

# Monitoring Macquarie perch (*Macquaria australasica*) in Hughes Creek



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**Front cover photo:** Hughes Creek within the gorge (Renae Ayres).

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# Monitoring Macquarie perch (*Macquaria australasica*) in Hughes Creek

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June 2013

In partnership with:



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# Summary

The Macquarie perch (*Macquaria australasica*) is a nationally endangered native fish species. Substantial declines in this species' abundance and distribution has been reported over the past 50 years. Less than 10 populations remain throughout Victoria, with a large proportion located within the Goulburn Broken Catchment. One such population exists within Hughes Creek in Northern Victoria which has endured much adversity in recent years, primarily after periods of low flow caused by severe drought. As a result, 32 Macquarie perch individuals were temporarily translocated to aquaculture facilities at Snobs Creek (Department of Primary Industries) during March 2009 and held there for nine months before being re-released into Hughes Creek once water quality had improved. More recently, flood conditions have facilitated large deposits of sediment (sand) within Hughes Creek. These depositions have buried entire reaches, resulting in sand slugs that substitute diverse river habitats with wide and shallow flowing sand beds. Sand slugs pose a significant threat to the survival of Macquarie perch as they reduce habitat available for their breeding, feeding, shelter and survival. Macquarie perch lay their eggs on rock and gravel substrates. Sand deposits can smother eggs which can reduce successful breeding and recruitment and potentially longer term population abundances and occurrence.

Monitoring surveys of Macquarie perch have been conducted in Hughes Creek since 2006, where individuals have been tagged since 2009 to investigate population size and movement. The importance of long-term monitoring is well established and is considered essential in detecting population trends and responses to both natural and anthropogenic influences. These surveys facilitate the delivery of scientifically sound projects and management recommendations in accordance with conservation objectives in the action statements for this threatened species.

The aim of this study was to assess the current status of Macquarie perch within Hughes Creek and evaluate potential changes on a temporal scale. Fish surveys were conducted in Hughes Creek during Autumn 2013 using a combination of sampling techniques including backpack electrofishing and fyke netting.

The major findings from this investigation include:

- Increased abundance of Macquarie perch in Hughes Creek compared with 2012.
- A large proportion of Macquarie perch individuals were collected within the gorge, suggesting that this stretch of the creek remains the stronghold of this population.
- Increased abundance of river blackfish in Hughes Creek compared with 2012.
- Increased abundance and distribution of carp compared with 2012.

Recommendations include:

- Continue annual fish surveys in Hughes Creek to monitor this Macquarie perch population.
- Erect signage at key access points to promote awareness of Macquarie perch within this system.
- Undertake carp reduction in Hughes Creek at targeted periods (i.e. prior to spawning in Spring and times of low flow, where carp have a restricted range), to reduce the threat posed on this Macquarie perch population.
- Continue efforts by the GBCMA and local landcare to improve the riparian landscape in an effort to reduce the quantity and severity of sand slugs and consider instream habitat restoration – i.e. resnagging to create scour pools in areas impacted by sand.
- Investigate the prospect for sand extraction in Hughes Creek above the gorge.
- Investigate potential movement of Macquarie perch between Hughes Creek and the Goulburn River using acoustic or radio telemetry techniques.

## Site selection and methods

Nine sites from a long-term monitoring program were sampled in the current study (Table 1 and Figures 1-3). Backpack electrofishing was conducted at all sites using a Smith Root® model LR20B backpack (250 volts and 90 Hertz) following the Sustainable Rivers Audit (SRA) standardized protocol which consisted of eight replicates of 150 electrofishing seconds, with the exception of site G18 which consisted of a total of 4630 electrofishing seconds (MDBC 2007). A higher fishing effort was applied to site G18 given that this site is considerably larger than all other sites in the study. Fish were attracted to the electrode, immobilised and then caught using a dip net. Four single wing fyke nets (5 mm mesh) were also set overnight at site G24 with an approximate soak time of 13 hours. Floats were used at the cod end of each net to ensure that any mammals captured would be safely held until release. Fyke nets were not able to be set at site G23 as the water was not deep enough. All Macquarie perch collected were scanned for the presence of an internal passive integrated transponder (PIT) tag. An external t-bar tag (inserted into the white muscle near the dorsal fin) and internal PIT tag (implanted into the stomach cavity of individuals) was given to Macquarie perch individuals greater than 200 mm total length and a small sample of fin tissue was collected for genetic investigations. All fish were released at the site of capture after being measured for total length (TL) (mm) and weight (g).

