Department of
Sustainability and
Environment

Identification and protection of key spawning habitats for Macquarie Perch in King Parrot Creek

Black Saturday Victoria 2009 – Natural values fire recovery program

Joanne Kearns, Zeb Tonkin, Justin O'Mahony and Jarod Lyon

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Identification and protection of key spawning habitats for Macquarie Perch in King Parrot Creek

Joanne Kearns, Zeb Tonkin, Justin O'Mahony and Jarod Lyon

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Arthur Rylah Institute for Environmental Research
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Front Cover photograph: Macquarie Perch larvae 10 minutes old (Joanne Kearns).

All photographs in this report are by Joanne Kearns unless otherwise credited.

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Summary

The Macquarie Perch (*Macquaria australasica*) is a threatened native fish species listed under both State and National legislation. The King Parrot Creek Macquarie Perch population is one of only a few small, discrete populations of the species remaining in the Goulburn-Broken Catchment. This population has been used as a key indicator of river health actions by the Upper Goulburn Landcare Network (e.g. maintaining environmental flows, minimising water extraction, weed control and riparian restoration). As such, community groups have become increasingly involved in the protection and enhancement of this important fish population (see Appendix 1). King Parrot Creek was heavily impacted by the February 2009 bushfires, with both community and scientists raising concerns about the ongoing effects of these fires on the future of this fragile population. Consequently, a portion of the population from near Flowerdale was temporarily moved to the Department of Primary Industries (DPI) Snobs Creek Fish Hatchery near Lake Eildon in March 2009, in an effort to protect these individuals from heavy sediment loads entering King Parrot Creek. These fish were returned to King Parrot Creek in December 2009 after water quality had sufficiently improved. However, there is continued concern about the effect of ongoing sediment loads entering the creek and its impact on reducing the survival rate of Macquarie Perch eggs and how this may impact subsequent recruitment.

The project objectives were to identify key spawning areas of Macquarie Perch in King Parrot Creek and determine the extent of sedimentation on these spawning areas. Key outcomes will assist in developing strategies with the Goulburn Broken Carchment Management Authority (GBCMA) and the Upper Goulburn Landcare Network to undertake suitable protection and enhancement of these areas, to ensure future sustainability of this species in the system.

Larval drift nets and fyke nets were set at four sites in King Parrot Creek between Flowerdale and Kerrisdale over a four-week period during November and December 2010 to identify key spawning areas of Macquarie Perch. Ripe male and female Macquarie Perch were collected along with the presence of Macquarie Perch eggs, collectively indicating this species is still spawning in King Parrot Creek. However, spawning activity was not evenly distributed throughout the study area. Instead results identified a key spawning area with 95% of eggs collected at a single site. Fieldwork was slightly interrupted as a result of numerous rainfall events during October and early November which lowered water temperatures in the creek and hence delayed and/or interrupted Macquarie Perch spawning by nearly one month.

This project highlights the importance of this spawning area, and its need for protection from impacts such as sedimentation, which remains a key threat to the Macquarie Perch population in King Parrot Creek. Recommendations include continued riparian restoration and bank stabilisation, with key Macquarie Perch spawning areas having the highest priority. These works will assist in reducing further sediment inputs into the creek thereby aiding recovery of Macquarie Perch in King Parrot Creek.

1 Introduction

The Macquarie Perch (*Macquaria australasica*) is an Australian native freshwater fish endemic to the south-eastern reaches of the Murray-Darling Basin. Over the past 50 years, a decline in this species range and abundance has been documented (Gray *et al.* 2000). Macquarie Perch is currently listed as a threatened species under the *Victorian Flora and Fauna Guarantee Act 1998*, listed nationally as endangered under the *Environmental Protection and Biodiversity Conservation Act 1999* and considered endangered in Victoria according to the Advisory List of Threatened Vertebrate Fauna in Victoria – 2007 (DSE 2007). Macquarie Perch is also recommended to become listed as endangered in all the States and Territories in which it occurs (ACT, NSW, VIC and SA) (Lintermans 2007). Under Victorian legislation, the taking of Macquarie Perch from all waters, with the exception of the Yarra River, Lake Dartmouth and the Upper Coliban River, is prohibited.

In Victoria, only a small number of fragmented populations now exist, mainly in cool, rocky, fast flowing streams within relatively undisturbed upland catchments. One such population exists at King Parrot Creek, in the Goulburn Broken Catchment in northern Victoria. During extensive bushfires in early 2009, several sections of the creek were burnt to the water's edge, resulting in a significant loss of riparian vegetation (Kearns 2009). As such, this Macquarie Perch population was greatly impacted by this event.

Fires can have a devastating effect on waterways, both directly and indirectly. Direct effects, such as the deposits of ash and debris, can decrease dissolved oxygen (DO) (Lyon and O'Connor 2008), alter pH (Cushing and Olson 1963) and increase nutrient loads such as nitrogen and phosphorus (Beschta 1990). Indirect effects on aquatic ecosystems include increased nutrient inputs from burnt material, increased water temperatures as a result of decreased riparian vegetation (Minshall *et al.* 1997), altered flow regimes (Bushfire Recovery Program–Aquatic Ecosystems Assessment 2006), and siltation of pools and slow moving habitats (Benda *et al.* 2003). An additional threat to fire effected waterways is sediment slugs. These occur when runoff causes a sudden pulse of organic matter (ash, burnt woody debris and charred leaves) into the waterway. The associated decline in oxygen has the potential to cause fish kills, ranging from small isolated pockets to the elimination of populations in entire sections of streams (DSE 2009b; Lyon and O'Connor 2008).

