

A survey of the freshwater fish fauna of the Tarkine region, north-west Tasmania

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Scott Hardie



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List of contributors

List of contributors to this report.			
Name	Institution/affiliation	Qualifications/area of expertise	Level/form of contribution
<i>Scott Hardie</i>	<i>DPIPWE</i>	<i>BSc (Hons), PhD; freshwater fish, aquatic ecology</i>	<i>Study design, survey participant, fish specimen identification, report author</i>
<i>Chris Bobbi</i>	<i>DPIPWE</i>	<i>BSc (Hons); aquatic ecology</i>	<i>Survey participant, reviewer of report</i>
<i>Tom Krasnicki</i>	<i>DPIPWE</i>	<i>BSc (Hons); aquatic ecology, macroinvertebrate taxonomy</i>	<i>Crayfish specimen identification</i>

Abstract

Fifteen riverine sites (elevation range = 11-538 m a.s.l.) in the Tarkine region were surveyed using backpack electrofishing between 27 and 31 January 2015. The findings of the survey indicate that rivers and streams which do not connect with the Arthur River, Pieman River or Henty River systems contain only native fish species (i.e. are trout-free). Furthermore, there is distinct longitudinal variation in fish community composition in rivers in the region, with more diverse and abundant communities in lower reaches. No undescribed, threatened or endemic fish species were recorded during the survey.

The absence of introduced brown trout and lack of substantial barriers to fish migration in many rivers in the region has provided suitable conditions for diverse (for Tasmania) native populations to persist in rivers in the Tarkine. The natural status of the composition of fish communities in these areas should be viewed as an environmental value and this status should be preserved.

1. Introduction

The Tarkine region in north-west Tasmania is renowned for its expanse of cool temperate rainforest, wind-swept coastline and free-flowing rivers and streams. The region covers approximately 477 000 ha and is bounded roughly by the Southern Ocean to the west, the Arthur River to the north, the Pieman River to the south, and the Murchison Highway to the east. The Tarkine includes several formal reserves, including the Arthur Pieman Conservation Area (APCA), Savage River National Park, Savage River Pipeline Regional Reserve, Donaldson River Nature Recreation Area, Meredith Range Regional Reserve and the Pieman River Reserve. Significant reserves immediately to the south of the Tarkine (i.e. south of the Pieman River) include the Mount Dundas Regional Reserve and Mount Heemskirk Regional Reserve.

Given the remoteness of much of the Tarkine, freshwater-dependent values in aquatic ecosystems in the region have not previously been well surveyed, including instream fauna such as fish and aquatic macroinvertebrates. This survey focused on freshwater fish in rivers and streams in the Tarkine. (Note aquatic macroinvertebrate samples were also collected, but the results are not included in this report.) Previous sampling of fish in the Tarkine has mostly been restricted to the following locations:

- A small number of sites in rivers in the southern proportion of the Arthur River catchment (northern Tarkine) (e.g. Davies and Cook, 1996; DPIPWE, 2014).
- A few streams near Nelson Bay and Temma (northern Tarkine).
- Several sites on the Savage River (upstream and downstream of the mine site) and a few sites on rivers adjacent to the Savage River catchment (e.g. Whyte River, lower Donaldson River) (Davies, 1995, 1998; Davies and Cook, 2001; Davies *et al.*, 2008; DPIPWE, 2012).
- A few sites on the Pieman River system, including upstream and downstream of the Pieman Dam.

In most instances, sites where fish have been previously been sampled in the Tarkine have been accessible by 4WD vehicles, with only some remote sites in the Savage River and some adjacent river systems being assessed via helicopter. Because of this, many of the moderate-sized river systems and upland reaches in catchments of the larger sized rivers have not been previously surveyed for fish.

The limited surveys of fish fauna that have been undertaken in the Tarkine (e.g. Davies and Cook, 1996; DPIPWE, 2012, 2014), and surveys in coastal-draining rivers further south on the

west coast of Tasmania (Howland *et al.*, 2001; Davies *et al.*, 2009; Hydro Tasmania, 2012, 2013b), helped conceptualise the pre-survey expectations of the likely composition of fish communities in rivers in the Tarkine. General patterns which occur in fish communities in rivers in south-eastern Australia (Fulton, 1990; McDowall, 1996; Humphries and Walker, 2013) were also drawn upon to set the expectations of the survey. Three key aspects of fish communities were of most interest: (1) degree of nativeness (focusing on the absence of salmonid fishes, i.e. trouts), (2) longitudinal variation in community composition and (3) presence/absence of threatened species (focusing on Australian grayling (*Prototroctes maraena*)).

Brown trout is an important species for recreational angling in Tasmania and its populations in many waters in the State are proactively managed as recreational fisheries by the Tasmanian State Government (via the Inland Fisheries Service). However, the presence of this species does have ecological consequences, and the State Government has fisheries management strategies and policies relating to maintenance of trout-free waters, especially in wilderness areas (e.g. IFS, 2002). Similar to the rest of Tasmania, fish communities in river systems on the west coast into which exotic brown trout (*Salmo trutta*) have been introduced (or have managed to migrate into) are dominated by this species. The dominance of brown trout in such rivers is due to their ability to predate on small-sized native fishes and compete with them for resources (food and habitat) (Crowl *et al.*, 1992; McDowall, 2006). However, several remote rivers in southern and western Tasmania are known to be 'trout-free' and contain entirely native fish communities (e.g. rivers in the far south-west: Davies *et al.*, 2009). While these systems may not necessarily contain endemic or threatened species, the natural state of their fish communities can be viewed as a significant environmental value.

