

Surveys, monitoring and conservation status of Southern Pygmy Perch (*Nannoperca australis*) within Blakney and Pudman Creeks



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Introduction

Southern Pygmy Perch, *Nannoperca australis*, is a small freshwater fish in the family Percichthyidae, with a maximum size 85 mm, but is rarely more than 65 mm in length. They are native to the Lachlan, Murrumbidgee and Murray catchments in NSW, all Victorian tributaries of the Murray River and lower Murray River in South Australia. They are also present in coastal catchments between the Murray River in South Australia and the Genoa catchment in Victoria/NSW, in Northern Tasmania and on King and Flinders Islands. (Allen *et al.*, 2002; Kuitert *et al.*, 1996; Lintermans, 2007).

Recent genetic studies by Unmack *et al.* (2011) have shown that there are two species of Southern Pygmy Perch: an eastern coastal species (nom. *Nannoperca flindersi*) and another in the Murray Darling Basin and western coastal streams, with the Murray Darling Basin form likely representing a separate sub species.

Southern Pygmy Perch have undergone significant declines across the Murray-Darling Basin (Lintermans, 2007), with the most significant decline within the NSW portion. Since 2000 only five isolated remnant populations have been identified within NSW; Normans Lagoon at Albury, the Millewa Forest near Mathoura, Coppabella Creek at Jingellic, Upper Billabong Creek catchment near Holbrook and Blakney Creek near Yass (Gilligan *et al.*, 2010).

Recent extensive surveys of the Normans Lagoon and Millewa Forest sites specifically targeting Southern Pygmy Perch failed to detect any (Sharpe & Wilson, 2012; Sharpe *et al.*, 2012) and so it appears as though these populations are now extinct. This leaves only three remaining known remnant populations within the NSW portion of the Murray-Darling Basin; Coppabella Creek, Blakney Creek and Upper Billabong Creek.

Between 2009 and 2013 Fisheries NSW undertook an opportunistic captive breeding and re-introduction program with Southern Pygmy Perch, from both Coppabella and Blakney Creeks. The fish used for these breeding programs were fish that were rescued from drought affected drying pools in Coppabella Creek or as a response to an invasion of Redfin Perch (*Perca fluviatilis*) in Blakney Creek. Fish were bred at both the Narrandera Fisheries Research Centre and a private facility in Tumut and stocked into several locations as itemised in Table 1.

Table 1. Summary of fish rescues and stocking activities for Southern Pygmy Perch within NSW.

Location	Year	Action	Number of fish rescued or released	Partner organisations
Coppabella Creek	2007	Drought rescue	122	
Coppabella Creek	2008	Fish release	69	Murray Catchment Management Authority (CMA)
Coppabella Creek	2009	Drought rescue	2000	
Blakney Creek	2006	Redfin incursion rescue	50	
Pudman Creek	2007	Fish release	379	Lachlan Catchment Management Authority (CMA), Greening Australia
Blakney Creek	2007	Redfin incursion rescue	50	
Pudman Creek	2008	Fish release	6	Lachlan CMA, Greening Australia
Blakney Creek	2009	Redfin incursion rescue	63	
Pudman Creek	2009	Fish release	37	Lachlan CMA, Greening Australia
Pudman Creek	2010	Fish release	106	Lachlan CMA, Greening Australia
Thegoa Lagoon	2011	Fish release	4500	
Washpen Creek	2011	Fish release	4500	
David Mitchell Wetlands Albury	2011	Fish release	2500	Charles Sturt University
Deniliquin wetlands	2012	Fish release	200	Murray (CMA)/ Local Land Services(LLS), Deniliquin Shire Council.

The Blakney Creek population of Southern Pygmy Perch was discovered in 2002. This was the first time the species had been recorded within the Lachlan Catchment. Since then, several surveys have been conducted within Blakney Creek and more broadly to determine the distribution and abundance of Southern Pygmy Perch within the Upper Lachlan Catchment. However subsequent surveys have failed to detect Southern Pygmy Perch outside Blakney Creek and its tributaries.

The results of this report show a marked decline in both the abundance and distribution of this population over the survey period. Distribution has declined from 25.37km of the creek being inhabited by Southern Pygmy Perch in 2007 to 15.73km in 2009 and 12.83km in 2013.

The introduced species Redfin Perch (*Perca fluviatilis*) was discovered within Blakney Creek for the first time in 2005 (Gilligan *et al.*, 2010). Given the known impacts that Redfin Perch have on native fish species (Woodward & Malone, 2002), this discovery created heightened concern within Fisheries NSW for the survival of the resident population of Southern Pygmy Perch.

In an attempt to establish an “insurance population”, 50 Southern Pygmy Perch were captured from Blakney Creek during 2006 and 50 during 2007. These fish were transferred to an earthen pond at the Narrandera Fisheries Centre. In addition to this in 2009 63 Southern Pygmy Perch captured from Blakney Creek were transferred to a holding facility at Tumut. While these fish were being held they bred within the holding ponds, with the progeny being released into Pudman Creek. A total of 529 Southern Pygmy Perch have been released into Pudman creek; 379 in 2007, 6 in 2008, 38 in 2009 and 106 in 2010. Pudman Creek was chosen as a stocking location for the following reasons;

- Good habitat (excellent aquatic vegetation)
- Reliable water source
- No introduced fish species present
- Close proximity to source population and the same catchment
- Active local Landcare group engaged

The aim of the stocking of Pudman Creek was to establish an additional viable population of Southern Pygmy Perch, to extend their range and facilitate the expansion of the species into the Boorowa River.

Prior sampling at Blakney Creek was conducted in 2003, 2005, 2006 and 2009 on multiple dates. The most comprehensive fish survey of 26 sites was undertaken in 2009. This survey gave a good baseline of the distribution and abundance of fish species within Blakney Creek at that time.

Following the breaking of the drought in 2010 and subsequent wet years, there was consistent anecdotal evidence from local landholders along with results from some opportunistic surveys which indicated that the distribution and abundance of Redfin Perch had increased. As a result, it was determined that a more detailed survey was required to quantify the spread of Redfin Perch and determine its impacts on the distribution and abundance of Southern Pygmy Perch within the Blakney Creek system.

Fisheries NSW with funding from the Lachlan Catchment Management Authority and Greening Australia carried out a fish sampling program within the Pudman and Blakney Creeks during May 2013. The objectives of this work were to:

- Determine the distribution and abundance of Southern Pygmy Perch within Blakney and Pudman Creeks
- Determine the distribution and abundance of Redfin Perch within Blakney Creek
- Compare the abundance and distribution of Southern Pygmy Perch and Redfin Perch between 2006-2009 and 2013.
- Report on the success of the reintroductions and make recommendations for future directions for monitoring, reintroduction/translocation and habitat protection programs.