**Table 1. Hughes Creek site summary information.**

| Site | Location   | Latitude<br>(°S) | Longitude<br>(°E) | Date<br>sampled |
|------|--|------------------|-------------------|-----------------|
| G15  | Fishway - 6.5 km upstream of Hume Highway off Tarcombe Rd.       | -36.95200        | 145.281330        | 21/03/2013      |
| G16  | Scout hut and camp area off Tarcombe Rd.                         | -36.94715        | 145.267810        | 20/03/2013      |
| G17  | Hume Highway bridge, Avenel off Ash Rd.                          | -36.90794        | 145.234360        | 18/03/2013      |
| G18  | Gorge area. Access through Booroola Property off Tarcombe Rd.    | -36.98986        | 145.287960        | 19/03/2013      |
| G19  | Farmland immediately upstream of gorge, off Hughes Creek Rd.     | -37.00151        | 145.331560        | 26/03/2013      |
| G20  | Rock shoot off Wicket Hill Road.                                 | -36.98404        | 145.353590        | 21/03/2013      |
| G21  | Bungle Boori Crossing where Hughes Creek Road crosses the creek. | -36.99211        | 145.357860        | 26/03/2013      |
| G23  | Private property - access through Booroola off Tarcombe Rd.      | -36.97596        | 145.285110        | 20/03/2013      |
| G24  | Private property - access through Booroola off Tarcombe Rd.      | -36.95128        | 145.292590        | 20/03/2013      |
|      |  |                  |                   | 21/03/2013      |