To protect the Macquarie Perch from possible sediment slugs entering King Parrot Creek, a portion of the population from near Flowerdale was temporarily moved to the Department of Primary Industries (DPI) Snobs Creek Fish Hatchery near Lake Eildon in March 2009. These fish were returned to King Parrot Creek in December 2009 after water quality had sufficiently improved.

Although significant replanting and natural regeneration of riparian vegetation alongside King Parrot Creek has occurred, there are continued concerns about the ongoing sediment inputs entering the creek. Implications of increased sediment loads on Macquarie Perch are well documented; the most concerning of these being the potential for reducing the survival of eggs during spawning times (Koehn *et al.* 1991).

Macquarie Perch spawning occurs between October and December when water temperatures exceed 16 °C (DSE 2009a). Known habitats for spawning are generally shallow, well oxygenated riffles and runs associated with rocky substrates (Cadwallader 1981; Harris and Rowland 1996; Appleford *et al.* 1998; Gibson 2005). Eggs are laid at the top of these riffles and drift downstream where they lodge amongst the cobble and gravel substrate (DSE 2009a). Females may lay up to 30,000 eggs per kg body weight (Trueman 2007), and larvae hatch after 10–11 days and are approximately 7 mm in length (DSE 2009a).

For the past five years, scientists from the Arthur Rylah Institute (ARI) have been undertaking annual fish surveys in King Parrot Creek in conjunction with the GBCMA threatened species program (Kearns *et al.* 2011). While these surveys have been vital in assessing how Macquarie Perch populations in King Parrot Creek respond to fire, no work has previously been undertaken to investigate Macquarie Perch spawning in King Parrot Creek. As such, it is difficult to identify management actions which protect spawning sites against sedimentation until these spawning sites are identified. This project addresses this shortcoming, with the specific objectives being to:

- Identify key spawning areas of Macquarie Perch in King Parrot Creek
- Determine the extent of sedimentation and potential sedimentation on these spawning areas
- Identify protection and enhancement actions required to improve recovery of Macquarie Perch
- Develop strategies with the GBCMA and the Upper Goulburn Landcare Network to undertake suitable protection and enhancement of these areas, to ensure future sustainability of this species in the system.