In the absence of barriers to fish movement (e.g. dams and weirs), there is typically distinct, natural, longitudinal patterns in abundance and diversity of the fish communities in coastal-draining rivers in south-eastern Australia. More diverse fish communities are generally found in the lower reaches of rivers, where species with migratory life cycles and obligatory estuarine/marine life phases dominate lowland reaches (DPIW, 2008; Gehrke and Harris, 2000; McDowall, 1996), while upper reaches are inhabited by species with the strongest migratory abilities (e.g. eels, *Anguilla* species) or those which complete their life cycles in these environments.

Australian grayling is listed as *vulnerable* under the Tasmanian *Threatened Species Protection Act 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. This species has a modelled distribution which includes the lower reaches of most coastal draining rivers in Tasmania (DPIW, 2008); although there are few records from the south-west of the State which may reflect limited sampling effort in this area (Backhouse *et al.*, 2008; Davies *et al.*, 2009; Hydro Tasmania, 2013a). This species is also found in similar habitats on the south-east mainland of Australia (McDowall, 1996; Backhouse *et al.*, 2008). Australian grayling is a migratory (diadromous) species, migrating between rivers, estuaries and near-shore coastal areas (Crook *et al.*, 2006; Koster *et al.*, 2013) and thus requires access to a range of freshwater, estuarine and marine habitats to complete its life cycle. Adult Australian grayling mostly inhabit rivers and streams, usually in cool, clear waters with gravel substrata (Bishop and Bell, 1978; Bell *et al.*, 1980), and there appears to be an obligatory marine phase for larvae/juveniles prior to migrating into fresh waters (Crook *et al.*, 2006; Koster *et al.*, 2013).

In recent years, Australian grayling have only rarely been captured in Tasmania (DPIPWE, Tasmania, unpublished data). However, of particular interest to this survey, juveniles were collected in the Pieman River downstream of Pieman Dam in December 2013 (Entura, Tasmania, unpublished data) and there are historical records of this species occurring in the Arthur River estuary (Edgar *et al.*, 1999).

For these reasons, this survey aimed to assess the following three broad hypotheses regarding the composition of the fish fauna in rivers in the Tarkine and other nearby reserves:

1. Rivers and streams which do not connect with the Arthur River, Pieman River or Henty River systems contain only native fish species (i.e. are trout-free).
2. There is distinct longitudinal variation in community composition in rivers in the region, with more diverse and abundant communities in lower reaches.
3. Depending on the habitat characteristics of the lower reaches of rivers (and their estuaries) in the region, the threatened Australian grayling could be present in rivers in the region.

2. Methods

2.1 Site selection

In order to examine the three hypotheses of this survey (section 1), a range of sites covering most of the reserves in the Tarkine region (including some of the reserves which are south of the Pieman River) were sampled (Table 1; Appendix 1). Sites were selected by targeting unsampled rivers in the region and upland/remote reaches in drainages which had previously been sampled only in their lower reaches. Across the sites, a mixture of lowland (<200 m a.s.l.) and upland (>200 m a.s.l.) sites were sampled (Table 1; see Appendix 1) to gather information about longitudinal variation in composition of fish communities in rivers in the Tarkine.

2.2 Collection methods

2.2.1 General methods

Fifteen riverine sites (Table 1) were surveyed between 27 and 31 January 2015. At all survey sites, an average of 16 min (range = 9-21 min) of backpack electrofishing (Smith and Root Inc, model LR-20B) with a 250-mm anode ring was undertaken in wadeable areas (<1.2 m in depth) by a two-person team (see Figure 1). This fishing effort covered an average reach length of 116 m (range = 70-200 m) at each site. Electrical settings were adjusted to water chemistry at each site, but were similar across the sites (200-350 V, DC current of 40-45 Hz, duty cycle =30%). The depth and fast velocity of in-channel habitats at some sites prevented electrofishing being conducted over the entire study reach. Instead, sampling at sites with these issues was largely confined to shallower backwater and snag-dominated habitat on the sides of the river channel.

Fish were the target fauna of this survey; however, freshwater crayfish were also captured opportunistically during fish sampling. Electrofishing is not an efficient sampling method for crayfish, so crayfish records from this survey do not necessarily provide accurate information about the presence/absence of crayfish at surveyed sites. For these reasons, crayfish data are reported along with fish data in Appendix 2, but are not discussed in this report.

All captured fish and freshwater crayfish were identified to species in the field where possible, counted and their total length (mm) was measured. Small numbers of lampreys and crayfish were euthanised and preserved to enable species identification in the laboratory, while all other fish and crayfish were released at the site of capture.