Study Sites

Blakney Creek

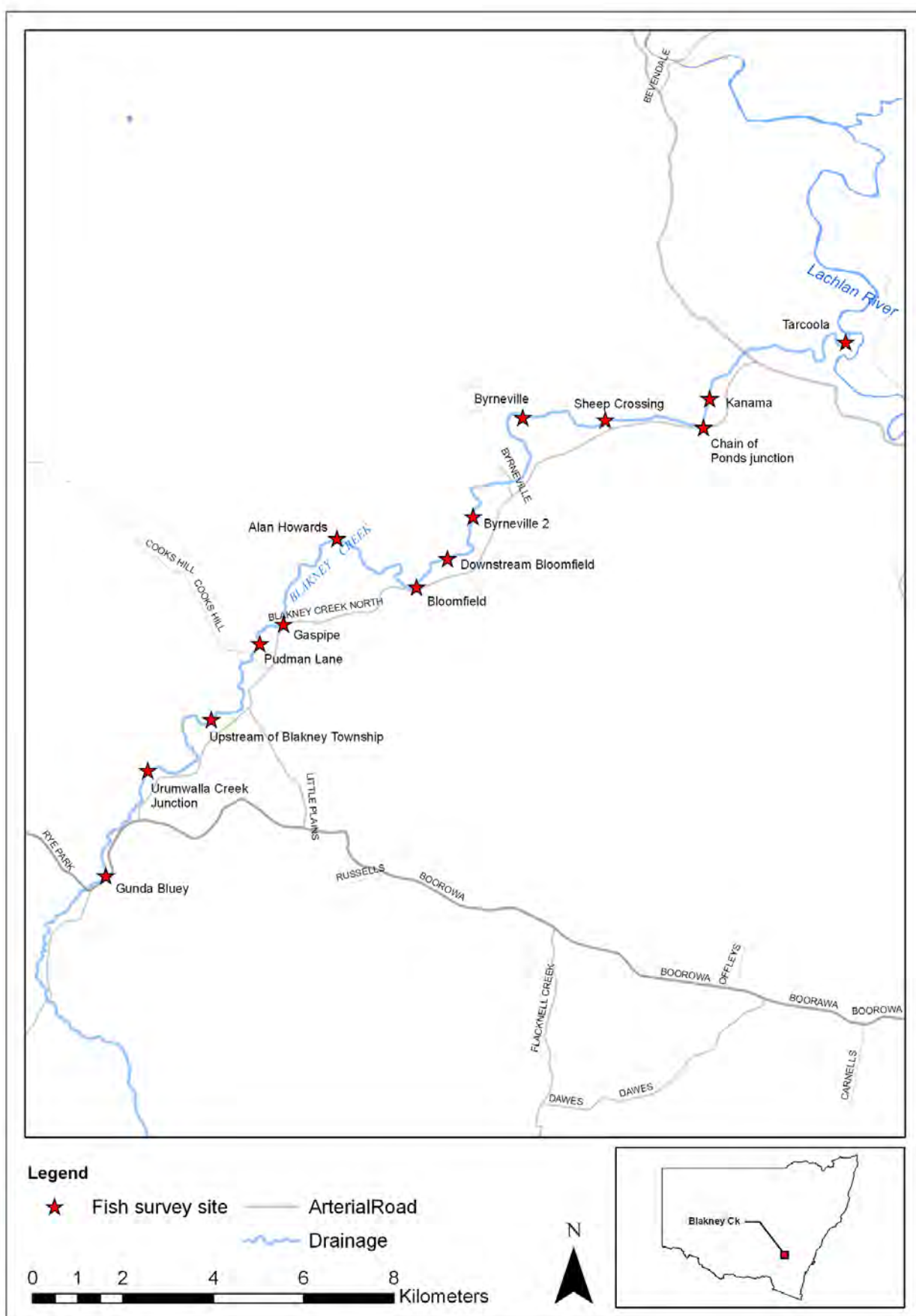
Blakney Creek is a small tributary of the Upper Lachlan River north east of the township of Yass. It is approximately 35 km in length and flows in a north easterly direction before flowing into the Lachlan River upstream of Wyangala Dam. It drains mostly cleared mixed farming land, consisting of grazing and dry-land cropping. The landscape is highly modified with little remaining native vegetation, particularly riparian vegetation. There is however high quality, abundant and diverse submerged and emergent macrophytes along most of the creek.

Fourteen sites were sampled along the length of the Blakney Creek in 2013 (Figure 2). Sites were chosen based on locations where Southern Pygmy Perch and Redfin Perch have been previously sampled as well as achieving a broad and even distribution along the length of the creek.

Figure 1 Southern Pygmy Perch habitat Blakney Creek



Figure 2 Location of survey sites along Blakney Creek.



Pudman Creek

Pudman Creek is a small tributary (approximately 35km length) of the Boorowa River which then flows into the Lachlan River downstream of Wyangala Dam. Pudman Creek flows in a north westerly direction south east of the township of Boorowa. It drains mostly cleared mixed farm land, consisting of grazing and dry-land cropping. Seven sites were established along the creek (Figure 3).

Figure 3 Survey sites and stocking locations within Pudman

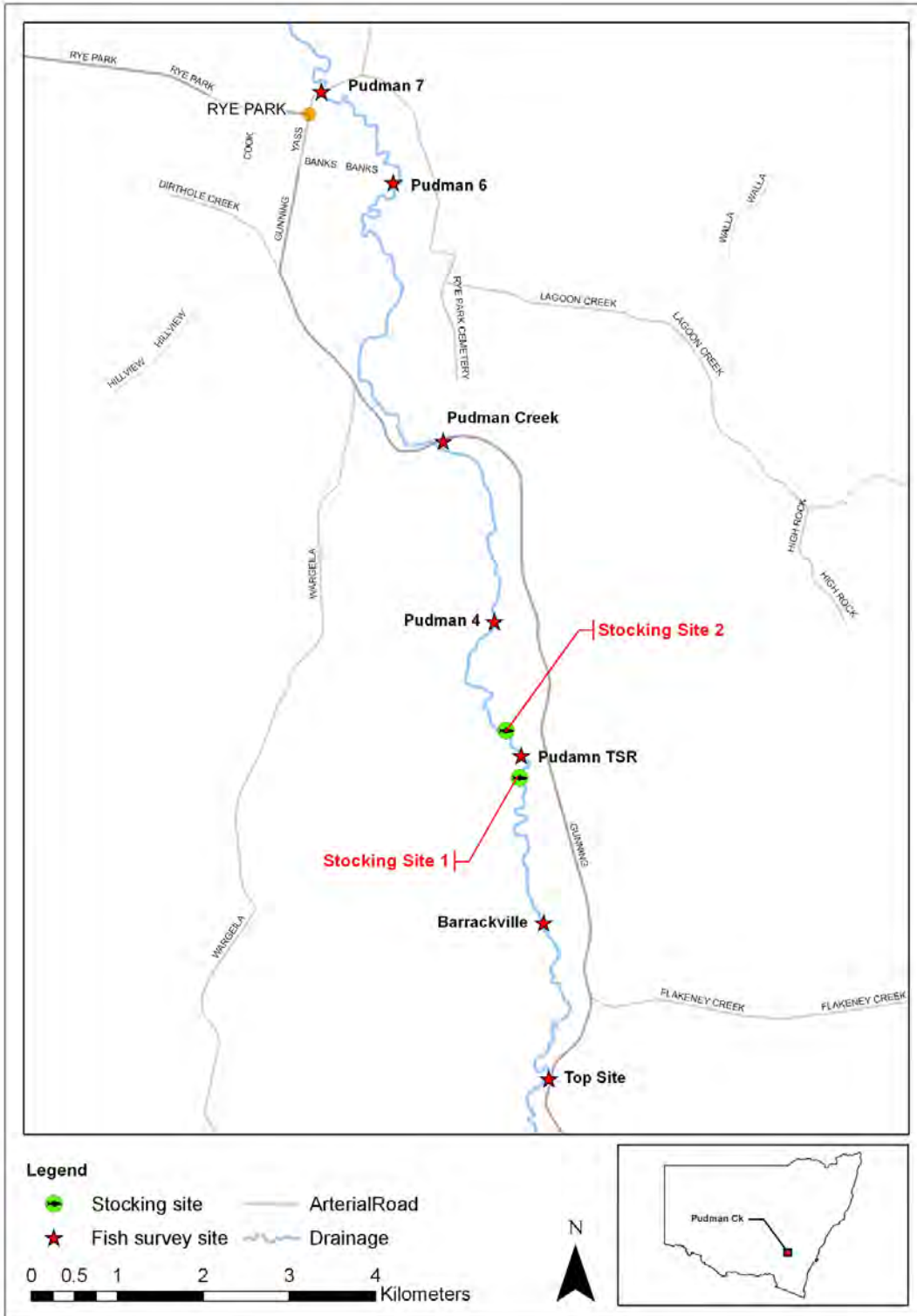


Figure 4 Redfin Perch *Perca fluviatilis* (© G. Schmida).



Figure 5 Redfin Perch captured from Pudman Lane site Blakney Creek March 2013.



Figure 6 Stocking site 1 and Southern Pygmy Perch habitat Pudman Creek.



Figure 7 Male Southern Pygmy Perch



Methods

Sampling was conducted during the following periods: 21st February – 15 March 2007, 11th February – 10th September 2009 and 23rd May -18th June 2013 at Blakney Creek and 17th – 20th June 2013 at Pudman Creek. Each site was sampled using a standard protocol consisting of a combination of backpack electrofishing and unbaited traps as developed for the Sustainable Rivers Audit (SRA) (MDBA 2011). Electrofishing consisted of 8 operations per site with a power-on time of 150 seconds for each operation. Ten unbaited concertina-style shrimp traps were deployed at each site prior to the commencement of electrofishing and were left for a period of at least 2 hours. Water quality measurements were taken at each site at a water depth of 20 cm. Additionally, a range of habitat descriptors were recorded during each electrofishing operation including: flow, substratum, structural habitat, riparian and instream vegetation, stream width and depth.

All captured fish were identified to species and measured to the nearest millimetre. Measurements were obtained as either fork length or total length depending on species caudal fin morphology. Fish that were not captured but could be positively identified during sampling were recorded as 'observed'.

Results

Blakney Creek

This report concentrates on the 14 sites that were sampled in 2013 as part of this project and the results from the previous sampling at these same sites. All of the sites apart from one were sampled in 2009, with the site 'Chain of Ponds' being sampled in 2007.

