae such as that of dipteran larvae in Bull Creek.

Aim

The current project aimed to re-establish two native fishes into Bull Creek. The first part of the project was to undertake a One-spot Livebearer reduction programme. As this species had large abundances in the system, it was deemed necessary to reduce their abundances at the sites where the native fishes were to be re-introduced to minimise the level of competition for food and habitat. The second phase of the project was to stock native fishes sourced from within the Canning River Catchment. A third phase of the project will be undertaken in 2007 whereby monitoring will determine whether the

populations of the two native species have bred during their known breeding period in winter/spring 2006.

Methodology

Feral Control Program

Three sites were the focus of the reduction effort of One-spot Livebearer (see Figure 3). Fish were captured using a combination of a back-pack electrofisher (that temporarily stunned the fish enabling them to be scooped up) and fyke nets that were set at the downstream section of each site to prevent the fish escaping. At each site, up to 280 m² of stream area was covered during the eradication with a total of 860 m² being sampled.

In each section, a subsample of fish were counted with the overall number extrapolated and a density determined. A subsample of 200 One-spot Livebearers was measured to the nearest 1 mm total length (TL) and a length-frequency histogram plotted to examine population structure.

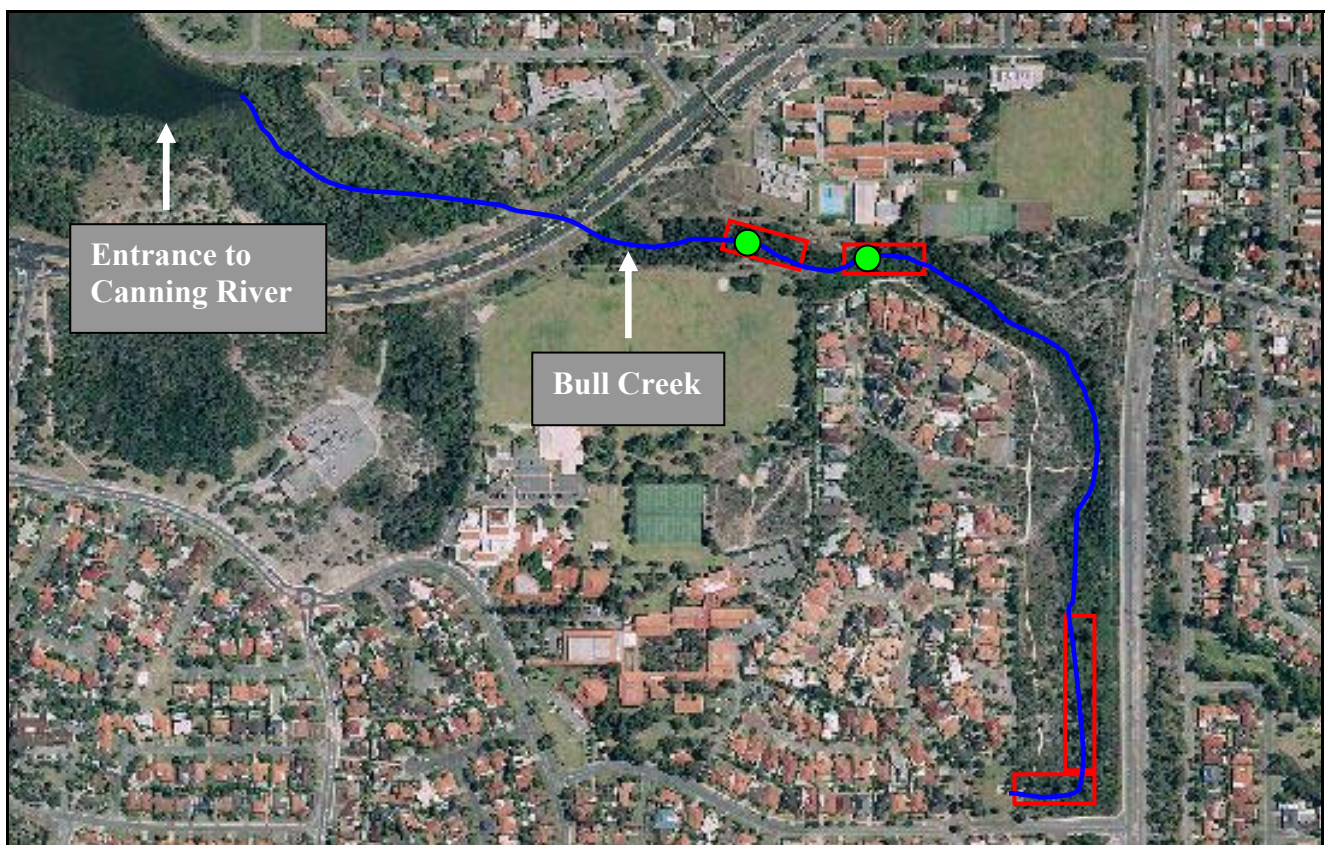


Figure 3 The study sites on Bull Creek in April, 2006. Green circles indicate points of native fish release and the red boxes are sites of feral fish reduction.