Table 1. Riverine sites in the Tarkine region where freshwater fish were sampled.					
Reserve	Site code	Site name	Lat DD	Long DD	Elevation (m)
Meredith Range Regional Reserve	Fish_1	Rocky River in Meredith Range	-41.65119	145.23675	224
Meredith Range Regional Reserve	Fish_2	Yellow Creek at Yellowband Plain	-41.58942	145.33659	538
Savage River Pipeline Regional Reserve	Fish_3	Un-named tributary of Donaldson River	-41.37442	145.17935	375
Savage River Pipeline Regional Reserve	Fish_4	Little Donaldson River upstream of Donaldson River confluence	-41.43901	145.13065	219
Savage River Pipeline Regional Reserve	Fish_5	Rapid River at Pipeline Road	-41.26707	145.33289	466
Arthur-Pieman Conservation Area	Fish_6	Toner River near Mount Hadmar	-41.44426	145.04426	276
Arthur-Pieman Conservation Area	Fish_7	Rocky Creek upstream of Elliotts Track	-41.58145	144.96884	148
Arthur-Pieman Conservation Area	Fish_8	Interview River upstream of river mouth	-41.58245	144.88924	11
Arthur-Pieman Conservation Area	Fish_9	Lagoon River upstream of river mouth	-41.49289	144.86470	46
Arthur-Pieman Conservation Area	Fish_10	Lagoon River near Mount Judith	-41.46887	144.98511	274
Arthur-Pieman Conservation Area	Fish_11	Native Hut Creek upstream of Pedder River	-41.40239	144.80869	31
Arthur-Pieman Conservation Area	Fish_12	Thornton River downstream of Murray Creek	-41.31728	144.80494	80
Mount Dundas Regional Reserve	Fish_13	Henty River at Zeehan Highway	-41.99395	145.47159	88
Mount Dundas Regional Reserve	Fish_14	Ewart Creek at Zeehan Highway	-41.97489	145.46251	135
Mount Heemskirk Regional Reserve	Fish_15	Tasman River off Granville Harbour Road	-41.82647	145.10509	135



Figure 1. Chris Bobbi backpack electrofishing in the lower Lagoon River, 30 January 2015.

2.2.2 Methods used at standard survey sites

Freshwater fish were not surveyed at the standard sites as surveys at these sites focused on terrestrial flora and fauna.

2.3 Identifying the collections

Most fish were identified *in situ* based on knowledge of taxonomic keys from McDowall (1996), while taxonomic keys from Potter (1996b, a) were used to examine preserved lampreys. Preserved crayfish specimens were identified to species using taxonomic keys for Australian Decapoda (Hamr, 1992; Horwitz, 1995), and occurrence locations were cross-referenced with distribution ranges for Tasmanian freshwater crayfish species (Richardson *et al.*, 2006).

3. Results and Discussion

3.1 Named taxa newly recorded for the reserves

Despite the limited number of previous fish fauna surveys (especially in terms of spatial coverage) in the reserves which were sampled, historical surveys appear to have collected most species which occur in the reserves. Therefore, few taxa that had not been previously been recorded in the reserves were captured in this survey (Appendix 2).

The native pouched lamprey and introduced brown trout were recorded for the first time in the Arthur-Pieman Conservation Area (Table 2). This region is within the known distribution ranges of both species, so this is not surprising. It should be noted that brown trout were only recorded in Toner River on the eastern boundary of the reserve and that this species does not appear to be present in most rivers in this reserve (this is discussed further in sections 3.4 and 4).

According to the Tasmanian Natural Values Atlas (NVA, 2015), no freshwater fish sampling has previously been undertaken in the Mount Heemskirk Regional Reserve. Two fish species, short-finned eel and climbing galaxias, were recorded at the single site on the Tasman River which was surveyed, thus these are new records for this reserve (Table 5). This finding suggests that the fish fauna in this reserve is similar to coastal draining rivers north of the Pieman River in the Tarkine region. The absence of the introduced brown trout at this site and the high abundance of native climbing galaxias are noteworthy.

No species which were new to the reserves were found in the Meredith Range Regional Reserve, Mount Dundas Regional Reserve or Savage River Pipeline Regional Reserve (Tables 3, 4 and 6). These reserves have received the most historical fish sampling effort, so this result is not surprising.

Arthur-Pieman Conservation Area

Taxon	Comment
Pouched lamprey (<i>Geotria australis</i>)	Native migratory species, this is within the range of its known distribution in Tasmania
Brown trout (<i>Salmo trutta</i>)	Introduced fish, this is within the broad range of its known distribution in Tasmania; however, this species was only recorded in Toner River on the eastern boundary of the reserve. This species does not appear to be present in most rivers in this reserve.

Meredith Range Regional Reserve

Table 3. Named taxa newly recorded from Meredith Range Regional Reserve	
Taxon	Comment
Nil	NA

Mount Dundas Regional Reserve

Table 4. Named taxa newly recorded from Mount Dundas Regional Reserve	
Taxon	Comment
Nil	NA

Mount Heemskirk Regional Reserve

Table 5. Named taxa newly recorded from Mount Heemskirk Regional Reserve	
Taxon	Comment
Short-finned eel (<i>Anguilla australis</i>)	Native migratory species, this is within the range of its known distribution in Tasmania
Climbing galaxias (<i>Galaxias brevipinnis</i>)	Native migratory species, this is within the range of its known distribution in Tasmania

Savage River Pipeline Regional Reserve

Table 6. Named taxa newly recorded from Savage River Pipeline Regional Reserve	
Taxon	Comment
Nil	NA

3.2 Un-named or not formalised taxa

No un-named or not formalised taxa were recorded during this survey.

3.3 Putative new species (new to science)

No new species were recorded during this survey.