A total of 396 fish of 11 species were captured in the 2013 surveys, compared with a total 1026 fish of 10 species in previous surveys. Forty-two Southern Pygmy Perch were captured from 8 of the sites in 2009, with only 19 being captured from 5 of the sites in 2013. The additional species that was captured in 2013 was a single Golden Perch. Three species, Redfin Perch, Mountain Galaxias and Australian Smelt, showed an increase in abundance. Redfin Perch increased in both abundance and distribution, from 8 fish at only 2 sites in 2009 to 14 fish at 6 sites in 2013. Smelt increased from 7 fish at 2 sites in 2009 to 145 fish at 5 sites in 2013. Mountain Galaxias increased from 4 fish at 3 sites in 2009 to 26 fish at 5 sites in 2013. All other species sampled showed declines in their abundances.

Table 2 Abundance of fish recorded at each fish survey site in Blakney Creek in 2009 (2007 data has been used for Chain of Ponds site).

Site	Goldfish	Carp	Gambusia	Redfin Perch	Mountain Galaxias	Carp Gudgeon	Southern Pygmy Perch	Blackfish	Flat-headed Gudgeon	Smelt	Total
Gunda Bluey Urumwalla Ck Junction		1			1	5	1				8
U/S Blakney Township						4	3				7
Pudman Lane		2			2	66	19	4	7		100
Gaspipie Alan		1				41	5		2		49
Howard's Bloomfield D/S				5			19	2	1	7	34
Bloomfield				2							2
Byrneville 2		12	247			4					263
Byrneville	43	10	56			10		1	1		121
Sheep Crossing	1	11	170			1		2		1	186
Chain of Ponds		10	78	6		5	1	3		6	109
Kanama	2	8	45	2					1		58
Tarcoola		11	44			4					59
Total	46	67	647	8	4	171	42	14	20	7	1026

Table 3 Abundance of fish recorded at each fish survey site in Blakney Creek in 2013

Site	Goldfish	Carp	Gambusia	Redfin Perch	Mountain Galaxias	Carp Gudgeon	Southern Pygmy Perch	Blackfish	Flat-headed Gudgeon	Smelt	Golden Perch	Total
Gunda Bluey		3			4	2	4			128		141
Urumwalla Ck Junction					9	1	9		3			22
U/S Blakney Township					3	3	1		1			8
Pudman Lane		2		6	1		2					11
Gaspipie Alan		1		3		1		1		1		7
Howards		2		1	9	1	3					16
Bloomfield D/S			2	2		1			1			6
Bloomfield		3	5			3			1			12
Byrneville 2		5	18			17				4		44
Byrneville		1	27			1						29
Sheep Crossing	2	1	6	1		3			1	10	1	25
Chain of Ponds	2		8	1		1				2		14
Kanama	2	2	50			1		3				58
Tarcoola		3										3
Total	6	23	116	14	26	35	19	4	7	145	1	396

Figure 8 Abundances of each species at all of 14 Blakney Creek sites combined.

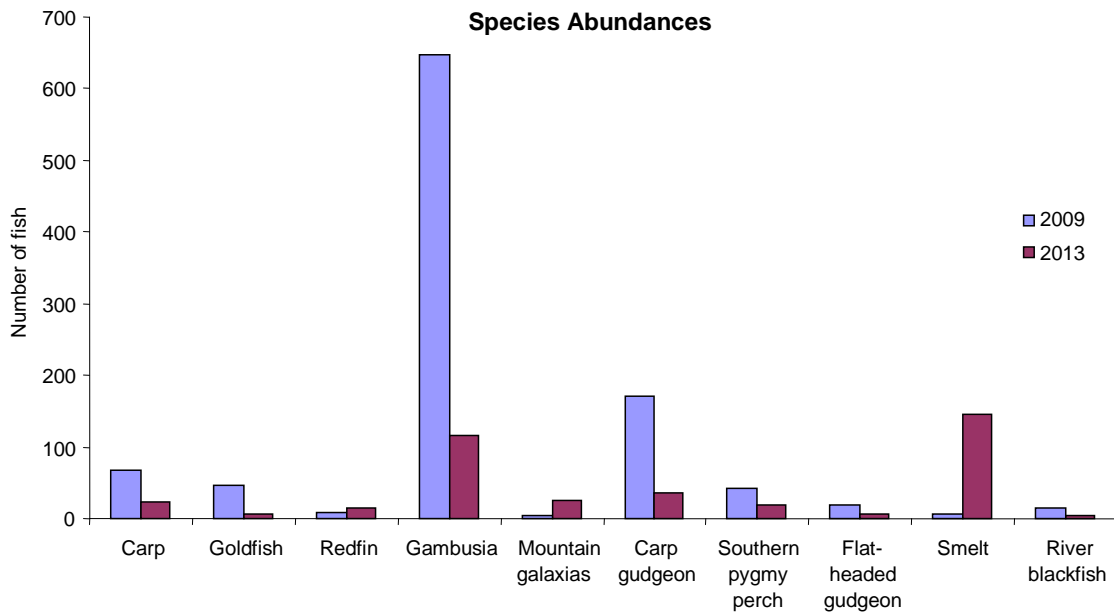


Figure 9 Total abundance of all fish species for the four sites that have consecutive data available in Blakney Creek (2009 data for Chain of Ponds is not available so 2007 data has been substituted).

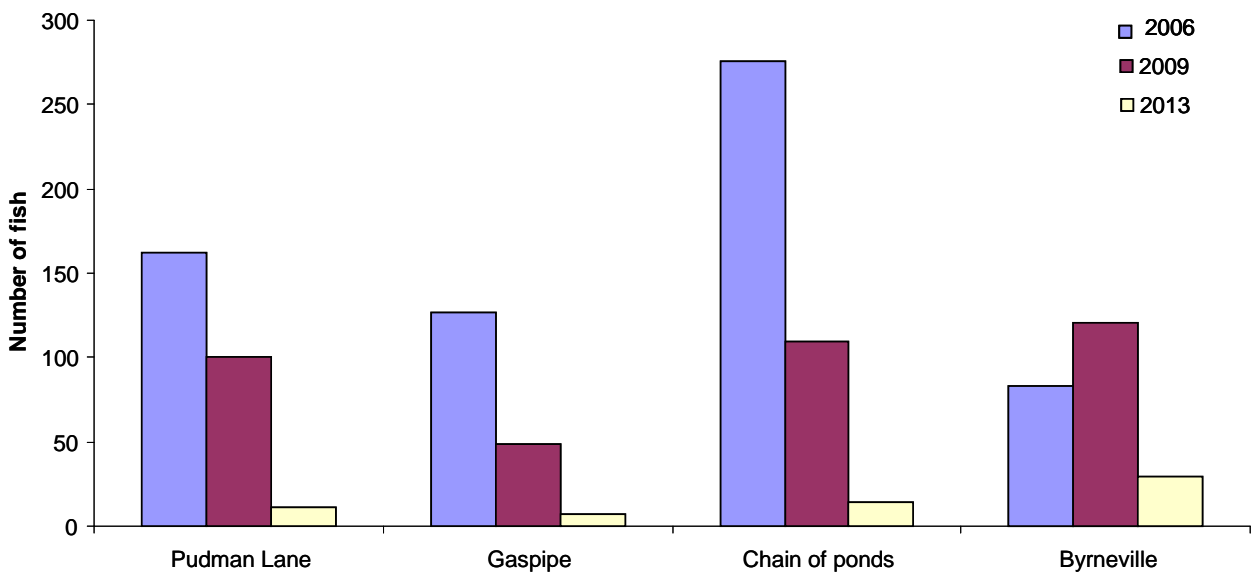


Figure 10 Abundance of native fish species for the four sites that have consecutive data available (2009 data for Chain of Ponds is not available so 2007 data has been substituted).

