Avon River Pool Invertebrate Survey

Report to the Species and Communities Branch, Department of Environment and Conservation

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Introduction

The Avon River basin is the major river system located in the central wheatbelt of Western Australia. Composed of three water catchments; the Avon, Yilgarn and Lockhart, the basin covers an area of over 120,000 km^2 (Water and Rivers Commission and Avon River Management Authority 1999). Between 1956 and 1972 the Avon River was 'trained' in an attempt to prevent flooding. The River Training Scheme involved gouging out the river bed and removing the braided channels to form one large channel from Brookton to Toodyay. This allowed an increase in water flow, reducing the risk of flood. However, the increased flow rate was able to carry with it large sediment loads. The results of this have been disastrous for the river pools that were a significant feature of the Avon. The Avon River originally had twenty six major pools, some being over 10m deep, however six of the pools have been almost filled with sediment and seven are totally filled with sediment (Davies and Ecoscape 1997). The Avon River pools are significant aquatic ecosystems in a considerably altered semi-arid landscape, which provide a summer refuge for a variety of wildlife. The major risks to the pool ecosystems are from further salinisation, sedimentation and excess nutrients, which allow the growth of algal blooms. Furthermore as the pools fill, the water temperature increases. The salinity of the Avon is already high, reducing the habitat suitability for many aquatic organisms.

This report presents the results of a survey of aquatic invertebrates from four river pools in the Avon River. The survey was commissioned by, the Species and Communities Branch as part of an assessment to list the river pools invertebrates as a Threatened Ecological Community. The aim of this project was to survey the aquatic invertebrate fauna and assess their regional significance.

Methods

Four river pools within the Avon River were sampled for aquatic invertebrates; Deep Pool, Mile Pool, Wilberforce Pool and Gwambygine Pool. At Gwambygine Pool two samples were collected within the pool, one on the north side and one on the south side. The pools were sampled on the 12th and 13th February 2007.

The sampling of aquatic invertebrates was carried out by the Species and Communities Branch, according to methods used by the Department of Environment

and Conservation (DEC) Science Branch. Macroinvertebrates were collected using a D-net with a 250μm mesh size and preserved in alcohol.

Invertebrates were sorted under a dissecting microscope and identified to the lowest possible taxon. In most cases this was to species, however for some dipteran groups, family was the lowest determination possible. All taxonomic identifications were carried out by the author, with the exception of the Oligochaeta, which were identified by Adrian Pinder (DEC), and the fish, which were identified by David Cale (DEC).

Results and Discussion

A total of 43 taxa thought to be distinct species were collected from the four wetlands, with 22 taxa at Deep Pool, 17 at Wilberforce Pool, 24 at Mile Pool and 31 at Gwambygine Pool (21 taxa at the north site and 21 taxa at the south site). As well as invertebrates, 2 fish species were collected: *Pseudogobius olorum, Gambusia holbrooki.* (Table 1.). *Fluviolanatus subtorta, Austrochiltonia subtenuis, Onychocamptus bengalensis, Monohelea sp, Procladius paludicola, Tanytarsus fuscithorax/semibarbitarsus, Oecetis sp.*and *Gambusia holbrooki* were found at every site.

Two taxonomic groups comprised the bulk of the invertebrate species collected. Insects were the most species rich and comprised 72% (34 spp) of the fauna. All of these species include winged stages and disperse readily; consequently they tend to be ubiquitous and commonly collected. Crustacea comprised 14% (7 spp) of the fauna, which are more restricted in dispersal capability. Other studies (Smith 1996; Kay *et al.* 2001) also showed that the aquatic invertebrate fauna of the Avon was dominated by insects and crustaceans.