3.4 Weed, pest or introduced species

The presence and distribution of introduced brown trout in the Tarkine region was of particular interest to this study (section 1, hypotheses 1). This species was recorded for the first time in the Arthur-Pieman Conservation Area; albeit in the Toner River on the eastern boundary of the reserve (Table 7). The Toner River is a tributary of the Donaldson River (Pieman River catchment) which contains an abundant brown trout population; therefore, this result is not unexpected and aligns with our hypotheses that rivers in the Pieman River system contain brown trout. However, of greater interest is the fact that brown trout were not recorded in any of the five rivers coastal draining rivers on the western boundary of this reserve which were surveyed.

As expected, brown trout were also recorded in the Mount Dundas Regional Reserve (Table 9) and Savage River Pipeline Regional Reserve (Table 11). In all cases, sites in these

reserves where brown trout were present were in river systems which are known to contain this species (i.e. Arthur River, Henty River and Pieman River).

No brown trout were recorded at sites in the Meredith Range Regional Reserve (Table 8) and Mount Heemskirk Regional Reserve (Table 10) during this survey. Brown trout is, however, known to occur in the Meredith Range Regional Reserve (e.g. in the Whyte River, tributary of the Pieman River). In this survey only two upland river sites were sampled, and brown trout do not appear to have moved upstream into some of the streams draining off the Meredith Range. Only one site on the Tasman River in the Mount Heemskirk Regional Reserve was surveyed; therefore, it is difficult to assess whether brown trout occur in any of the waterways in this reserve, but it appears that the Tasman River is trout-free.

Arthur-Pieman Conservation Area

Introduced species	Location sighted/observed	Indication of abundance	Comments
Brown trout (<i>Salmo trutta</i>)	Toner River, tributary of Donaldson River on eastern boundary of reserve	Low abundance at this location	This is within the broad range of its known distribution in Tasmania; however, this species was only recorded in Toner River on the eastern boundary of the reserve. This species does not appear to be present in most rivers in this reserve.

Meredith Range Regional Reserve

Introduced species	Location sighted/observed	Indication of abundance	Comments
Nil	NA	NA	No introduced species were sampled in this reserve

Mount Dundas Regional Reserve

Introduced species	Location sighted/observed	Indication of abundance	Comments
Brown trout (<i>Salmo trutta</i>)	Henty River at Zeehan Highway, Ewart Creek at Zeehan Highway	High abundance at these locations	This is within the broad range of its known distribution in Tasmania. This species appears to be abundant in the Henty River system.

Mount Heemskirk Regional Reserve

Introduced species	Location sighted/observed	Indication of abundance	Comments
Nil	NA	NA	No introduced species were sampled in this reserve.

Savage River Pipeline Regional Reserve

Introduced species	Location sighted/observed	Indication of abundance	Comments
Brown trout (<i>Salmo trutta</i>)	Little Donaldson River upstream of Donaldson River confluence, Rapid River at Pipeline Road	High abundance at these locations	This is within the broad range of its known distribution in Tasmania. This species appears to be abundant in the Donaldson and Rapid river systems.

3.5 Vulnerable, threatened or endangered species

No fish species listed under Commonwealth or Tasmanian threatened species legislation (i.e. 'threatened' species) were recorded during this survey. This is despite one of the hypotheses of the survey suggesting the threatened Australian grayling may be present in rivers in the region. Habitats surveyed in river reaches were mostly not preferred habitats for this species (e.g. substrate was boulder-dominated, velocities were too high, etc.; see Appendix 1). Australian grayling have previously been recorded in some rivers within reserves in the Tarkine region.

3.6 Range extensions

No significant range extensions of fish species were recorded during this survey.

4. Information on species lists

The Tasmanian Natural Values Atlas (NVA) (NVA, 2015) was used to compile the species list that accompanies this report. The NVA is the central repository for fish survey data in Tasmania. Fish data from the NVA provided an accurate assessment of the species that occur in the Tarkine region, with authors of this report having contributed to some of the historical records for this region. Fish data collected in the present survey will be uploaded onto the NVA in the near future.

All species recorded on the NVA for the Tarkine region are highly likely to occur in this area (i.e. are likely to be accurate records). In addition, some other species, especially rare ones (e.g. Australian grayling, Tasmanian mudfish), are also likely to occur in some of the reserves in the Tarkine.

5. Information for land managers

In order to provide information for land managers from the findings of this survey, the three hypotheses which the survey sought to address are discussed.

1. *Rivers and streams which do not connect with the Arthur River, Pieman River or Henty River systems contain only native fish species (i.e. are trout-free).*

The results of the fish fauna survey supported this hypothesis, with introduced brown trout being captured at only four of the 15 sites that were surveyed, and all of the sites where this species was present were in the Arthur River, Pieman River or Henty River systems (see Appendix 2). Brown trout was also the only introduced species captured in the survey, with five native species being captured across the survey sites. The occurrence of brown trout and the most abundant native species in the survey, climbing galaxias (Figure 2), was mutually exclusive (Appendix 3), with these species only co-existing at one site (Toner River) where brown trout were in low abundance. This finding re-enforces the detrimental impact of brown trout on small-sized native fishes, such as galaxiid species (Hardie *et al.*, 2006), in Tasmania.