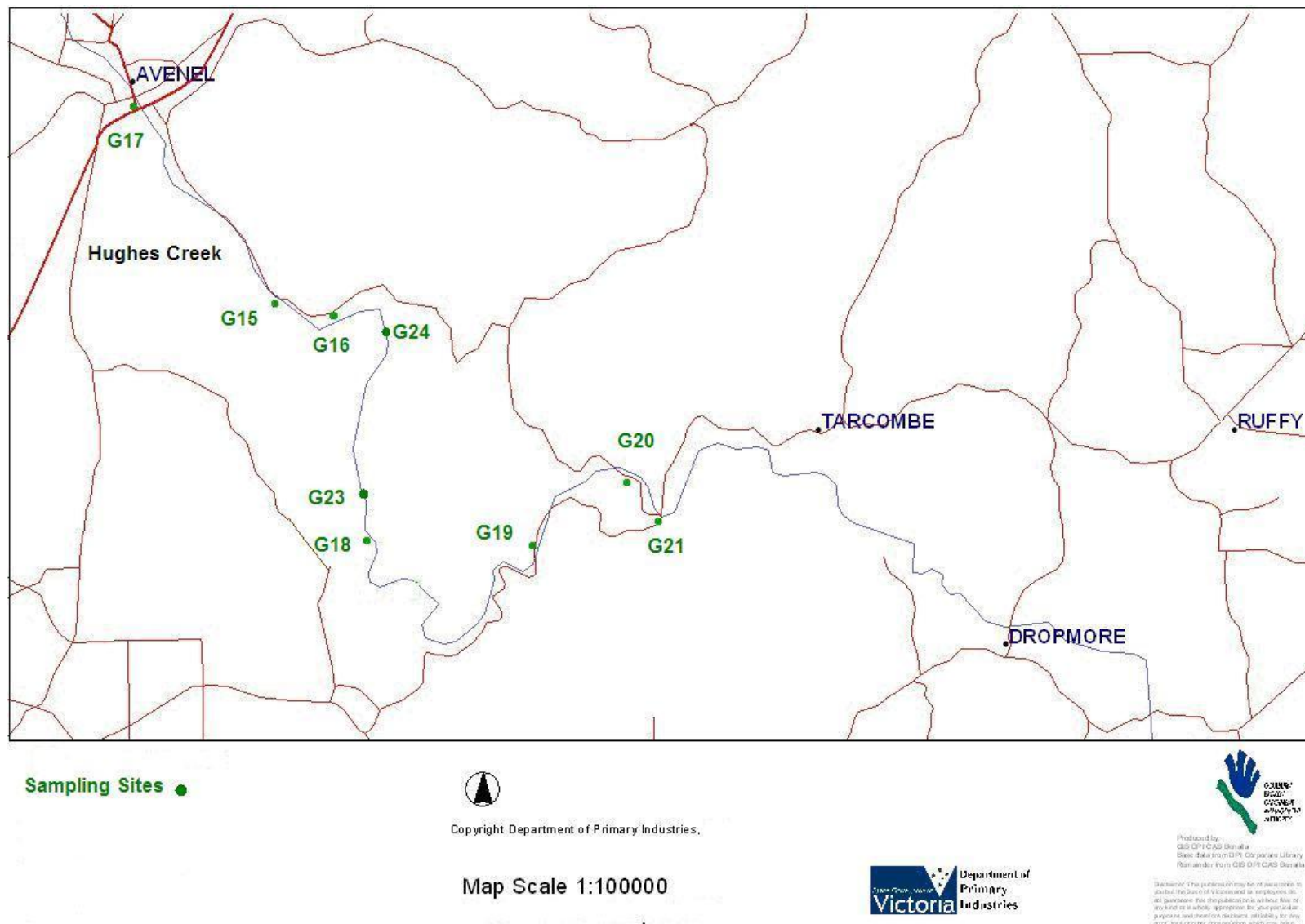


Figure 1. Map of survey sites in Hughes Creek.

**(a)**



**(b)**



**(c)**



**(d)**



**(e)**



**(f)**



**Figure 2. Hughes Creek survey site photos (a) G15, (b) G16, (c) G17, (d) G18, (e) G19 and (f) G20.**



**(a)**



**(b)**



**(c)**



**Figure 3. Hughes Creek survey site photos (a) G21, (b) G23 and (c) G24.**

## Survey results

A total of 316 fish, comprising eight native and four introduced species, were collected from Hughes Creek, with native fish accounting for 47.5 % of the total catch (Table 2). The most abundant native species captured was river blackfish ( $n = 50$ ) and the most abundant exotic species was carp ( $n = 94$ ). A total of 26 Macquarie perch individuals were collected from four sites, where this species abundance has increased by 65 % compared to surveys conducted in 2012 (Table 3). A large proportion of these individuals (46 %) were from one size cohort (370 - 390 mm TL) (Figure 4). Two young of year Macquarie perch were collected from sites G18 and G23. The majority of Macquarie perch individuals were collected within Site 18 (the gorge) where 10 individuals were caught within a single pool measuring 5 x 5 m and one metre deep (Figure 5). During the current survey, we did not collect any Macquarie perch which had been PIT or t-bar tagged from previous surveys.

There was a slight increase in river blackfish abundance compared to 2012, however, this abundance is still significantly lower than in surveys conducted between 2006 and 2009 where fewer sites were surveyed (Appendix 1). There continues to be considerable changes in substrate composition at numerous study sites as a result of sand slugs, with site G23 showing the most temporal change (Figure 6). The abundance and distribution of carp has also increased during the past year: the number of carp increased three fold compared to 2012 (Table 4) and they were recorded in upstream sites G20 and G21 for the first time since surveys commenced in 2006. Carp abundance has been shown to be quite variable between survey years (Table 4), and should be taken into consideration when looking at long-term trends in abundance for this species.