2 Methods

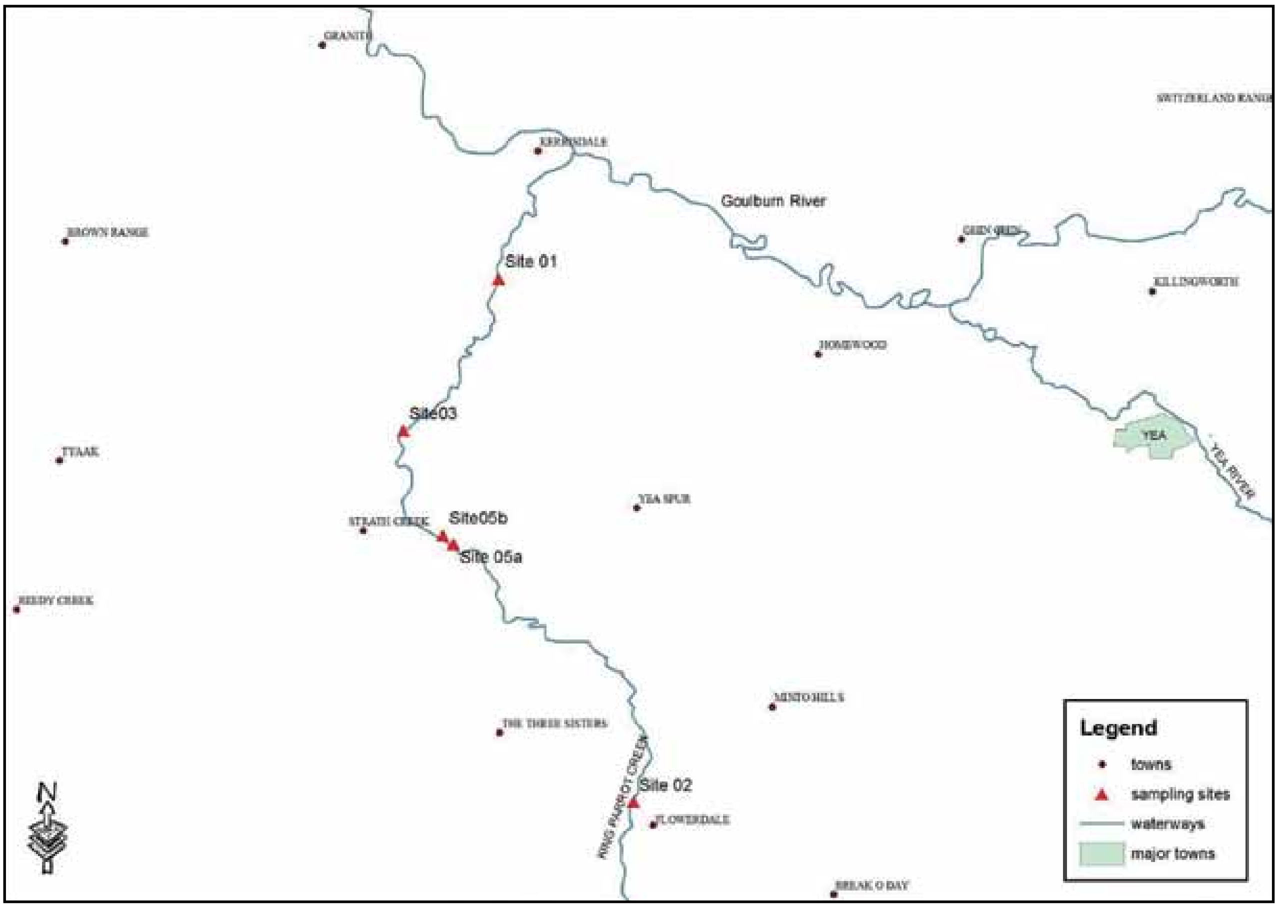
2.1 Study site

Sites for the current study were chosen in conjunction with annual fish monitoring in King Parrot Creek (Kearns *et al.* 2011). Previous surveys have consistently recorded Macquarie Perch at each of the sampling sites (see Table 1 and Figure 1) and all have riffle run sequences which are suitable for Macquarie Perch spawning.

Table 1. Site details for the November–December 2010 Macquarie Perch spawning assessment surveys in King Parrot Creek.

Site	Location	Easting	Northing	Date/s sampled
01	Draytons Bridge on Fairview Rd off King Parrot Creek Rd, North-East of Strath Creek.	344887	5884349	8/11/2010 – 10/11/2010 16/11/2010 – 18/11/2010 23/11/2010 – 26/11/2010 6/12/2010 – 8/12/2010 10/02/2011 – 11/02/2011
02	Moores Rd off King Parrot Creek Rd, site downstream of Flowerdale, small dirt parking area to one side of road.	348277	5869263	8/11/2010 – 10/11/2010 16/11/2010 – 18/11/2010 23/11/2010 – 26/11/2010 6/12/2010 – 8/12/2010 10/02/2011 – 11/02/2011
03	Richards Bridge on King Parrot Creek Rd near junction with Kerrisdale Rd. North-East of Strath Creek.	342750	5879907	8/11/2010 – 10/11/2010 16/11/2010 – 18/11/2010 23/11/2010 – 26/11/2010 6/12/2010 – 8/12/2010 10/02/2011 – 11/02/2011
05a	Callandoon Property, 1.5 km upstream of Draytons Bridge off Flowerdale Rd behind worker's residence, Strath Creek.	343987	5876657	8/11/2010 – 10/11/2010 16/11/2010 – 18/11/2010 23/11/2010 – 26/11/2010 6/12/2010 – 8/12/2010 10/02/2011 – 11/02/2011
05b	Callandoon Property – 300 m downstream from site 05a.	343732	5876898	6/12/2010 – 8/12/2010

Figure 1. Location of study sites within King Parrot Creek, Victoria.



2.2 Fish and egg sampling

The collection of ripe adult Macquarie Perch or eggs was used to identify important Macquarie Perch spawning areas in King Parrot Creek using methods described by Tonkin and Lyon (2010b). One larval drift net (1 m deep wing with 1 mm mesh size, 800 mm diameter hoop leading to a 500 µm cod end) was set at each site and positioned facing upstream of key riffle habitats to collect drifting eggs and/or larvae (Figure 2). All nets were set to block off a comparable amount of water (approximately 20% of the flow) which was consistent across sites. All nets were checked at 0800h (night set) and again at 1800h (day set). Two fyke nets were also set at each site, with one upstream and another downstream of larval nets, to target adult Macquarie Perch. Weeks one, two and four consisted of two consecutive night and one day sets, while week three consisted of three night and two day sets.

Macquarie Perch eggs are relatively large (2–4 mm diameter) and are easily seen with the naked eye. For this reason, the contents of each larval net were live sorted in the field to avoid destructive sampling (Figure 3). All eggs and larvae were counted and returned to the site of capture. All fish collected in the fyke nets were measured for total length (TL, nearest mm) and weighed (nearest g). Macquarie Perch were also examined for sex by applying light pressure to the abdomen to identify the presence of milt or eggs. All fish were returned to the site of capture. A sub-sample of 13 eggs collected from site 05a were brought back to the ARI and reared in the aquarium to confirm species identity.

An additional fieldtrip was undertaken on the 10th of February 2011. One larval net and 10 bait traps with a cyalume lightstick in each net were set overnight at sites 01, 02, 03 and 05a and the contents of each net sorted as previously described in order to detect Macquarie Perch young of year (yoy).

2.3 Sediment sampling

Sediment traps were constructed as described by Bond (2002). In essence, these traps consisted of a simple plastic storage box (200 x 150 x 150 mm) with four holes (3 mm diameter) drilled approximately 30 mm from the top of the trap so that two pieces of wire rod (3 mm diameter and 205 mm long) can be passed through the box. A piece of wire mesh (25 x 25 mm opening, 1.5 mm gauge wire), was cut to fit just inside the box and was placed on top of the rods. Three replicates were used at each site whereby each trap was buried in the streambed such that their tops were flush with the bed. Once the traps were in position, a layer of course bed material (cobble) one layer thick, was positioned on the wire mesh of each trap. This creates hydraulic conditions over the box comparable to the rest of the streambed and also creates conditions within the box that allows fine particles to settle (Bond 2002). Sediment traps were used during weeks two, three and four and were left for the duration of each sampling event. Traps were positioned at the top of each riffle directly upstream from the larval drift net at each site, along with a wooden stake with flagging tape positioned alongside each trap to aid their location upon retrieval times (see Figure 4). The average depth of each trap was 500 mm and this was consistent across all sampling sites. Sediment traps were collected at the conclusion of the sampling weeks by gently lifting traps from the stream bed and letting the traps settle on the creek bank for 15 minutes. Water was gently decanted from each box and the contents of each trap were returned to ARI and air dried. All samples were weighed and results were standardised to account for difference in sampling times between each site.