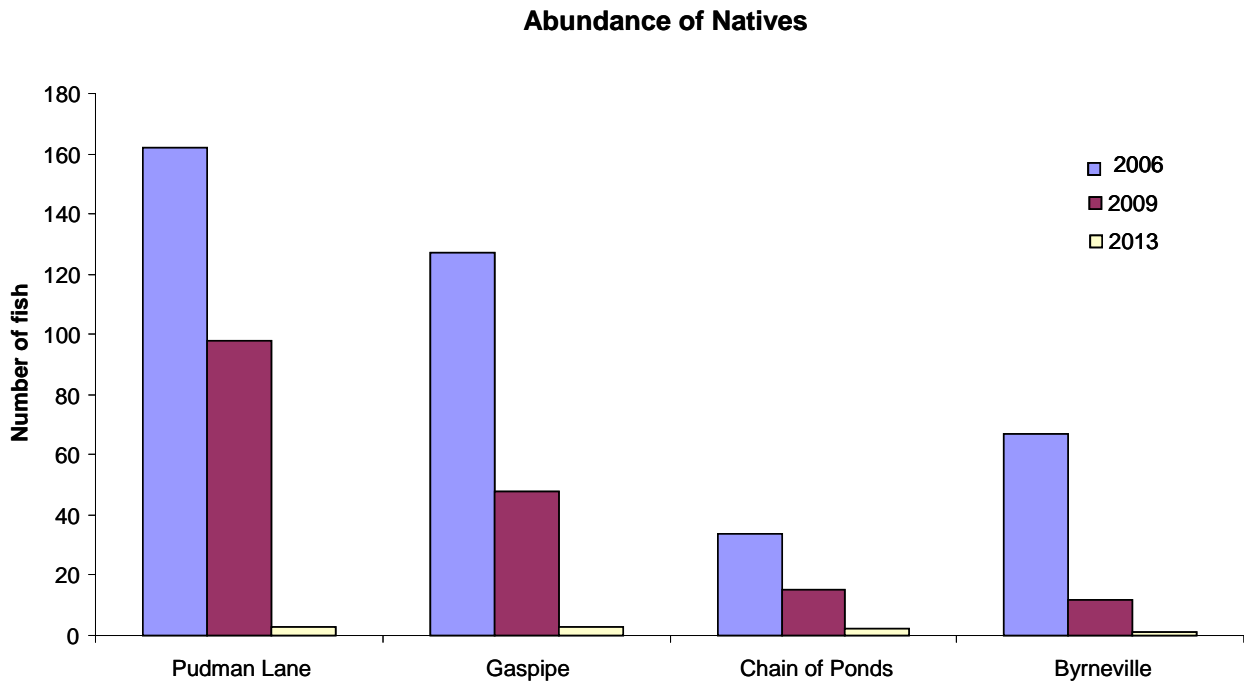


Figure 11 Abundance of alien species for the four sites that have consecutive data available. (2009 data for Chain of Ponds is not available so 2007 data has been substituted).

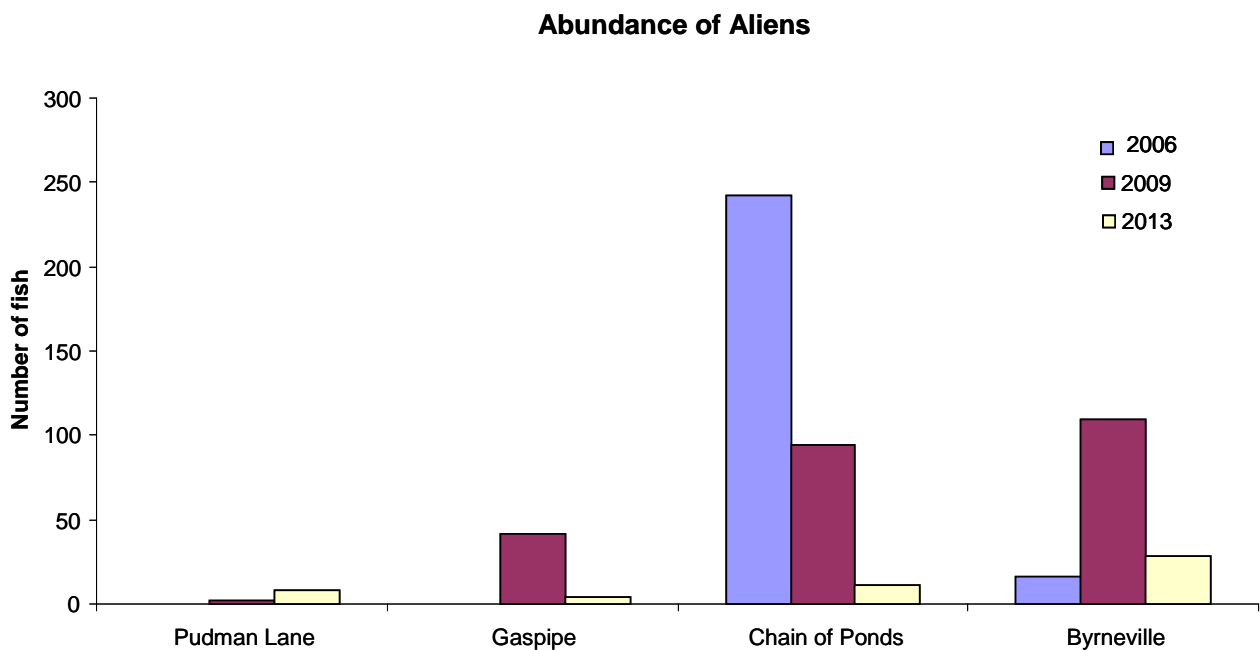


Figure 12 Southern Pygmy Perch abundance by site and year. Sites are ordered from most upstream to most downstream along the x axis.

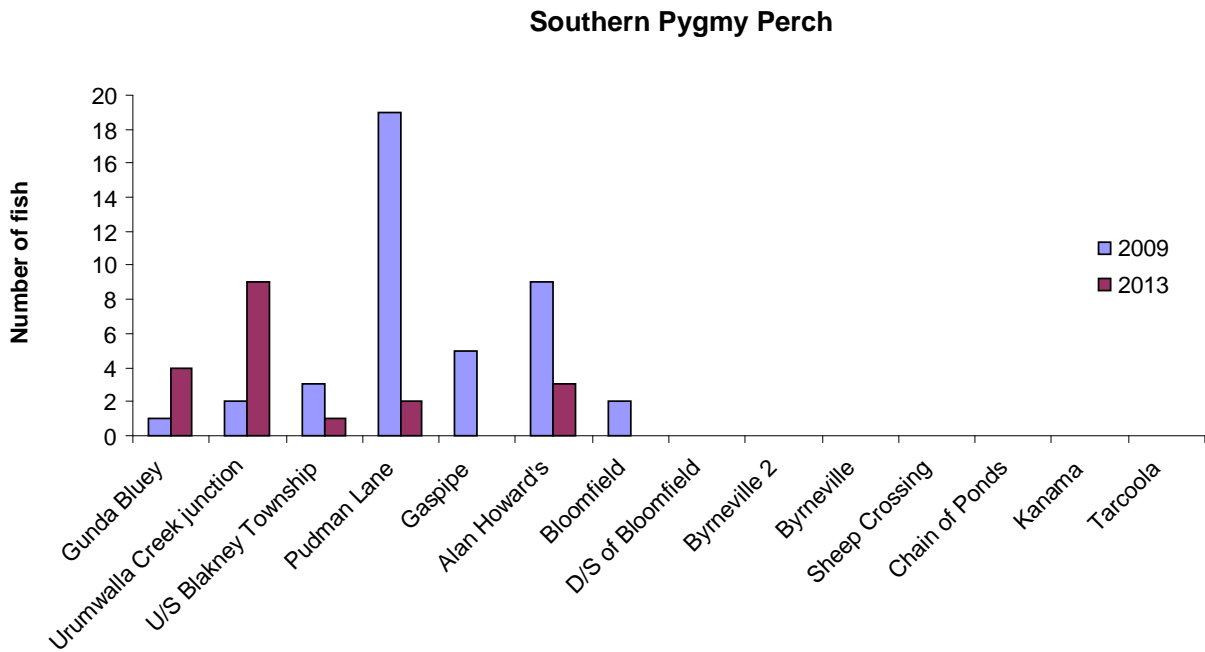


Figure 13 Redfin Perch abundance by site and year. Sites are ordered from most upstream to most downstream along the x axis. (2009 data for Chain of Ponds is not available so 2007 data has been substituted).