**Table 2. Catch summaries for Hughes Creek during March 2013.**

|                               |                      | Site      |           |           |            |           |           |           |           |           | TOTAL      |
|-------------------------------|----------------------|-----------|-----------|-----------|------------|-----------|-----------|-----------|-----------|-----------|------------|
| Species name                  | Common name          | G15       | G16       | G17       | G18        | G19       | G20       | G21       | G23       | G24       |            |
| <i>Macquaria australasica</i> | Macquarie perch      |           |           |           | 21         | 1         |           |           | 2         | 2         | <b>26</b>  |
| <i>Macquaria ambigua</i>      | Golden perch         |           |           |           |            |           |           |           |           | 4         | <b>4</b>   |
| <i>Gadopsis marmoratus</i>    | River blackfish      |           |           |           | 38         |           |           | 6         | 2         | 4         | <b>50</b>  |
| <i>Philypnodon grandiceps</i> | Flatheaded gudgeon   | 1         | 1         | 1         | 4          | 1         | 18        |           | 1         |           | <b>27</b>  |
| <i>Galaxias olidus</i>        | Mountain galaxias    | 2         | 1         | 19        | 5          |           | 2         |           | 3         | 3         | <b>35</b>  |
| <i>Galaxias species 1</i>     | Obscure galaxias     |           |           |           |            |           |           | 3         |           |           | <b>3</b>   |
| <i>Retropinna semoni</i>      | Australian smelt     |           | 3         |           |            |           |           |           |           |           | <b>3</b>   |
| <i>Nannoperca australis</i>   | Southern pygmy perch |           |           |           |            |           |           | 2         |           |           | <b>2</b>   |
| <i>Perca fluviatilis</i> *    | Redfin perch         |           | 2         |           | 6          | 2         |           |           | 1         | 2         | <b>13</b>  |
| <i>Cyprinus carpio</i> *      | Carp                 | 3         | 5         |           | 30         | 8         | 10        | 16        | 4         | 18        | <b>94</b>  |
| <i>Gambusia holbrooki</i> *   | Mosquitofish         | 2         | 15        | 30        | 1          | 2         | 1         |           |           | 6         | <b>57</b>  |
| <i>Tinca tinca</i> *          | Tench                |           |           |           | 1          |           |           |           | 1         |           | <b>2</b>   |
| <i>Cherax destructor</i>      | Yabby                | 3         | 7         | 33        | 10         | 7         | 14        | 19        | 16        | 8         | <b>117</b> |
| <b>TOTAL</b>                  |                      | <b>11</b> | <b>34</b> | <b>83</b> | <b>116</b> | <b>21</b> | <b>45</b> | <b>46</b> | <b>30</b> | <b>47</b> | <b>433</b> |

\* Exotic

**Table 3. Catch summaries for Macquarie perch in Hughes Creek between 2006 and 2013. Note: cells in red represent sites which were not surveyed.**

|              | Site     |          |          |            |           |          |          |           |           |            |
|--------------|----------|----------|----------|------------|-----------|----------|----------|-----------|-----------|------------|
| Year         | G15      | G16      | G17      | G18        | G19       | G20      | G21      | G23       | G24       | TOTAL      |
| 2006         | 3        | 0        |          | 9          | 11        |          | 0        |           |           | 23*        |
| 2007         | 5        | 1        | 0        | 57         | 0         | 0        | 0        |           |           | 63         |
| 2008         |          |          |          |            |           |          |          |           |           | 0          |
| 2009         | 0        | 0        | 0        | 17         | 0         | 0        | 0        | 25        | 11        | 53         |
| 2010         |          |          |          |            |           |          |          |           |           | 0          |
| 2011         | 0        | 0        | 0        | 9          | 0         |          |          | 6         | 0         | 15         |
| 2012         | 0        | 0        | 0        | 5          | 1         | 0        | 0        | 3         | 0         | 9          |
| 2013         | 0        | 0        | 0        | 21         | 1         | 0        | 0        | 2         | 2         | 26         |
| <b>TOTAL</b> | <b>8</b> | <b>1</b> | <b>0</b> | <b>118</b> | <b>13</b> | <b>0</b> | <b>0</b> | <b>36</b> | <b>13</b> | <b>189</b> |

\* An additional site was surveyed in 2006 located between sites G15 and G16 where four Macquarie perch were captured, bringing the total to 27 individuals.