Figure 2. Larval drift net set at (a) Draytons Bridge (site 01) photo facing downstream; (b) Moores Rd (site 02) photo facing upstream; (c) Richards Bridge (site 03) photo facing upstream; (d) larval net being checked at Callandoon (site 05a). Photo (d) courtesy of Fern Hames.

Figure 3. (a) Contents of larval drift net at Callandoon (site 05a); (b) sorting through a sample with the assistance of members from the Strath Creek Landcare Group. Photo (b) courtesy of Fern Hames.

(a)

(b)

Figure 4. Photo of a sediment trap at Moores Rd (site 02).

2.4 Water quality

Prior to fieldwork, one HOBO® pendant temperature/light data logger was deployed at sites 01 and 02 where water temperature (°C) was recorded hourly. The average daily water temperature at site 02 between 10/10/10 and 31/12/10 was calculated and correlated with water discharge (ML/day) and sampling events (see Figure 9).

3 Results

3.1 Fyke nets

A total of 92 individual fish representing three native and four exotic species were collected during the fyke net surveys (Table 2). The most abundant native species caught was Macquarie Perch (n=23), while the most abundant exotic species was brown trout (n=34). Macquarie Perch were caught at all sampling sites with the highest abundance of this species observed at Richards Bridge (site 03) (n=9). A total of nine Macquarie Perch individuals were sexually mature with milt or eggs present, of which six were collected at Callandoon (site 05) (see Figure 6). There were four distinct size classes of Macquarie Perch whereby the total length ranged between 94–412 mm (Figure 5). Eleven platypus were also unintentionally collected and released throughout the surveys with the highest abundance observed at Draytons Bridge (n=5).

3.2 Larval drift nets

A total of 314 eggs were collected from site 02, 05a and 05b during weeks three and four (see Table 1; Figures 7 and 8). A sub-sample of these eggs was successfully hatched between five and nine days after their collection and all eggs were confirmed as Macquarie Perch. Ninety-five percent of these eggs were collected from site 05a and b, indicating that spawning activity was not evenly distributed throughout the study region. Larval nets, which were set at night, were more effective than day sets with 79% of all eggs collected during the night. The two periods when eggs were collected coincided with the two highest peaks in water temperature which exceeded 16 °C (see Figure 9). Five blackfish larvae were also collected in the drift nets at sites 03 and 05a during week two and three. No Macquarie Perch young of year were detected during surveys undertaken in February 2011.

3.3 Sediment traps

Whilst sediment analysis was conducted over a three week period corresponding to fish sampling, only week two generated valid results (see Table 4). This was attributed to flash flooding which occurred during these two other sampling events, which washed the remaining traps away. Results from week two indicated Callandoon (site 05a) samples contained the highest ratio of sediment deposited per hour (0.56 g), followed by Draytons Bridge (0.47 g), Moores Rd (0.19 g) and Richards Bridge (0.01 g) (see Table 4). The substrate composition of samples collected from Callandoon was predominantly sand, while samples from Moores Rd and Richards Bridge were fine sediment and samples from Draytons Bridge were a combination of sand and fine sediment. During week three, only three samples from Moores Rd and one sample from Callandoon were able to be recovered. All samples had a significantly higher quantity of sediment deposited when compared to the previous sampling week, whereby Callandoon contained the highest ratio (8.58 g) followed by Moores Rd (6.65 g). Both sites had higher sediment deposits as a result of flash flooding during the sampling period.

Table 2. Total number of each species captured at each site during the November–December 2010 King Parrot Creek Macquarie Perch survey. * Denotes exotic (non-native) species. # Denotes sites which had ripe Macquarie Perch individuals.

SITE		01-Draytons Bridge	02-Moore Road	03-Richards Bridge#	05a-Callandoon Property#	05b-Callandoon Property#	Total
Common name	**Species name**						
Macquarie Perch	*Macquaria australasica*	5	2	9	5	2	23
River Blackfish	*Gadopsis marmoratus*			1	14		15
Flathead Gudgeon	*Philypnodon grandiceps*			1	5		6
Brown Trout*	*Salmo trutta*	3	21	4	5	1	34
Rainbow Trout*	*Oncorhynchus mykiss*	1		2		1	4
Redfin Perch*	*Perca fluviatilis*	2		1	4		7
Goldfish*	*Carassius auratus*			3			3
Total fish catch per site		**11**	**23**	**21**	**33**	**4**	**92**

Figure 5. Total length (TL) frequency of Macquarie Perch collected during the King Parrot Creek survey during November–December 2010 (n=23).