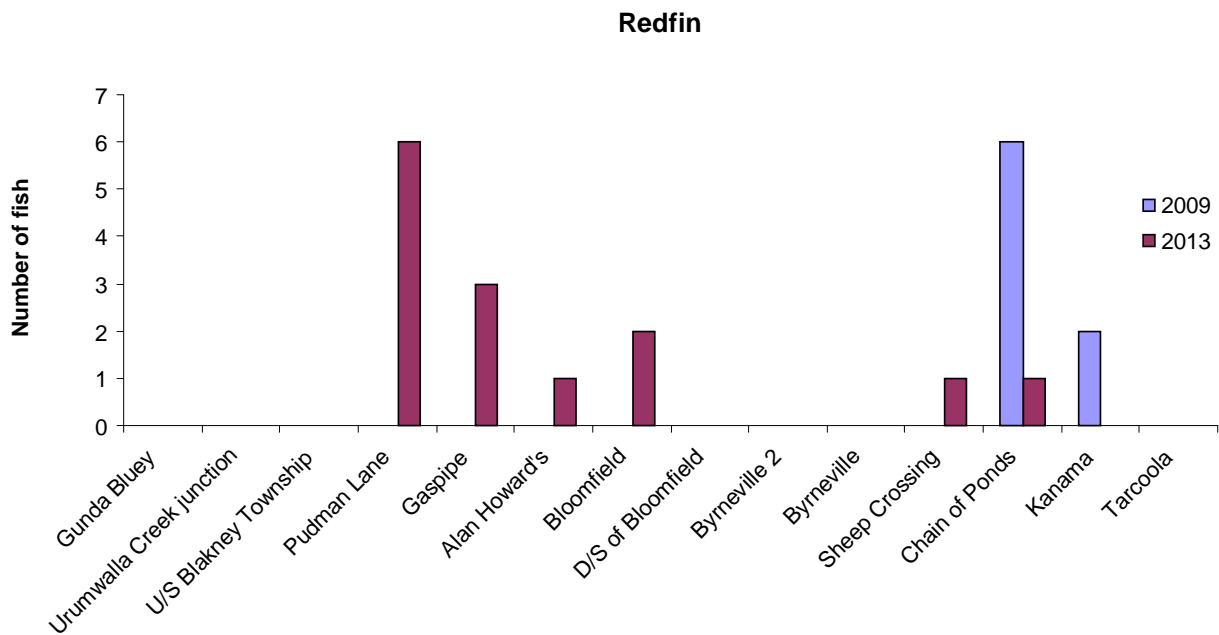


Figure 14 Carp abundance by site and year. Sites are ordered from most upstream to most downstream along the x axis. (2009 data for Chain of Ponds is not available so 2007 data has been substituted)

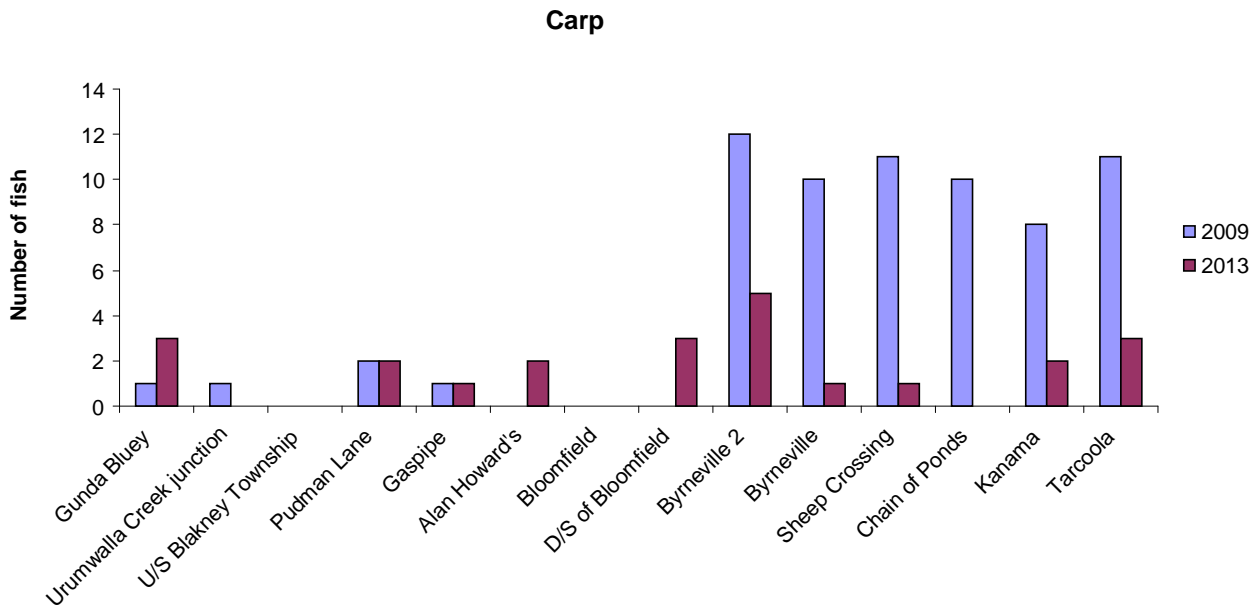


Figure 15 Gambusia abundance by site and year. Sites are ordered from most upstream to most downstream along the x axis (2009 data for Chain of Ponds is not available so 2007 data has been substituted)

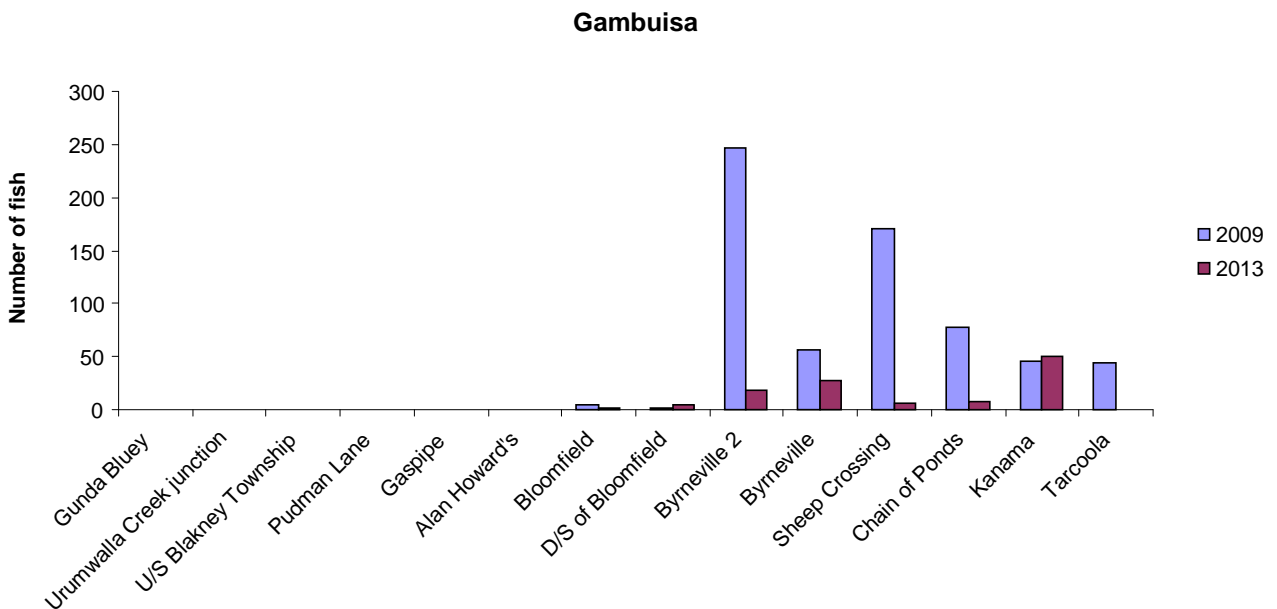
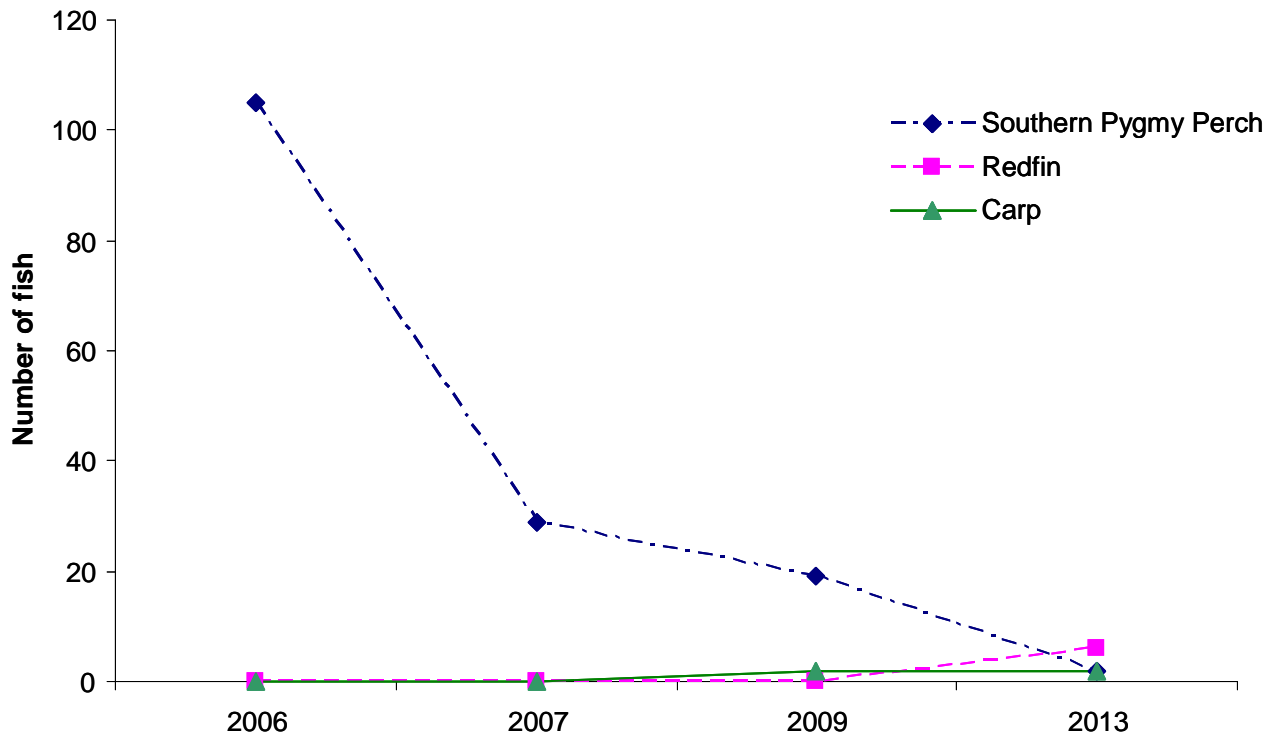


Figure 16 Abundance of Southern Pygmy Perch, Redfin Perch and Carp for the Pudman Lane site Blakney Creek. This site has historically been one of the sites with the highest abundances of Southern Pygmy Perch.