Although all species are commonly found, some other elements of the fauna are of interest. Several species collected; *Hydrodroma sp., Berosus dallasi* (Watts 1987) and *Helochares tatei* (Watts 1995) are all northern species, which were commonly collected in the Pilbara Survey conducted by DEC, but have had few occurrences in the wheatbelt region. *Berosus dallasi* has only been found at three other sites in the south-west; Calyerup Creek and Hamersley River near Esperance, and Tutunnup near Busselton. *Hydrodroma* have been collected widely in north-west and occurs on the Swan Coastal Plain but in the wheatbelt the genus is known only from three reservoirs. *Helochares tatei* had not been collected south of Geraldton in Western Australia before this survey but is common in the north-west. These species may have migrated south to the Avon river pools from northern latitudes or these records may represent peripheral rarity. Pinder et al. (2004) also recorded a number of invertebrates in the northern wheatbelt on the southern edge of northern ranges.

Physical data, collected by a hydrologist at the time of sampling, showed the pools to have a high level of salinity, ranging from 7.9 g/L at Deep Pool to 20.5g/L at Wilberforce Pool (Table 2.). All pools experienced relatively high temperatures, with surface temperatures recorded between 24.5°C and 29.7°C. Even though there was a slight thermal variation between the surface and bottom water, the only pool that was slightly stratified (9°C and 1.3g/L) was Wilberforce Pool at the deepest point (unpublished data, Lance Mudgway). The lower number of species collected at Wilberforce Pool may be a result of this increased salinity and slight stratification.

Most of the species collected have been previously been recorded to have a high tolerance to saline conditions. Two species collected, *Sulcanus conflictus* and *Fluviolantus subtorta,* are estuarine species, which are found in the Swan Estuary and have migrated upriver to the Avon River pools. *Fluviolantus subtorta* has been found to survive in salinities up to 29g/L in the Swan River system (Ashman *et al.* 1969). *Sulcanus conflictus* has the ability to produce diapause eggs, which may help explain its widespread distribution (Hodgkin and Rippingale 1971; Newton and Mitchell 1999). *Cletocamptus dietersi* is most frequently found in mildly saline waters at locations with recent or past connections to the sea or to exorheic saline rivers. *Halicyclops sp. 1 (nr ambiguus,)* and *Palaemonetes australis* are both riverine species with a high salt tolerance (Bailey *et al.* 2002). *Austrochiltonia subtenuis* is common throughout saline southern lowland rivers (Hart *et al.* 1991), as well as many wetlands. Other salt tolerant species collected have been commonly recorded in the wetlands of the Swan coastal plain and wheatbelt region. Pinder *et al.*(2004) found the midges *Tanytarsus fuscithorax* and *Procladius paludicola,* the amphipod *Austrochiltonia subtenuis* and the beetle *Necterosoma pencilllatus* were particularly eurytolerant with respect to salinity. The ostracod genus *Mytilocypris* is characteristic of moderately saline waters, but De Dekker and Geddes (1980)state it is not present in highly saline lakes. Cheal *et al.* (1993) and Pinder *et al.* (2005) also found the freshwater species *Micronecta robusta* and *Triplectides australis* to be salt tolerant occurring in saline water up to 16.7g/L and 11.7g/L respectively. The Australian Biodiversity Salt Sensitivity Database (Bailey *et al.* 2002) has also recorded the above mentioned species in saline water (> 10g/L) as well as the genus *Oecetis* which has occurred in salinities higher than 35g/L. Smith (1996) also noted that fauna of the Avon River appeared to be restricted to salt tolerant species, however it is uncertain whether the macroinvertebrate fauna has changed as a result of human activities in the catchment as the river is thought to have had naturally high periods of saline water before European settlement.

Except for Gwambygine Pool, there has been little aquatic invertebrate survey work done on the Avon River Pools. The Monitoring River Health Initiative found 57 families (not species) across 20 sites located in the Avon region. The three pools sampled; Dewars, Duck and Gwambygine having 15, 15 and 14 families recorded, respectively. Smith (1996), found a total of 100 taxa collected from 19 sites along the Avon River, 22 taxa were found at Gwambygine. A previous survey undertaken by the River Conservation Society (1999) at Gwambygine Pool found over 50 taxa. The pool was sampled monthly for 17 months. The highest species richness occurred in October with 24 species collected. They found the species diversity varied seasonally with some species being more prevalent at seasonal and shorter temporal cycles. By comparing species recorded in February 1996, 1997 and this study, 2007 (11, 19 and 31 species respectively), there also seems to be a distinct annual variation in species diversity.