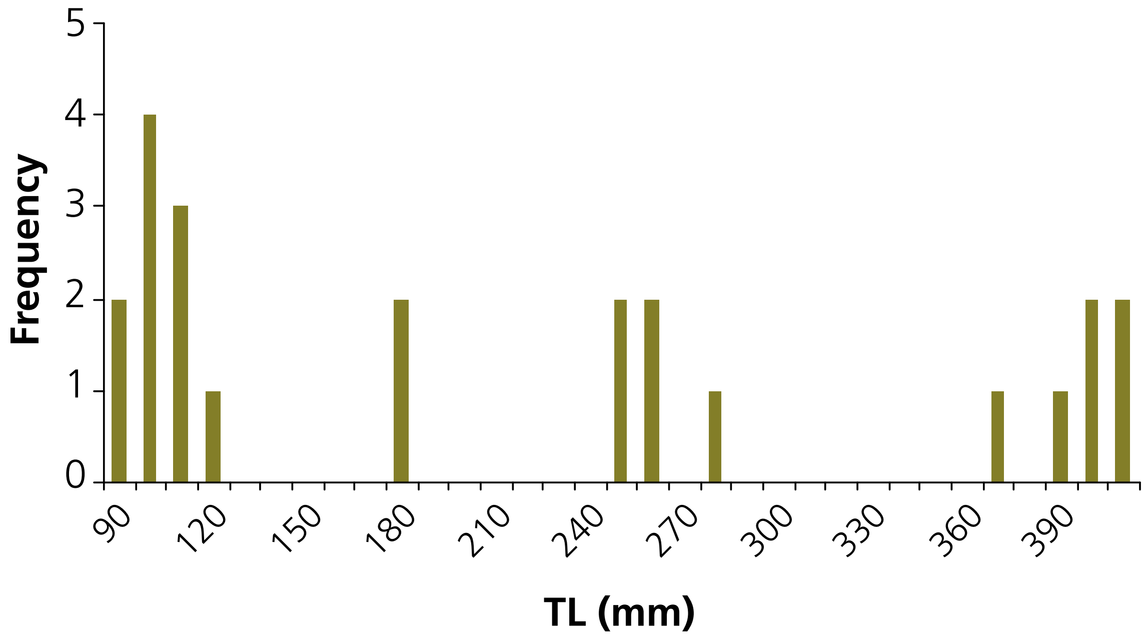


Figure 6. (a) Juvenile Macquarie Perch; (b) adult Macquarie Perch; (c) mature male Macquarie Perch (note milt); (d) mature female Macquarie Perch (note eggs) caught from King Parrot Creek. Photo (d) courtesy of Zeb Tonkin.

(a)

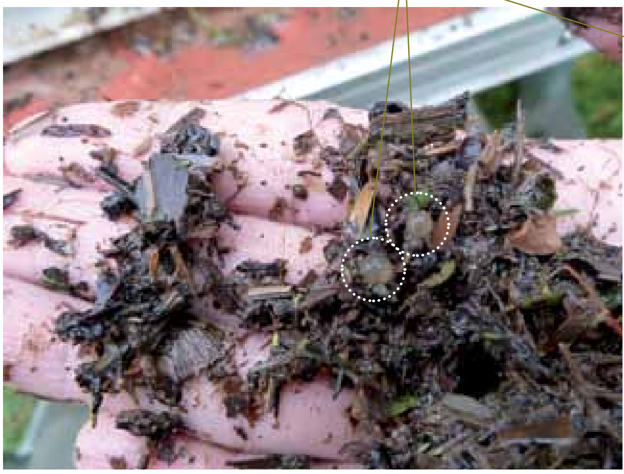
(b)

(c)

(d)

Figure 7. (a) and (b) Macquarie Perch eggs collected from Callandoon (site 05) in King Parrot Creek.

(a)



(b)

Table 3. Summary of Macquarie Perch eggs caught in larval drift nets during the November–December 2010 King Parrot Creek Macquarie Perch survey.

Week	Date	Site	Night 1	Day 1	Night 2	Day 2	Night 3	TOTAL
1	8/11/2010 – 10/11/2010	02	0	0	0	n/a	n/a	
1	8/11/2010 – 10/11/2010	05a	0	0	0	n/a	n/a	
1	8/11/2010 – 10/11/2010	03	0	0	0	n/a	n/a	
1	8/11/2010 – 10/11/2010	01	0	0	0	n/a	n/a	
2	16/11/2010 – 18/11/2010	02	0	0	0	n/a	n/a	
2	16/11/2010 – 18/11/2010	05a	0	0	0	n/a	n/a	
2	16/11/2010 – 18/11/2010	03	0	0	0	n/a	n/a	
2	16/11/2010 – 18/11/2010	01	0	0	0	n/a	n/a	
3	23/11/2010 – 26/11/2010	02	2	0	0	0	3	5
3	23/11/2010 – 26/11/2010	05a	37	11	14	9	89	160
3	23/11/2010 – 26/11/2010	03	0	0	0	0	0	
3	23/11/2010 – 26/11/2010	01	0	0	0	0	0	
4	6/12/2010 – 7/12/2010	02	3	5	n/a	n/a	n/a	8
4	6/12/2010 – 7/12/2010	05a	77	41	n/a	n/a	n/a	118
4	6/12/2010 – 7/12/2010	03	0	n/a	n/a	n/a	n/a	
4	6/12/2010 – 7/12/2010	01	0	n/a	n/a	n/a	n/a	
4	6/12/2010 – 7/12/2010	05b	22	1	n/a	n/a	n/a	23
								314

Figure 8. (a), (b) and (c) Macquarie Perch eggs in the aquarium at ARI; (d) and (e) magnified photos of a well-developed Macquarie Perch egg; (f) Macquarie Perch larvae 10 minutes old.