Distribution

A total of 30.72 km of Blakney Creek was surveyed in 2007, 2009 and 2013. In 2007 Southern Pygmy Perch were found in the upper 25.46km (Figure 17) and as far downstream as the Chain of Ponds site. In 2009 their distribution had reduced to 15.5 km (Figure 18) and they were only found down to the Bloomfield site. In 2013 their range had contracted further and they were only found in the upper 12.5km (Figure 19) of the creek and as far down as the Alan Howards site. In 2007 Redfin were sampled in the lower 5.26 km of the creek (Figure 17). No change in their distribution was detected in 2009. However by 2013 their range had increased by 16.5 km upstream, increasing their total range to 21.76 km (Figure 19). Carp were found along the entire length of the creek (Figures 17, 18, 19).

Table 4 Summary of the distribution of Southern Pygmy Perch, Carp and Redfin along Blakney Creek.

Species	Distribution		
	2007	2009	2013
Southern Pygmy Perch	25.46km	15.5km	12.5km
Carp	30.72km	30.72km	30.72km
Redfin	5.26km	5.26km	21.75km

Figure 17 Distribution of Southern Pygmy Perch, Carp and Redfin Perch within Blakney Creek in 2007

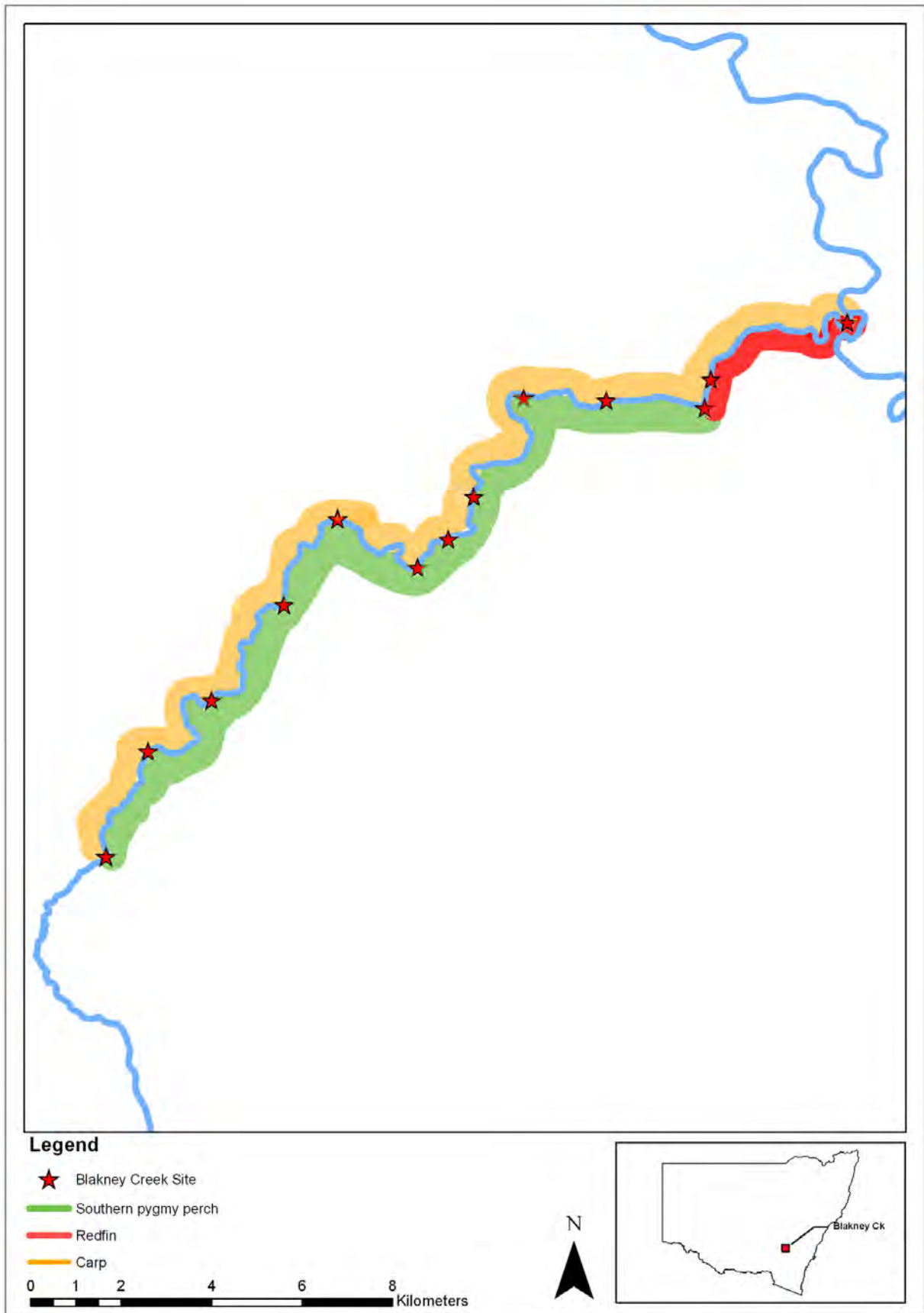


Figure 18 Distribution of Southern Pygmy Perch, Carp and Redfin Perch within Blakney Creek in 2009