Figure 2. Climbing galaxias (*Galaxias brevipinnis*) collected in (a) Rocky Creek upstream of Elliotts Track and (b) Yellow Creek at Yellowband Plain in the Meredith Range during the fish fauna survey of the Tarkine region.

It appears that all of the coastal draining rivers north of the Pieman River and south of the Arthur River (Arthur-Pieman Conservation Area; e.g. Lagoon River, Thornton River, etc.) are trout-free and contain only native fish species (see Appendix 2). A similar pattern is also likely to be evident in the coastal draining streams between Trial Harbour and Grandville Harbour (Mount Heemskirk Regional Reserve; e.g. Tasman River). In addition, some upland streams in the Arthur River, Pieman River and Henty River systems (e.g. Yellow Creek and Rock River in the Meredith Range) appear to also be trout-free, especially in reaches where high gradients or

natural barriers to the upstream movement of brown trout (e.g. steep cascades or waterfalls) have prevented this species from establishing populations in these areas.

The natural status of the composition of fish communities in these areas should be viewed as an environmental value and this status should be preserved. The translocation of introduced species, especially brown trout, into the Tarkine region should be proactively avoided.

2. *There is distinct longitudinal variation in community composition in rivers in the region, with more diverse and abundant communities in lower reaches.*

The results of the fish fauna survey supported this hypothesis, with natural, longitudinal patterns in the composition of fish communities across the surveyed sites (Appendix 4). More diverse and abundant fish communities are present in the lower reaches of rivers in the Tarkine region. Up to four species and relative abundances of mostly >40 fish per 20 min of fishing effort were recorded at sites <100 m a.s.l. (Appendix 4). Conversely, no fish or only one species and relative abundances of <6 fish per 20 min of fishing effort were recorded at sites >350 m a.s.l. (Appendix 4). Furthermore, larger-sized, older climbing galaxias (Figure 2b) were more common at greater elevations (Appendix 5), which is thought to relate to the life history strategy of this species and is a feature of other populations of climbing galaxias in western Tasmania (Howland *et al.*, 2001; Hydro Tasmania, 2013b).

The natural status of the composition of fish communities in these areas should be viewed as an environmental value and this status should be preserved. In addition to issues regarding the translocation of introduced species into the Tarkine region, the installation of barriers to fish movement in rivers in the region should also be avoided. If fish passage in river systems in Tarkine becomes restricted by barriers, then species with migratory life histories and obligatory estuarine/marine life phases will not be able to move up and down rivers to complete their life cycle, and this will impact longitudinal patterns in community composition.

3. *Depending on the habitat characteristics of the lower reaches of rivers (and their estuaries) in the region, the threatened Australian grayling could be present in rivers in the region.*

As partly expected, no threatened or endemic fish species were recorded during the survey. In particular, no Australian grayling were recorded. Habitats in surveyed river reaches were mostly not preferred habitats for this species (e.g. substrate was boulder-dominated, velocities were too high, etc.; see Appendix 1). The Australian grayling has previously been recorded in some rivers within reserves in the Tarkine region, and this species is likely to exist in some of the larger coastal draining rivers in the surveyed reserves.

6. Conclusions

In conclusion, many rivers in the Tarkine contain abundant native fish populations, and introduced fish (e.g. brown trout) are absent from several rivers in the region. The lack of substantial barriers to fish migration in many rivers in the region has provided suitable conditions for diverse (for Tasmania) native populations to persist in rivers in the Tarkine. The natural status of the composition of fish communities in these areas should be viewed as an environmental value and this status should be preserved.

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Appendices

Appendix 1. Photographs of riverine sites in the Tarkine region where freshwater fish were sampled.



Fish_1. Rocky River in the Meredith Range (Meredith Range Regional Reserve), 31 January 2015.



Fish_2. Yellow Creek at Yellowband Plain (Meredith Range Regional Reserve), 31 January 2015.



Fish_3. Un-named tributary of Donaldson River (Savage River Pipeline Regional Reserve), 28 January 2015.



Fish_4. Little Donaldson River upstream of Donaldson River confluence (Savage River Pipeline Regional Reserve), 29 January 2015.



Fish_5. Rapid River at Pipeline Road (Savage River Pipeline Regional Reserve), 29 January 2015.



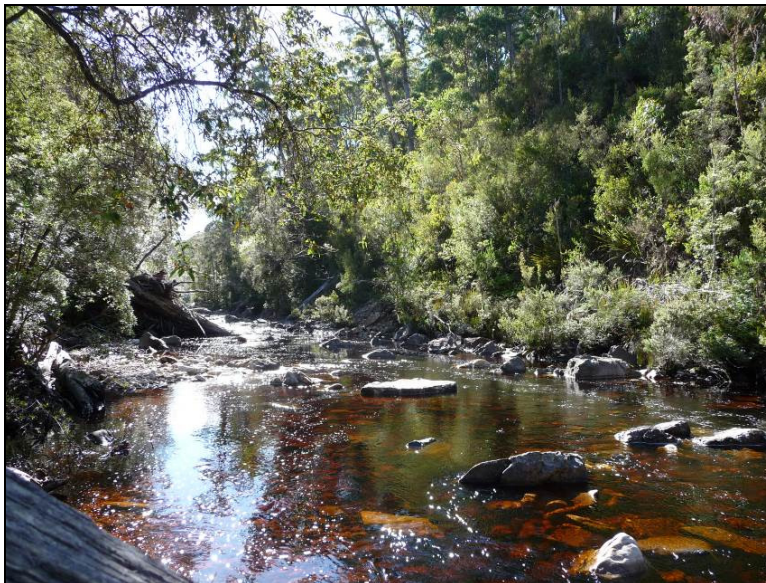
Fish_6. Toner River near Mount Hadmar (Arthur-Pieman Conservation Area), 29 January 2015.