**Table 5. Catch summaries for Carp in Hughes Creek between 2006 and 2013. Note: cells in red represent sites which were not surveyed.**

|              | Site      |            |           |            |           |           |           |           |           |            |
|--------------|-----------|------------|-----------|------------|-----------|-----------|-----------|-----------|-----------|------------|
| Year         | G15       | G16        | G17       | G18        | G19       | G20       | G21       | G23       | G24       | TOTAL      |
| 2006         | 10        | 7          |           | 0          | 0         |           | 0         |           |           | 17*        |
| 2007         | 37        | 95         | 0         | 81         | 0         | 0         | 0         |           |           | 213        |
| 2008         |           |            |           |            |           |           |           |           |           |            |
| 2009         | 6         | 5          | 0         | 3          | 0         | 0         | 0         | 0         | 28        | 42         |
| 2010         |           |            |           |            |           |           |           |           |           |            |
| 2011         | 5         | 4          | 55        | 15         | 5         |           |           | 7         | 6         | 97         |
| 2012         | 2         | 0          | 3         | 17         | 0         | 0         | 0         | 7         | 7         | 36         |
| 2013         | 3         | 5          |           | 30         | 8         | 10        | 16        | 4         | 18        | 94         |
| <b>TOTAL</b> | <b>63</b> | <b>116</b> | <b>58</b> | <b>146</b> | <b>13</b> | <b>10</b> | <b>16</b> | <b>18</b> | <b>59</b> | <b>499</b> |

\* An additional site was surveyed in 2006 located between sites G15 and G16 where one carp was captured, bringing the total to 18 individuals.