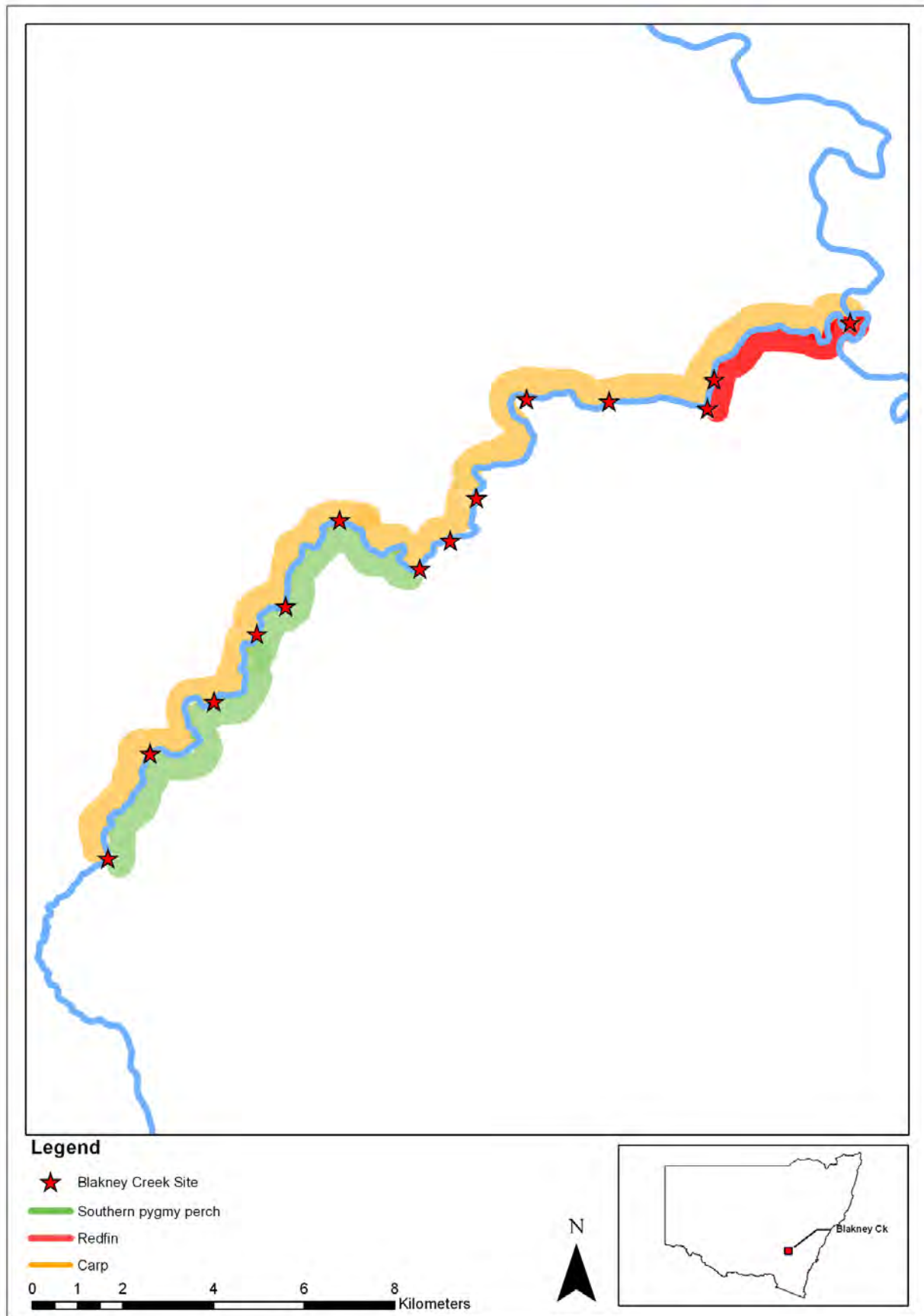
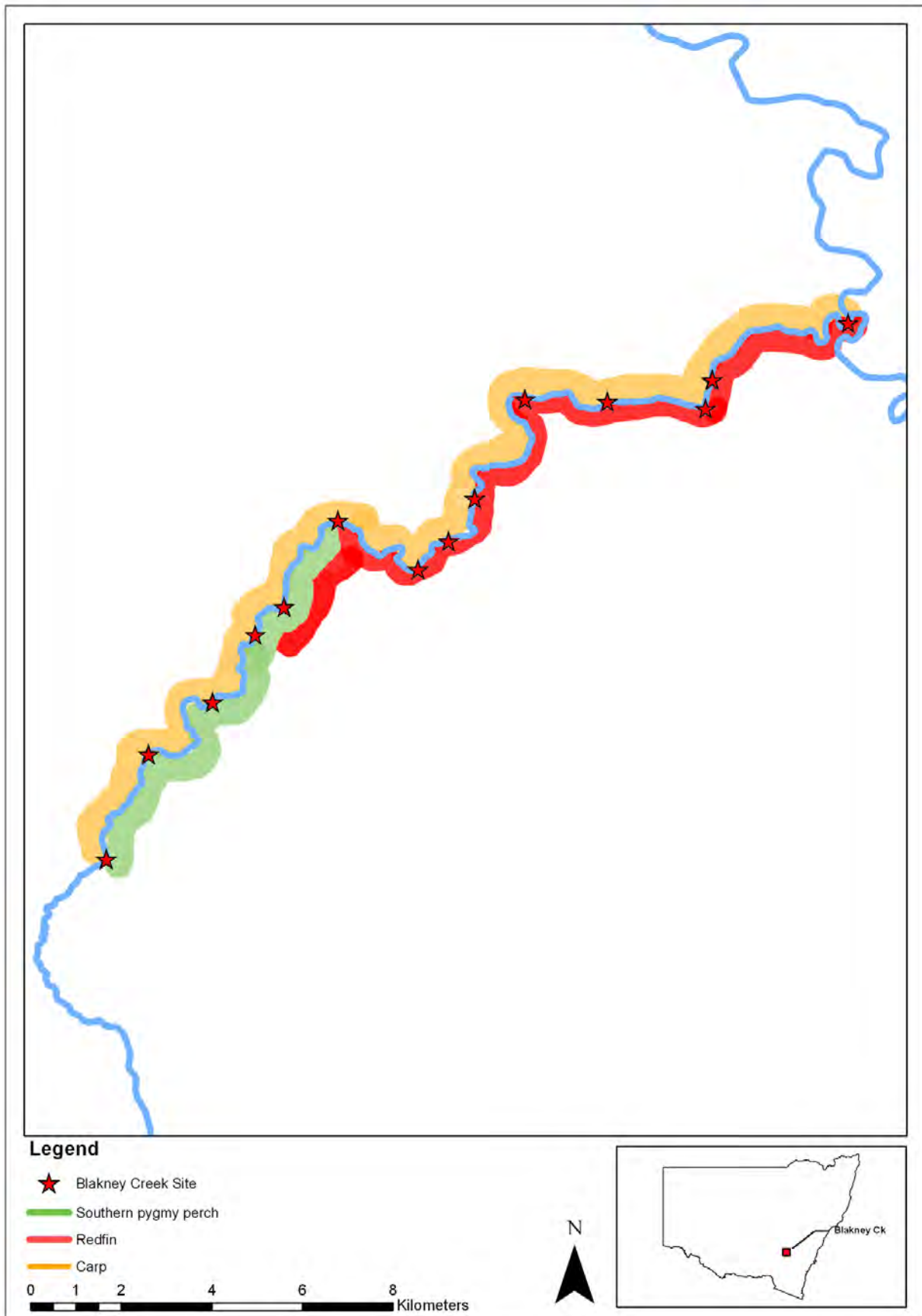


Figure 19 Distribution of Southern Pygmy Perch, Carp and Redfin Perch in Blakney Creek in 2013.



Pudman Creek

A total of 39 fish of three species were collected from the seven sites sampled in Pudman Creek. All species captured were native species, with no introduced species being captured.

Table 5 Abundance at the two sites in Pudman Creek surveyed in 2007.

Site	Mountain Galaxias	Flat-headed Gudgeon	Southern Pygmy Perch	Total
Barrackville	0	84	0	84
Pudman TSR	4	31	0	35
Total	4	115	0	119

Table 6 Abundance of fish recorded at the seven sites in Pudman Creek surveyed in 2013.

Site	Mountain Galaxias	Flat-headed Gudgeon	Southern Pygmy Perch	Total
Top Site	15			15
Barrackville		2		2
Pudman TSR	1	4	1	6
Pudman 4	1	1		2
Pudman 5				0
Pudman 6	5	4		9
Pudman 7	4	1		5
Total	26	12	1	39

Figure 20 Abundance of fish by site in Pudman Creek in 2013. Sites are ordered from most upstream to most downstream along the x axis.