Fish_7. Rocky Creek upstream of Elliotts Track (Arthur-Pieman Conservation Area), 28 January 2015.



Fish_8. Interview River upstream of river mouth (Arthur-Pieman Conservation Area), 30 January 2015.



Fish_9. Lagoon River upstream of river mouth (Arthur-Pieman Conservation Area), 30 January 2015.



Fish_10. Lagoon River near Mount Judith (Arthur-Pieman Conservation Area), 30 January 2015.



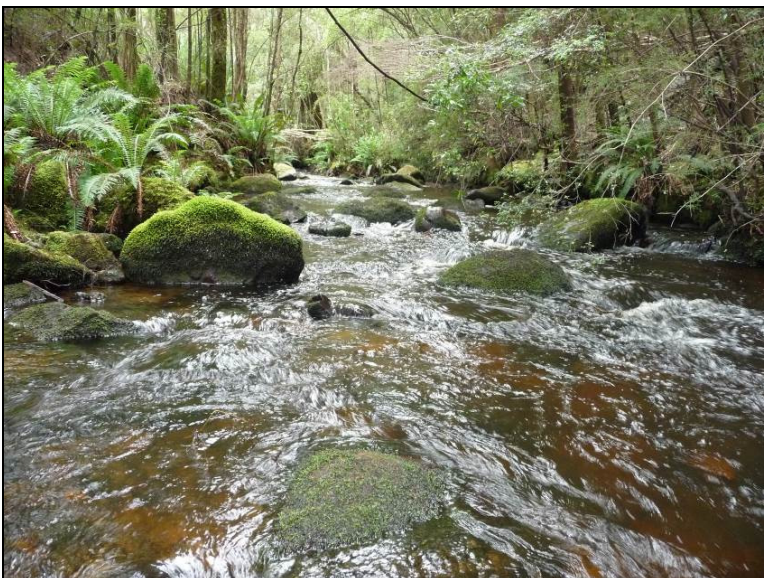
Fish_11. Native Hut Creek upstream of estuary of North Pedder River (Arthur-Pieman Conservation Area), 30 January 2015.



Fish_12. Thornton River downstream of Murray Creek (Arthur-Pieman Conservation Area), 28 January 2015.



Fish_13. Henty River at Zeehan Highway (Mount Dundas Regional Reserve), 27 January 2015.



Fish_14. Ewart Creek at Zeehan Highway (Mount Dundas Regional Reserve), 27 January 2015.



Fish_15. Tasman River off Granville Harbour Road (Mount Heemskirk Regional Reserve), 31 January 2015.

Appendix 2. List of freshwater fish occurring in the Tarkine region, north-west Tasmania

Reserve Name: Arthur-Pieman Conservation Reserve

Number of taxa: 7 fish (1 crayfish)

Appendix 1, Table 1. Full species list for the Arthur-Pieman Conservation Reserve							
Family	Species	Common name	New record	Putative new species	EPBC Listed	State or Territory Listed	Weed, Pest or Introduced
Anguillidae	<i>Anguilla australis</i>	Short-finned eel					
Bovichthidae	<i>Pseudaphritis urvillii</i>	Sandy					
Galaxiidae	<i>Galaxias brevipinnis</i>	Climbing galaxias					
Galaxiidae	<i>Galaxias maculatus</i>	Common galaxias					
Galaxiidae	<i>Galaxias truttaceus</i>	Spotted galaxias					
Geotriidae	<i>Geotria australis</i>	Pouched lamprey	✓				
Salmonidae	<i>Salmo trutta</i>	Brown trout	✓				✓
Parastictidae	<i>Astacopsis tricornis</i>	Western crayfish	✓				

Reserve Name: Meredith Range Regional Reserve

Number of taxa: 8 fish (1 crayfish)

Appendix 1, Table 2. Full species list for the Meredith Range Regional Reserve							
Family	Species	Common name	New record	Putative new species	EPBC Listed	State or Territory Listed	Weed, Pest or Introduced
Anguillidae	<i>Anguilla australis</i>	Short-finned eel					
Bovichthidae	<i>Pseudaphritis urvillii</i>	Sandy					
Galaxiidae	<i>Galaxias brevipinnis</i>	Climbing galaxias					
Galaxiidae	<i>Galaxias maculatus</i>	Common galaxias					
Galaxiidae	<i>Galaxias truttaceus</i>	Spotted galaxias					
Geotriidae	<i>Geotria australis</i>	Pouched lamprey					
Mordaciidae	<i>Mordacia mordax</i>	Short-headed lamprey					
Salmonidae	<i>Salmo trutta</i>	Brown trout					✓
Parastictidae	<i>Astacopsis tricornis</i>	Western crayfish	✓				