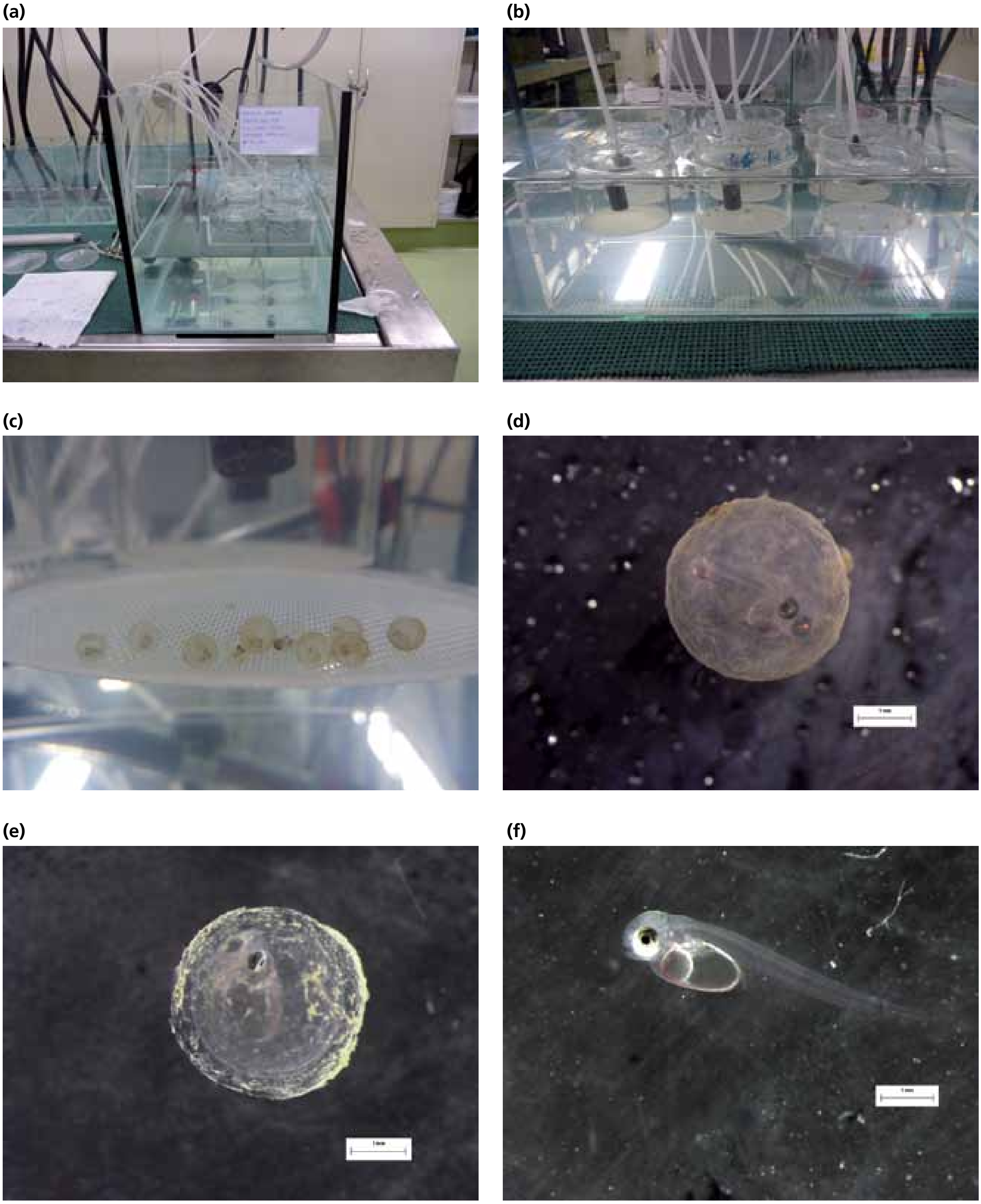
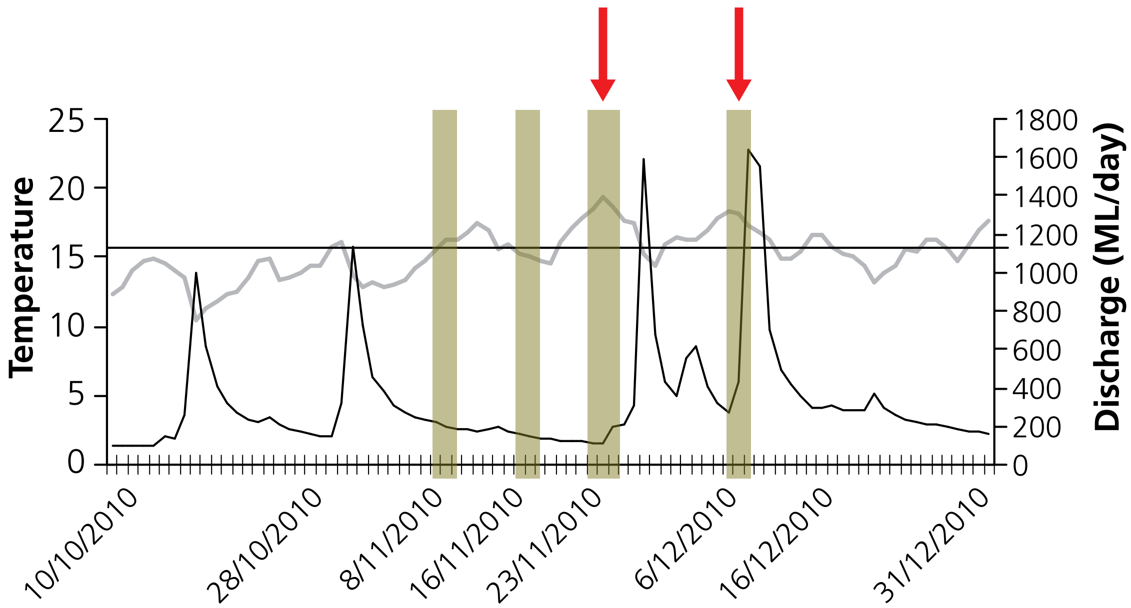


Table 4. Sediment values from each site in King Parrot Creek.