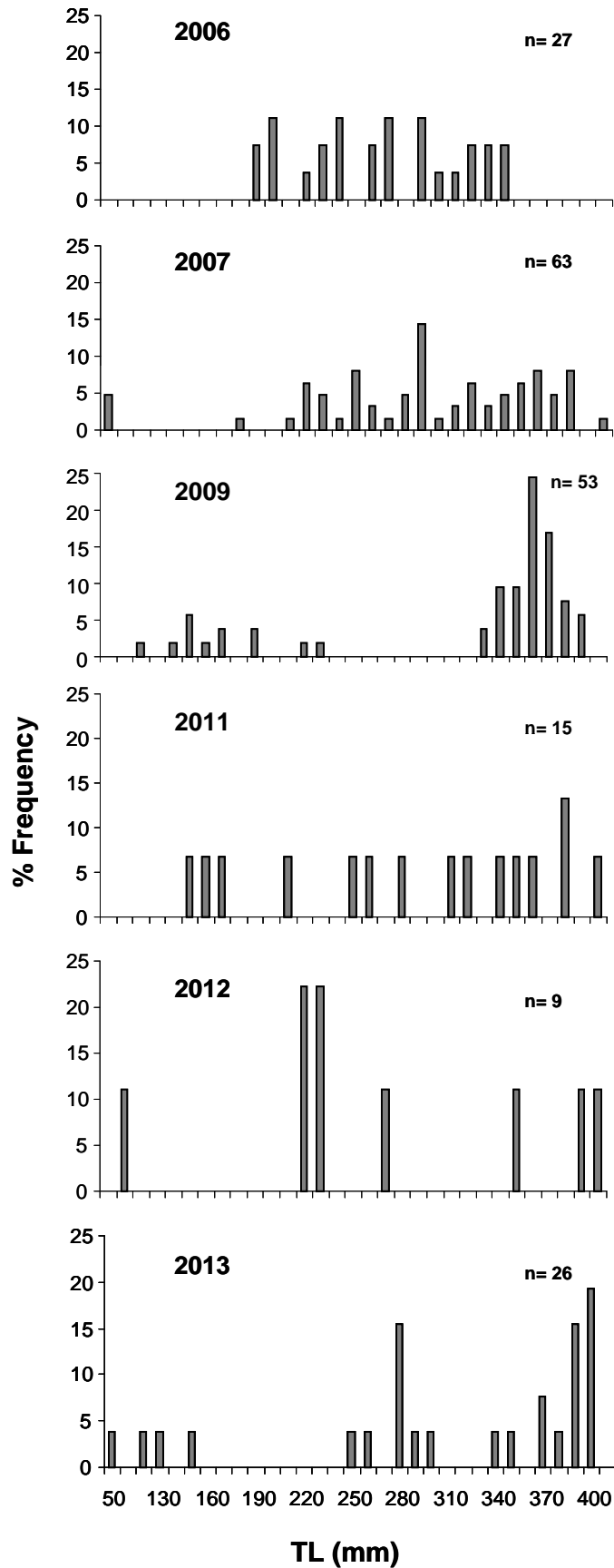


Figure 4. Total length (TL) frequency of Macquarie perch captured in Hughes Creek between 2006 and 2013.

(a)



(b)



(c)



(d)



**Figure 5. (a) Macquarie perch collected from site G24, (b) Macquarie perch from the gorge (site G18) (c) Assessing a Macquarie perch individual for the presence of a PIT tag and (d) the location within the gorge where 10 Macquarie perch individuals were collected.**

**(a)**



**(b)**



**(c)**



**Figure 6. Temporal changes in Hughes Creek at Site G23 in (a) July 2009, (b) March 2012 and (c) March 2013. Note: Flows were lower during 2009 compared with both 2012 and 2013.**



## Discussion

This survey confirmed the persistence of Macquarie perch in Hughes Creek. The majority of these were located within the gorge suggesting that this stretch of the creek remains the stronghold of this population. However, it must be noted that a higher fishing effort was applied to this site which could explain why more individuals were collected from this site. We observed a higher abundance of Macquarie perch in Hughes Creek compared with 2012 surveys which could be the result of reduced flows that has constricted Macquarie perch individuals to refuge pools within survey reaches, increasing fishing efficiency. Macquarie perch individuals collected within the gorge were in relatively good condition given the high densities at which they were found at some locations. However, some individuals collected at sites downstream from the gorge exhibited signs of stress (pale body colour, presence of the external parasite *Lernaea spp.*). This could be facilitated by a reduction in habitat (including refuge area) availability from increased sand deposits.

One size class of Macquarie perch dominated the catch during the current survey (370-390 mm TL). While young of year were observed at two sites, Macquarie perch recruitment appears limited within Hughes Creek with only three young of year individuals collected over the past three years. Sand slugs within Hughes Creek are not a recent occurrence and have been documented as early as 1916 (Davis and Finlayson 2000). However, it is these sand slugs coupled with other threats such as competition with exotic species (i.e. carp and redfin) for habitat, reduced flows and habitat modification, which continues to place immense pressure on this Macquarie perch population. Sand deposits are most likely the cause of limited recruitment of Macquarie perch in Hughes Creek as increased sediment (or sand) loads during spawning times can smother eggs and thus significantly reduce their survival (Koehn *et al.* 1991). A reduction in connectivity could also be impacting on spawning with shallow (<15 cm deep) areas between key refuge pools resulting from sand deposits. Over the past year, a reduction in the quantity of exposed granite boulders within the creek bed (now obscured by sand) was observed, particularly within the gorge and site G23.

During this survey, no tagged individuals were collected which was unexpected given tagging of Macquarie perch had been performed since 2009. It is unknown whether previously tagged individuals have migrated outside the study area or have died. Further studies using radiotelemetry or acoustic techniques could provide an insight into movement patterns and population connectivity.

In excess of 96 % of the Hughes Creek catchment is privately owned and of this, over 83 % has been cleared to the point where it is now a highly fragmented landscape (DSE 2008). For meaningful improvements in the population status of Macquarie perch within this catchment, resources need to be allocated to protect the upstream riparian zone. A feasibility study for sand extraction in Hughes Creek above the gorge could also be conducted in an attempt to reduce the quantity of sand moving through the system during flow events. A longer term goal for the recovery of the species in the Goulburn Broken Catchment area (and indeed, across the natural range of the species), is to consolidate recovery efforts to focus on major streams (in this case the Goulburn River) while utilising smaller 'satellite' populations such as Hughes and King Parrot Creeks, to spread extinction risk. Thus although focus could be on improving condition of Hughes Creek upstream of the confluence with the Goulburn River to mitigate sand slugs on the entire Hughes Creek system, improving stream condition upstream of the gorge remains a priority.