The Avon River pools have a relatively low species diversity (between 17 and 31 species, Table 1.) when compared to other river pools in the Avon region. During the Wheatbelt survey conducted by DEC, Twonkwilling Pool near Katanning (salinity 7.9 g/L) had 36 macroinvetebrates species and Dewars Pool on Toodyay Brook (salinity 5.7 g/L) had 41. This study recorded 9 species that also occurred at both Twonkilling and Dewars Pools (Figure 1.). Most of these species are saline tolerant wetland species discussed above. Both Twonkilling and Dewars Pool had a higher number of

beetles and dragonflies, than the Avon Pools. This may be a result of the fauna not surviving the increased salinities in the Avon pools over the summer or seasonal variation in species composition. The Gwambygine study (River Conservation Society Inc. 1999) also recorded a higher number of beetles and dragonflies than this study, but the species diversity did vary seasonally.

In this study only one species of mollusc was found, *Fluviolantus subtorta*. Previous studies by Kendrick (1976) and Smith (1996), found *F. subtorta* to be the most abundant mollusc recorded in the Avon River, and thought it to be the only bivalve currently inhabiting the Avon river. They recorded other species of molluscs, that were not collected during this study, however this may be due to the sampling period occurring in the summer when conditions are harsher in the pools, with higher conductivities, increasing temperatures and possible stratification occurring. In the early 1940's the large mussel *Westralunio cateri* was present in the Avon Pools but it was thought to have become extinct due to an increase in salinity (Kendrick, 1976; (Smith 1996). However, a study by the River Conservation Society (1999) reported *W.cateri* at Gwambygine Pool in low abundances. Further research would be needed to confirm if there has been a reduction in number of species of molluscs in the Avon pools, or whether the reduction of these species is due to annual variation in species composition and abundance.

Conclusion

The aquatic invertebrates in the Avon River pools appear to consist mainly of salt tolerant species, which are common and widespread in the wheatbelt region. However, there are a few species (those discussed above), which appear to be more northern in origin occurring seldom in the wheatbelt region. The river pools are important ecologically as they support a unique suite of aquatic invertebrates from different origins (i.e. northern, estuarine, riverine and wetland), some of which do not occur in nearby wetlands. The pools are providing an important refuge to many aquatic fauna, as there is still a diversity of aquatic invertebrates inhabiting the pools over the summer period when conditions elsewhere are unfavorable to many species. Further research on the seasonal variation in composition and diversity of the aquatic invertebrates would provide a better indication of the regional significance of the river pools.

Table 1. Taxa collected in the Avon River Pools during February 2007. Presence is shown in log abundance. DEC code is the unique identifier for these species in the Wetlands Database maintained by DEC, Science Division.

Taxa	DEC Code	Deep	Wilberforce	Mile	Gwambygine North	Gwambygine South	Distribution
ACARINA (watermites)							
Hydrodroma sp.	1235	2		2	1		Common northern species
Oribatida	1367				1		Common
Trombidioidea	1370	1			1	1	Common
Mesostigmata	1368	1		1			Common
BIVALVIA (aquatic mussels)							
Fluviolanatus subtorta	1070	3	3	3	1	1	Common estuarine
AMPHIPODA	2056						
Austrochiltonia subtenuis	1905	1	1	1	1	2	Common
COPEPODA							
Cletocamptus dietersi	1988		1	2	1	2	Common
Halicyclops sp. 1 (nr ambiguus) (SAP)#	1933			1			Common river
Onychocamptus bengalensis	2001	1	1	2	1	2	Common
Sulcanus conflictus	1905		2	1		2	Common estuarine
DECAPODA							
Palaemonetes australis	2191	1		1			Common river/estuarine
OSTRACODA							
Mytilocypris mytiloides	1782		1			1	Common
COLEOPTERA (beetles)							
Allodessus bistrigatus	2300	1					Common
Berosus australiae	2494		1				Common
Berosus dallasi	2499		1		1	1	Common northern species
*Berosus sp. **	2526			1			Common
Carabidae	2218					1	Common
*Helochares sp. **	2552					1	Common northern species
Helochares tatei	2550				1		Common northern species
Necterosoma penicillatus	2369	1		1		1	Common
Necterosoma sp.*	2378		1				Common
Ochthebius sp.	2870				1		Common
Sternopriscus multimaculatus	2363					1	Common
*Sternopriscus sp. **	2363				1		Common
DIPTERA (flies)							
Chironomus aff. alternans (V24) (CB)#	3296	2		2			Common
Chironomus tepperi	3293	2					Common
Cladotanytarsus sp. A (SAP)#	3214		1		1		Common
Corynoneura sp.	139	1					Common
Culicoides sp.	2869		2	2	3	2	Common
Ephydridae sp. 7(SAP)#	2974					1	Common
Monohelea sp. 1 (SAP)#	2871	2	2	2	1	1	Common