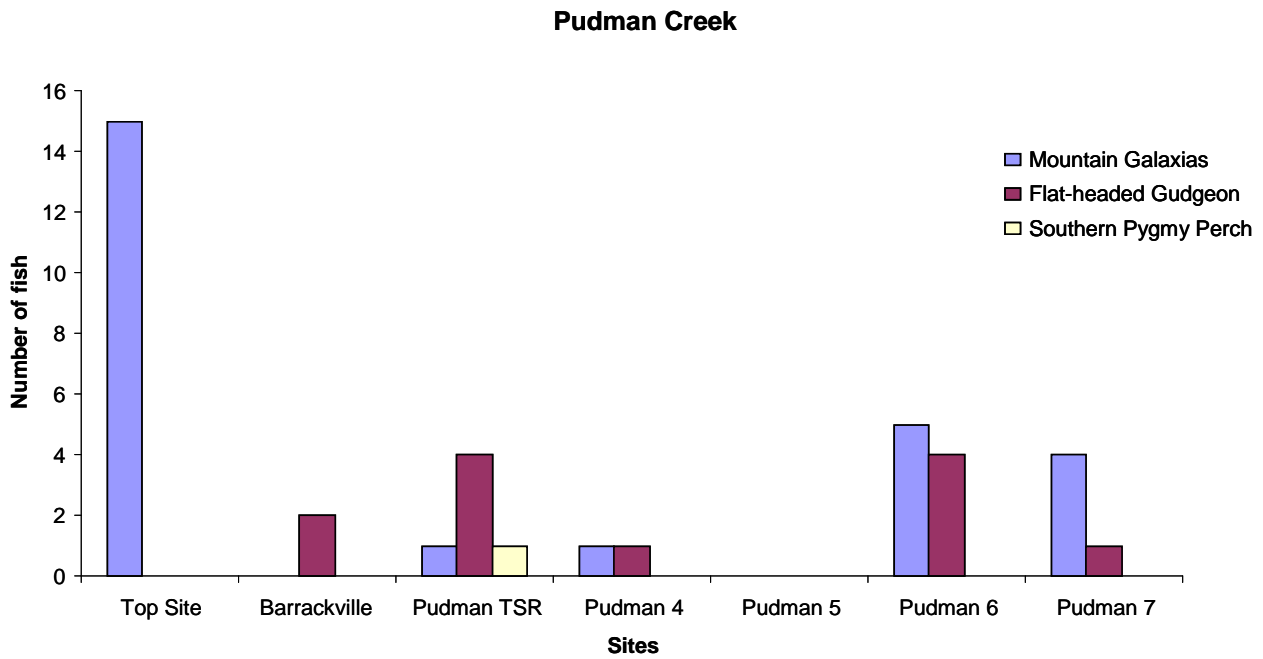
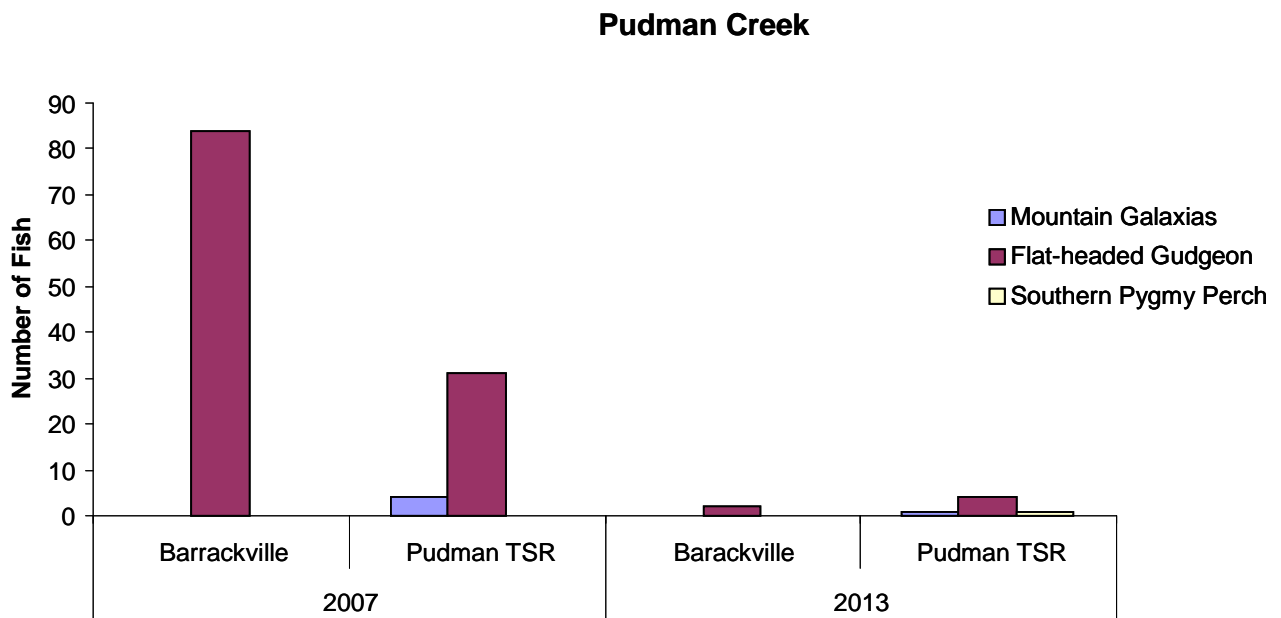


Figure 21 Abundance of fish at the two sites in Pudman Creek that were sampled in both 2007 and 2013.



Discussion

There was a 55% reduction in the number of Southern Pygmy Perch captured from 2009 to 2013 in Blakney Creek. There has been an increase in Southern Pygmy Perch abundance at only two sampled sites in Blakney Creek, with major declines at the other sites and none detected at two sites where they were previously sampled in 2009. Southern Pygmy Perch were detected at 50% of the 14 sites in 2009 but only 35% of the 14 sites in 2013.

All of the sites where there has been a decrease in Southern Pygmy Perch abundance are the sites where Redfin Perch have colonised since 2009. The only sites where there has been an increase in Southern Pygmy Perch abundance are the upper most sites of the creek where presumably Redfin Perch have not yet reached.

This assessment suggests that the Southern Pygmy Perch population within Blakney Creek is continuing to decline, despite the end of a prolonged drought, the return of more favourable environmental conditions (i.e. increased rainfall and stream flows) and considerable rehabilitation efforts. The Southern Pygmy Perch population has continued to decline in both abundance and distribution. Redfin Perch have displayed the opposite trend and increased in both abundance and distribution. There appears to be a direct correlation with the increase in Redfin Perch and the decrease in Southern Pygmy Perch. Each site that showed a decrease in the abundance of Southern Pygmy Perch showed an increase in the abundance of Redfin Perch. Similarly, the only sites that showed an increase in the abundance of Southern Pygmy Perch are those where Redfin Perch were not detected and presumably not yet reached.

It also possible that the increased spread of Redfin Perch is forcing the Southern Pygmy Perch to move upstream seeking refuge from predation, however given the poor dispersal capabilities of Southern Pygmy Perch as identified by Hammer (2002) and Cook *et al.* (2007) this is an unlikely scenario. The more likely scenario is that Redfin Perch are having a direct impact on the Southern Pygmy Perch population via predation, with the impacts of Redfin Perch predation on Southern Pygmy Perch being documented by other authors (Hammer, 2002; Woodward, 2005; Woodward & Malone, 2002).

The decline in total abundance of Southern Pygmy Perch between 2009 and 2013 may also be due to the different times of the year that the surveys occurred, with the 2009 surveys occurring in February through to September and the 2013 surveys occurring in May and June. However when comparing the surveys of the sites in 2006 and 2007, which were conducted at a similar time of the year to the 2009 surveys, there is a clear declining trend in fish abundance across all of the sites. There was also an increase in Southern Pygmy Perch abundance at the upper three sites in 2013, which would suggest that the declines are not related to the sampled times.

The large decline in *Gambusia* numbers may be as a result of the later survey times as there may have been some winter die back as described by Pyke, (2008). However, even with *Gambusia* removed from the survey results, there is still a clear overall decline in fish abundance. Furthermore *Gambusia* are only recorded at the eight lowest sites in Blakney Creek. This does not explain the decline in fish abundance at the upper six sites where they were not detected in the 2009 or 2013 surveys. *Gambusia* also only co-occurred with Southern Pygmy Perch at one site in 2009 (the Bloomfield site), where they were not detected in the 2013 surveys.

Conclusions

- Redfin Perch have continued to spread upstream within Blakney Creek, colonising approximately 16km of new stream since 2009.
- Southern Pygmy Perch numbers increased only at the sites where Redfin Perch have not yet invaded, indicating that environmental and habitat conditions have generally been favourable to both survival and reproduction.

- Sites which Redfin Perch have colonised since 2009 have either seen a decline in Southern Pygmy Perch numbers or they were not detected at all.
- There appears to be a direct correlation between the appearance of Redfin Perch and the decline or demise of Southern Pygmy Perch.
- Redfin Perch pose a very significant threat to the Blakney Creek Southern pygmy perch population. If Redfin Perch continue to spread upstream there is a real risk that they could lead to the localised extinction of Southern Pygmy Perch from the Lachlan Catchment.
- The stocked population of Southern Pygmy Perch within Pudman Creek is surviving and recruiting, however there is no evidence of their colonisation away from the initial stocking locations

Recommendations

- Identification of potential refuge sites elsewhere within the Lachlan Catchment that provide suitable habitat, where either wild captured Southern Pygmy Perch may be translocated to or captive bred fish released. These must be sites that are free of alien fish and at low risk of being colonised by alien fish, especially Redfin Perch. They could potentially be farm dams as well as reaches of streams that alien fish are unable to colonise due to downstream physical barriers such as waterfalls or weirs.
- Identification of current fish passage barriers in Blakney Creek that may prevent movement of Redfin Perch further upstream.
- Identification of locations in Blakney Creek for the possible construction of a barrier, or enhancement of current barriers to improve their effectiveness as a fish passage barrier for alien fish.
- Re-establish captive breeding and reintroduction programs for Southern Pygmy Perch. The initial positive results from the stocking of captive bred fish into Pudman Creek demonstrate that captive breeding of Southern Pygmy Perch can be undertaken, and that if suitable locations are identified, populations will establish from stocked fish.
- Continue to monitor the Southern Pygmy Perch population at regular intervals. Regular monitoring of the Upper Lachlan Catchment population is crucial to inform current and future management of this species.
- Implement projects to protect, restore and create suitable habitat for Southern Pygmy Perch. Projects that restrict stock access and protect and enhance aquatic vegetation are critical to maintaining this population.
- Investigate potential options for the control of alien fish species within Blakney Creek.
- Further research to determine current Blakney Creek, Southern Pygmy Perch population status, dynamics and stability, to assess what level of removal the population can sustain, for either translocation or the establishment of a captive population

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