Site	Date	Week	No of replicates	Soak time (hours)	Average weight (g)	Weight (g)/hr
02	16/11/2010	2	3	42.58	8.23	0.19
05a	16/11/2010	2	2	43.08	24.06	0.56
03	16/11/2010	2	3	42.5	6.82	0.01
01	16/11/2010	2	3	42.92	20.02	0.47
02	23/11/2010	3	3	66.83	444.67	6.65
05a	23/11/2010	3	1	68.08	584	8.58
03*	23/11/2010	3	n/a	n/a	n/a	n/a
01*	23/11/2010	3	n/a	n/a	n/a	n/a
02*	6/12/2010	4	n/a	n/a	n/a	n/a
05a*	6/12/2010	4	n/a	n/a	n/a	n/a
03*	6/12/2010	4	n/a	n/a	n/a	n/a
01*	6/12/2010	4	n/a	n/a	n/a	n/a

* Denotes sediment samples that were not recovered as a result of flash flooding.

Figure 9. Daily inflows (dark line) and average daily water temperatures (grey line) in King Parrot Creek at Flowerdale during October–December 2010. Colour bars indicate times of fish sampling.



Note: Black line represents water temperature cue (16 °C) for Macquarie Perch spawning and red arrows indicate when eggs were collected. Discharge data courtesy of Victorian Water Resources Data Warehouse http://www.vicwaterdata.net/vicwaterdata/home.aspx

4 Discussion

This research was novel as it was the first occasion that Macquarie Perch spawning has been investigated in King Parrot Creek. The study sites were chosen in accordance with annual fish monitoring surveys where Macquarie Perch have consistently been recorded and which had suitable spawning habitats. Results from this study show that Macquarie Perch spawning was not evenly distributed and was restricted to two sites, with one of these locations (site 05a and b) accounting for 95% of all eggs collected. Furthermore, the collection of ripe adult male and female fish at this site provides additional evidence of spawning at this location. The small percentage of eggs collected at site 02 indicated that Macquarie Perch were likely to be spawning at a different pool/riffle sequence further upstream from where the larval net was set. During the fourth week of sampling (6/12/2010–8/12/2010), an additional larval net was set 300 m downstream from site 05a and was utilised to determine how far the eggs travel from the upstream spawning area. While eggs were detected in this extra net, the abundance was lower than the primary net at site 05a, which suggests that the spawning aggregation is likely to be within one kilometre.

Fieldwork for this study was initially planned for mid October when water temperatures exceed 16ºC which is the cue for Macquarie Perch to spawn (Cadwallader and Rogan 1977; Tonkin *et al.* 2010a). However, fieldwork was postponed as a result of numerous rainfall events during October and early November, which kept water temperatures in the creek below the 16ºC threshold. These rain events delayed and/or interrupted Macquarie Perch spawning by nearly one month. Delayed spawning was also observed in Macquarie Perch from Lake Dartmouth during surveys conducted in Spring and Summer (Z.Tonkin pers com), as well as in other native species such as Murray Cod (King *et al.* 2011). The detection of eggs during weeks three and four of the study correlates with our water temperature data exceeding 16ºC and supports previous studies suggesting that Macquarie Perch are temperature cued spawners (Tonkin *et al.* 2010a).

During week three (23/11/2010–26/11/2010), Macquarie Perch eggs were detected at site 05a during all day and night sets. However, on night three there was a large rainfall event which substantially increased flows in the creek. It was during this night where over half of the eggs in this study were collected. Over half of these eggs were well developed (could visibly see the eyes inside the eggs). This result indicates that these well developed eggs were not from a recent spawning event but were >10 days old and had become dislodged and washed into the nets during the increase in flows. While fish spawning is promoted by a 'flushing flow' in the period prior to spawning (Young *et al.* 2003), such flows during spawning have potential implications on the survival of these eggs which are highly vulnerable during this early life history stage (Kamler 1992). Of most concern is the displacement of fertilised eggs from gravel substrates into sub-optimal habitat such as pools, where they can potentially become smothered by deposited sediment which blocks or disrupts the oxygen to the developing eggs, resulting in mortality or morphological adaptations (Kemp *et al.* 2011; Koehn *et al.* 1991). There is extensive evidence on the detrimental effects of sedimentation on the eggs of many freshwater fish species, which includes but is not limited to Grayling *Thymallus thymallus* (Sempeski and Gaudin 1995), Brown Trout *Salmo trutta* (Greig *et al.* 2005; Sternecker and Geist 2010), Danube Salmon *Hucho hucho* (Sternecker and Geist 2010) and Redfin Perch *Perca fluviatilis* (Stuart 1953). Furthermore, there is other research which verifies that increased sedimentation can severely affect fish at the early life stages i.e. larvae and juveniles (Alabaster and Lloyd 1980; Campbell and Doeg 1989; Doeg and Koehn 1994).