Taxa	DEC code	Deep	Wilberforce	Mile	Gwambygine North	Gwambygine South	Distribution
DIPTERA (flies)							
Muscidae sp. A (SAP)#	2976					1	Common
Nilobezzia sp. 1 (SAP)#	2876	1			2		Common
Polypedilum nubifer	3228			2			Common
Procladius paludicola	3037	2	3	3	3	3	Common
Tabanidae	2952			1			Common
Tanytarsus fuscithorax/semibarbitarsus	3326	3	2	3	2	1	Common
EPHEMEROPTERA (mayflies)							
Tasmanocoenis tillyardi	3414	1		1			Common
HEMIPTERA (water bugs)							
Agraptocorixa sp.	3622		1			1	Common
*Corixidae**	3646	1					Common
Micronecta robusta	3626	1		1	3	3	Common
LEPIDOPTERA							
Pyralidae sp. 40 of JHH (PSW)#	4518			1			Common
ODONATA (drangonflies and damselflies)							
Ischnura heterosticta heterosticta	3787	1	1	1			Common
Ischnura sp.*	3790					1	Common
Orthetrum caledonicum	3938				1		Common
TRICHOPTERA							
Oecetis sp.	4351	2	1	2	2	2	Common
Triplectides australis	4367	1			1		Common
ANNELIDA (leeches and worms)							
Potamothrix bavaricus	1121			2			Common
PISCES (fish)							
Gambusia holbrooki		2	1	2	1	1	Common, introduced
Pseudogobius olorum				1			Common
Species Richness		**22**	**17**	**24**	**21**	**21**	

* Larvae or early instar only; no further determination possible.
# number code used in the DEC voucher collection

Figure 1. List of species common to the three locations; Twonkilling Pool, Dewars Pool and the Avon Pools from this study.

Trombidioidea
Austrochiltonia subtenuis
Necterosoma penicillatus / *Necterosoma sp* (larvae)
Chironomus aff. alternans
Monohelea sp. 1 (SAP)
Procladius paludicola
Tanytarsus fuscithorax/semibarbitarsus
Micronecta robusta
Triplectides australis

Table 2. Physical parameters measured by Lance Mudgway, (Hydrologist) at time of sampling.

Site		Salinity (g/L)	pH	Temperature (°C)	Max. depth (m)
Deep Pool	Av. Surface	8.2	6.8	24.5	
	Av. Bottom	7.9	5.2	22.8	
	Av. Centre	8.1	6.9	24.1	5.1
Mile Pool	Av. Surface	8.3	8.1	29.0	
	Av. Bottom	8.5	6.6	22.6	
	Av. Centre	8.2	8.1	29.0	4.6
Wilberforce Pool	Av. Surface	20.5	7.9	29.7	
	Av. Bottom	20.5	6.9	26.4	
	Av. Centre	20.5	7.8	29.6	2.5
Gwambygine Pool	Av. Surface	13.2	7.4	26.0	
	Av. Bottom	13.2	6.4	25.6	
	Av. Centre	13.7	7.5	25.2	3.8

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