Reserve Name: Mount Dundas Regional Reserve

Number of taxa: 9 fish

Appendix 1, Table 3. Full species list for the Mount Dundas Regional Reserve							
Family	Species	Common name	New record	Putative new species	EPBC Listed	State or Territory Listed	Weed, Pest or Introduced
Anguillidae	<i>Anguilla australis</i>	Short-finned eel					
Bovichthidae	<i>Pseudaphritis urvillii</i>	Sandy					
Galaxiidae	<i>Galaxias brevipinnis</i>	Climbing galaxias					
Galaxiidae	<i>Galaxias maculatus</i>	Common galaxias					
Galaxiidae	<i>Galaxias truttaceus</i>	Spotted galaxias					
Galaxiidae	<i>Neochanna cleaveri</i>	Tasmanian mudfish					
Geotriidae	<i>Geotria australis</i>	Short-headed lamprey					
Prototroctidae	<i>Prototroctes maraena</i>	Australian grayling			✓	✓	
Salmonidae	<i>Salmo trutta</i>	Brown trout					✓

Reserve Name: Mount Heemskirk Regional Reserve

Number of taxa: 2 fish

Appendix 1, Table 4. Full species list for the Mount Heemskirk Regional Reserve							
Family	Species	Common name	New record	Putative new species	EPBC Listed	State or Territory Listed	Weed, Pest or Introduced
Anguillidae	<i>Anguilla australis</i>	Short-finned eel	✓				
Galaxiidae	<i>Galaxias brevipinnis</i>	Climbing galaxias	✓				

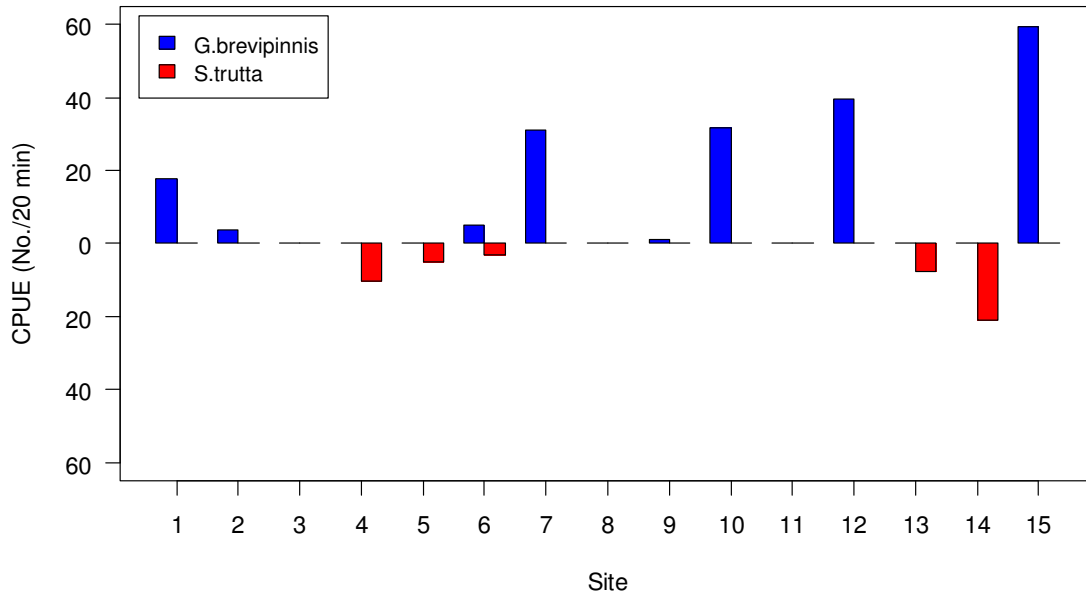
Reserve Name: Savage River Pipeline Regional Reserve

Number of taxa: 4 fish (1 crayfish)

Appendix 1, Table 5. Full species list for the Savage River Pipeline Regional Reserve							
Family	Species	Common name	New record	Putative new species	EPBC Listed	State or Territory Listed	Weed, Pest or Introduced
Anguillidae	<i>Anguilla australis</i>	Short-finned eel					
Galaxiidae	<i>Galaxias brevipinnis</i>	Climbing galaxias					
Geotriidae	<i>Geotria australis</i>	Pouched lamprey					
Salmonidae	<i>Salmo trutta</i>	Brown trout					✓
Parastidae	<i>Astacopsis tricornis</i>	Western crayfish					
Parastidae	<i>Engaeus fossor</i>	NA	✓				