Despite the detection of spawning, fish surveys conducted during April 2011 failed to detect any young of year Macquarie Perch in King Parrot Creek (see also Kearns *et al.* 2011). This may suggest poor survival of eggs, low retention of larvae/juveniles in the reach, or simply that young of year fish were not detected. Water levels were significantly higher than the previous survey year, which greatly reduced fishing efficiency. As Macquarie Perch tend to inhabit complex and often deep habitats, it is possible that young of year Macquarie Perch have also been occupying these habitats, especially during the summer months, which have been documented to be the wettest on record in Victoria (BOM 2011). Another explanation for young of year not detected in the study region during the April surveys is the possibility that individuals have migrated, as there was a decrease in Macquarie Perch abundance compared to the previous year of sampling. Furthermore, sedimentation, loss of riparian vegetation and bank erosion was evident at all sites, which may have implications on Macquarie Perch recruitment in King Parrot Creek (Kearns *et al.* 2011).

5 Management implications and future directions

- While this study was successful in identifying a key Macquarie Perch spawning area in King Parrot Creek, further studies would be of benefit to determine the spatial and temporal variability of this and other breeding locations within the creek. Acoustic and/or radio telemetry techniques could provide a means for such investigation to track fish movement within the creek and thus potentially identify additional spawning habitats.
- The continuation of annual fish monitoring is also recommended to assess recruitment success in this population in King Parrot Creek and monitor their response to post-fire conditions.
- Sedimentation, loss of riparian vegetation and bank erosion within King Parrot Creek is evident, and has been amplified by record rainfall over the past year. Therefore, recommendations include continued riparian restoration and bank stabilisation, with key Macquarie Perch spawning areas having the highest priority. These works will assist in reducing further sediment, inputs into the creek and thus give support to this species recovery in King Parrot Creek.
- King Parrot Creek is a popular spot for anglers, given it sustains a healthy population of Brown Trout. It is therefore recommended that additional signage is constructed at key access points to raise awareness of Macquarie Perch in King Parrot Creek and ensure the release of individuals if captured.
- The implementation of closed fishing zones during key spawning periods at locations where Macquarie Perch aggregate to breed would assist in species recovery. Whilst Macquarie Perch are protected in this waterbody, the species is highly susceptible to angling which can cause unnecessary stress to these individuals, and potentially have adverse effects on spawning.
- Findings from this study will facilitate the development of strategies with the GBCMA and the Upper Goulburn Landcare Network to undertake suitable protection and enhancement of Macquarie Perch spawning areas in order to ensure future sustainability of this species in the King Parrot Creek system.

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strath creek landcare group

NEWSLETTER

DECEMBER 2010

President: Terry Hubbard (5780 1489) **Vice-president:** David Wakefield (5780 1225)
Secretary: Janet Hubbard (5780 1489)
Treasurer: Jim Osborne (5784 9393)

End-of-year get-together. Our final activity for the year was a most enjoyable evening at Strath Creek Hall on 5th December. Members watched a fascinating DVD on Parrots of Australia, followed by the traditional Landcare buffet meal. It was good to see the new community laptop, projector and speakers in use – let's hope there will be many occasions in the future when they come in handy !
David Wakefield advised the group about a new fire recovery project for the district that he will be coordinating. The 12-month project is run by the Upper Goulburn Landcare Network, and will involve surveying fauna on various properties, with the help of local landowners and volunteers. Once the project is up and running, information sheets will be distributed and field days will be held, so it is hoped that Landcare members will join in. Terry Hubbard outlined other UGLN projects that are being funded under the Recycle for Recovery program, which resulted from the sale of recycled material after Grocon's clean-up of fire-damaged properties.

Rainfall. What an amazing year for rain ! Our total for the year (at Upper King Parrot Creek Road) to the 22nd December stands at 1197mm, easily the highest total in at least the last 30 years, the previous highest being 908mm in 1988. From official records, Yea only exceeded 1000mm once (1011mm in 1973). Flowerdale (measured at "The Willows"), on the other hand, exceeded 1000mm in 1939, 1952, 1955 and 1956. Earlier Flowerdale records show totals above 1000mm for 5 years in a row, between 1909 and 1913 ! Past records for Strath Creek are sparse, but the area would presumably have received considerably less than Flowerdale, however it still must have been a sodden place back in that period – just like now !

Macquarie Perch update. The DSE team from Arthur Rylah Institute have been back surveying in the King Parrot Creek, this time mainly looking for spawning sites that can then be targeted for special protection. Part of the survey involved painstakingly searching for tiny tapioca-like eggs among suspended debris collected from the creek water. Despite difficult conditions with the fast-flowing stream, the survey team (with some local help) managed to find a significant number of eggs in the section of creek through "Callandoon". It's very encouraging to know the Maccas are breeding. Also, one of the tagged fish that was returned to the creek after a spell at Snobs Creek last year was recaptured, so it seems they have survived the translocation.


Searching for eggs

Found one!


Under the microscope – note the eye!


Larvae at last

Tree farming and habitat friendly land management. A workshop organised by the Murrindindi Climate Network is to be held at "Kanumbra", north of Yarck at the end of Hodsons Lane (off Maroondah Hwy) on Saturday 15th January from 5 pm to 8 pm. Finger food and drinks provided. RSVP for catering purposes by January 11 to Rita on 5774 7617 or email: rita.seethaler@tuti.com.au

www.dse.vic.gov.au