Native species re-introduction

A total of 247 Western Pygmy Perch and 148 Western Minnows were captured from four sites in the Swan and Canning River catchments in April 2006 using a combination of 5, 10 and 15 m seine nets (2 mm mesh width). Fish were transported in aerated drums to Bull Creek. A sub-sample of each species was measured to the nearest 1 mm TL and then all fish were released at two downstream sites within the sites where reduction of One-spot Livebearers had occurred (Figure 3). Permission to introduce native fishes was granted by the Translocation Officer at Fisheries WA.

Results and Discussion

One-spot Livebearers were prolific in the sites sampled with a total of **47934** removed from Bull Creek at a mean density of ~56 fish/m². The population consisted of three length-classes with the dominant size class having a modal length of 24-26 mm (Figure 4). Note that in Bull Creek this species breeds continually throughout the year and that females attain considerably larger sizes than males with those fish greater than 30 mm TL invariably being females (see Figure 4 and Maddern 2003). Sexual maturity is attained at very small sizes with approximately 50% of males and females being sexually mature at ~22 mm TL. The small size and young age at sexual maturity, together with the bearing of live young and an omnivorous diet has allowed this species to thrive in waters where they have been introduced.

The very high densities of this species and presence of multiple size classes (corresponding to different age and sex classes) reflected the fact that it was a firmly established population. This fact and the continual recruitment of juveniles may prohibit its complete eradication from the creek without the use of chemical eradication methods (such as chlorination) which may not be environmentally sound given that the stream discharges into the Canning River. However, the localised eradication program was successful in drastically reducing the abundance of One-spot Livebearer at key sites of re-

introduction of the two native species which will reduce the potential for competition between the species.

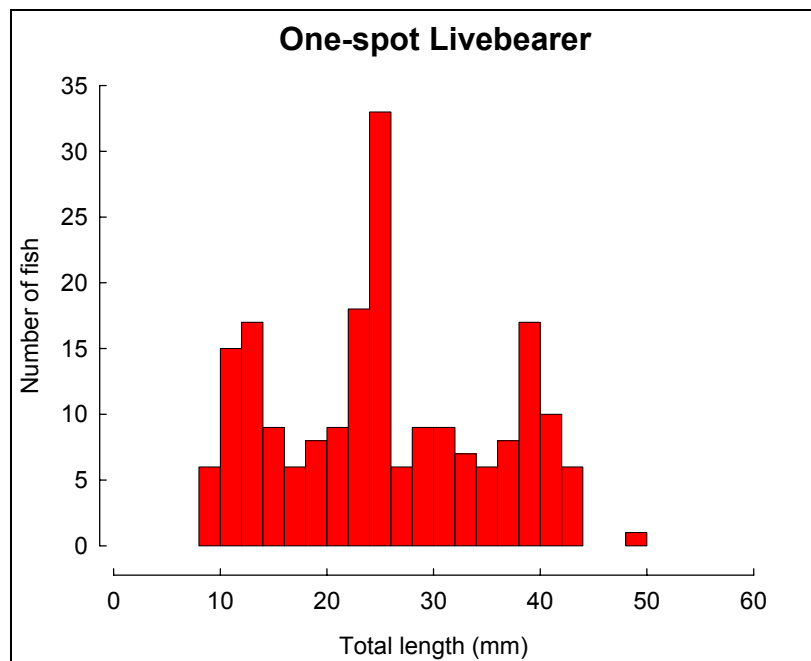


Figure 4 Length-frequency of feral One-spot Livebearers removed from Bull Creek in April, 2006.

The length-frequency distributions of a sub-sample of the Western Minnow and Western Pygmy Perch that were reintroduced into Bull Creek are shown in Figures 5 and 6. It can be seen that a wide size range were introduced to mimic a natural population structure with the aim of the population becoming self-sustaining with the first breeding period due to occur in the winter and spring of 2006 for Western Minnow and Western Pygmy Perch, respectively. Examination of the Western Minnow length-frequency distribution revealed that there were three length classes that correspond with three year classes, the smallest of which are 0+ individuals that would have been born in winter 2005 (Figure 5). This species is known to first reproduce at the end of its first year of life (Pen and Potter 1991a) and therefore all fish that were released have the potential to breed in winter 2005.

The length-frequency distribution of the sub-sample of Western Pygmy Perch introduced into Bull Creek shows that there was a dominant 0+ age cohort that would have been born in spring 2005 but the introduced population also contained numerous adults (Figure 6). As with the Western Minnow, this species is known to attain first maturity at the end of

the first year of life (Pen and Potter, 1991b) and therefore, all fish introduced have the potential to breed in spring 2006 in Bull Creek.