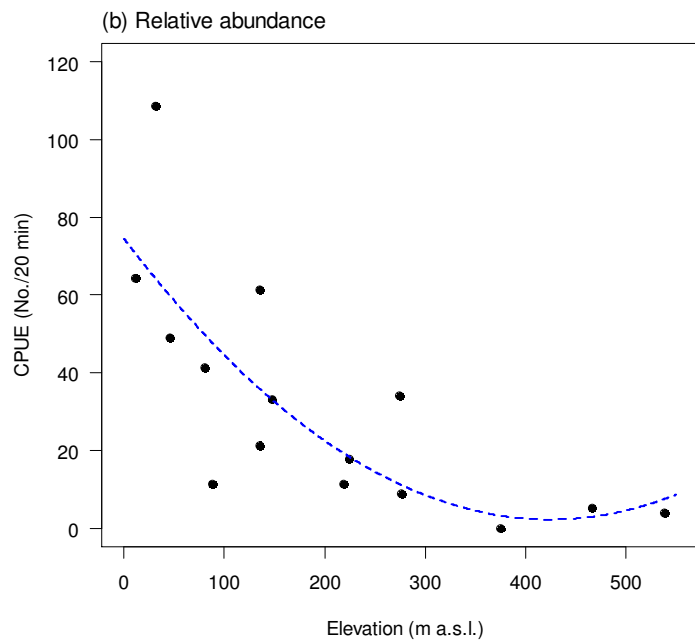
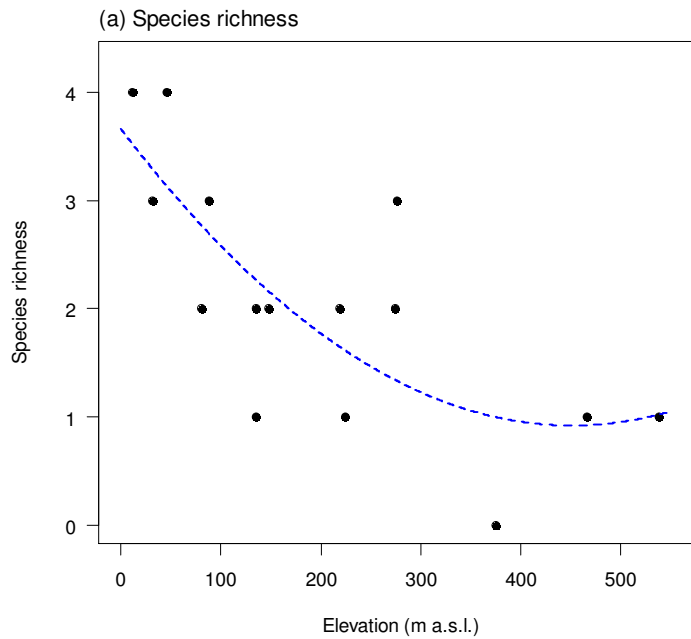
Appendix 3. Relative abundance of native climbing galaxias and introduced brown trout at survey sites in rivers in the Tarkine region.

Relative abundances of climbing galaxias (*Galaxias brevipinnis*) and brown trout (*Salmo trutta*) are displayed inversely to represent the mostly mutual exclusive occurrence of these species at the survey sites. Only site numbers are shown clarity; see Table 1 for site names.



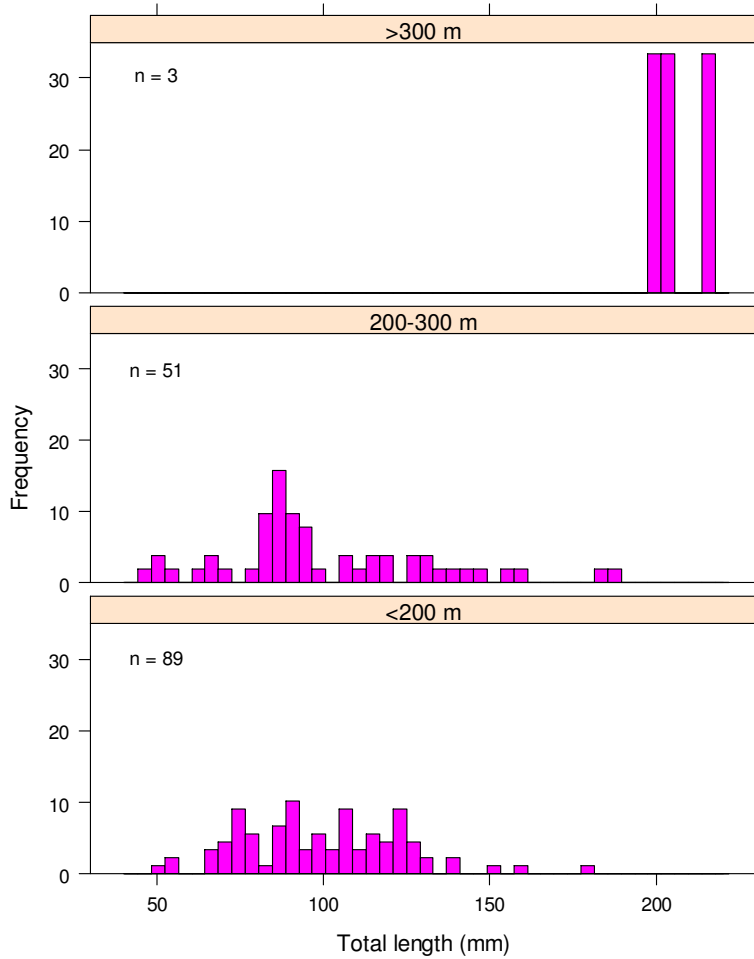
Appendix 4. Relationships between fish species richness and relative abundance and elevation at survey sites in rivers in the Tarkine region.

Relationships are represented using polynomial regression with quadratic terms (blue lines).



Appendix 5. Length frequencies of native climbing galaxias captured at survey sites in rivers in the Tarkine region according to elevations classes.

Elevation classes are: <200 m a.s.l, 200-300 m a.s.l. and >300 m a.s.l.



Appendix 6. Financial Statement

I hereby certify that all funds for this project have been spent in the manner and for the purposes specified by the contract.

Name: _____

Signed: _____

Date: _____