# Recommendations

Recommendations include:

- Continue annual fish surveys in Hughes Creek to monitor this Macquarie perch population.
- Erect signage at key access points to promote awareness of Macquarie perch within this system.
- Conduct carp reduction in Hughes Creek at targeted periods (i.e. prior to spawning in Spring and times of low flow, where carp have a restricted range), to reduce the threat posed on this Macquarie perch population.
- Continue efforts by the GBCMA and local landcare to improve the riparian landscape in an effort to reduce the quantity and severity of sand slugs and consider instream habitat restoration – i.e. resnagging, to create scour pools in areas impacted by sand.
- Investigate the prospect for sand extraction in Hughes Creek above the gorge.
- Investigate potential movement of Macquarie perch between Hughes Creek and the Goulburn River using acoustic or radio telemetry techniques.

## References

Davis, J. and Finlayson, B. (2000). Sand slugs and stream degradation: The case of the Granite Creeks, North-east Victoria. Cooperative Research Centre for Freshwater Ecology Technical Report 7/2000.

DSE (2008). Conservation plan for the Hughes Creek landscape zone: Biodiversity action planning in the upper Goulburn Broken Catchment. Department of Sustainability and Environment, Benalla.

Koehn, J., O'Connor, B. and O'Mahony, D. (1991). The effects of sediment on fish. Proceedings of the 1991 annual conference of the Australian Society for Limnology. Held at Lome, Victoria. (Abstract).

MDBC (2007). Sustainable Rivers Audit Protocols: Approved Manual for Implementation Period 4: 2007-2008. Murray-Darling Basin Commission, Canberra.



# Appendix 1

Catch summaries for Hughes Creek between 2006 and 2013.

|                                 | Sampling year (number of sites sampled) |            |             |            |            |            |
|---------------------------------|---|------------|-------------|------------|------------|------------|
| Common name                     | 2006 (6)                                | 2007 (7)   | 2009 (9)    | 2011 (7)   | 2012 (9)   | 2013 (9)   |
| Macquarie perch                 | 27                                      | 63         | 53          | 15         | 9          | 26         |
| Golden perch                    |   |            |             | 6          | 9          | 4          |
| Murray cod                      |   |            |             | 2          |            |            |
| Freshwater catfish              |   |            |             | 1          |            |            |
| River blackfish                 | 153                                     | 147        | 202         | 70         | 36         | 50         |
| Flatheaded gudgeon              | 10                                      | 3          | 17          | 20         | 30         | 27         |
| Mountain Galaxias               |   | 24         | 129         | 6          | 4          | 35         |
| Obscure galaxias                |   |            |             |            | 3          | 3          |
| Australian smelt                |   |            |             | 1          | 5          | 3          |
| Southern pygmy perch            | 1                                       | 3          | 7           |            | 1          | 2          |
| Redfin perch*                   | 53                                      | 3          | 4           | 50         | 17         | 13         |
| Carp*                           | 18                                      | 213        | 42          | 97         | 36         | 94         |
| Mosquitofish*                   |   | 31         | 730         | 15         | 32         | 57         |
| Tench*                          | 5                                       | 42         | 1           | 1          | 5          | 2          |
| Goldfish*                       |   | 1          |             | 6          |            |            |
| Brown trout*                    | 2                                       | 1          |             |            |            |            |
| <b>Total number of fish</b>     | <b>272</b>                              | <b>531</b> | <b>1185</b> | <b>290</b> | <b>182</b> | <b>316</b> |
| <b>Native species diversity</b> | 4                                       | 5          | 5           | 8          | 8          | 8          |
| <b>Exotic species diversity</b> | 4                                       | 6          | 4           | 5          | 4          | 4          |

\* Exotic