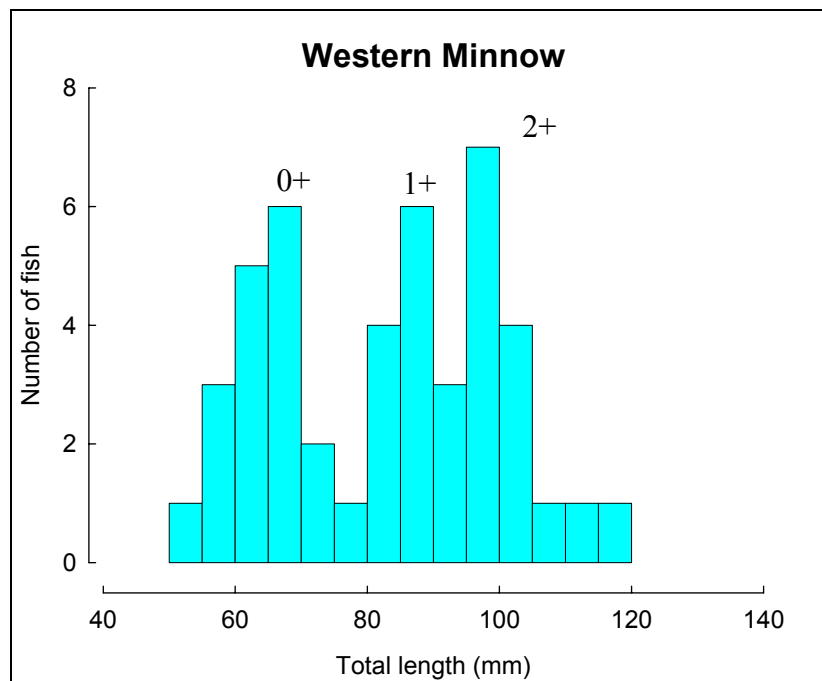


Figure 5 Length-frequency distribution of native Western Minnow introduced into Bull Creek in April, 2006. N.B. the modes of the three age classes are shown.

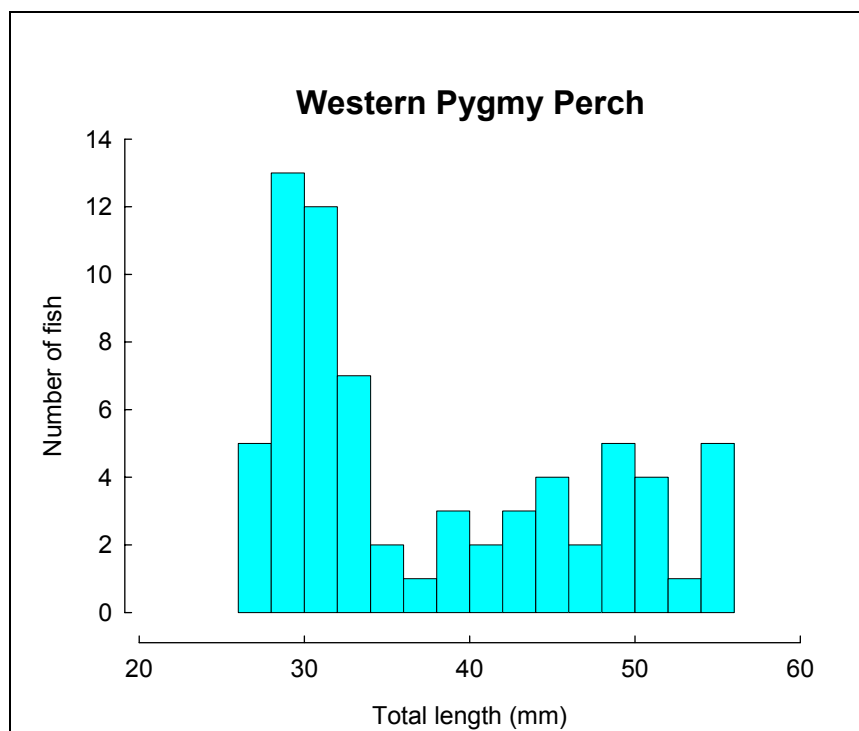


Figure 6 Length-frequency distribution of native Western Pygmy Perch introduced into Bull Creek in April, 2006.

It is envisaged that the native fish, which attain considerably larger sizes than the feral One-spot Livebearer, will prey on the One-spot Livebearer and naturally reduce the population. A follow-up monitoring event will occur in summer 2006-2007 to confirm that these species have reproduced via a re-examination of the length-frequency distribution of the established populations in Bull Creek.

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