Appendix J
Aquatic Fauna

Contents

Appendix J Aquatic Fauna

Appendix J.1
Aquatic Fauna Survey Methodology

Aquatic Fauna Survey Methodology

Sampling methods for the aquatic survey were dependant on site conditions, but various sampling procedures were used, including seine netting, gill netting, cast netting, fish trapping, macroinvertebrate dip netting (or "kick-sampling"), hook and line fishing and visual observations during both day and night. Fish and most other vertebrate, crustacean and mollusc specimens were generally identified and released at the point of capture. Some specimens were retained for verification. Taxonomy and common names of fish species generally conform to Allen *et al* (2002) and macroinvertebrate taxonomy follows Gunn *et al* (2000).

At each site aquatic macroinvertebrates were sampled from the main in-stream habitat type present. In many cases a single habitat was sampled at each site, however at sites AQ10 and AQ11 a number of habitat types were sampled (riffle and edge habitats). The main habitats sampled included sandbed, edge and riffle (Dostine 2002). At two sites other habitats were sampled, including rockpool (AQ3) and macrophyte edge (AQ10). Macroinvertebrate samples were not collected at sites on the McArthur River upstream of AQ6 (AQ8 and AQ9).

Samples were collected using a standard 250 micron mesh macroinvertebrate dipnet. Sampling involved disturbing an area of sediment/cobble/in-stream vegetation along a 10 m transect with the net held downstream to capture organisms present in the water column and/or dislodged from substrates. Samples were preserved in 70% ethanol solution for laboratory sorting.

Samples were washed through a 250 micron sieve to remove fine silt and washed though a 10 mm sieve to remove larger debris. Due to limitations on sorting time sub-sampling was undertaken to remove 50% of the material collected in each net sample. The remaining material was hand picked using a stereo dissecting microscope for the length of time required to remove specimens for further identification and estimate numbers of smaller taxa (such as microcrustacea, acarina). In general the picking was undertaken for a minimum of 30 minutes per sample, and continued until all invertebrates had been removed for identification and/or counted.

A sample of each taxa was removed and numbers of the remaining specimens estimated. Specimens removed from samples were subsequently identified to family level using a dissecting microscope and taxonomic keys. Exceptions to this included the chironomids (subfamily). Pupae and larvae of groups including the Coleoptera, Diptera and Trichoptera were not identified to family level.

References used in the Aquatic Survey

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Midgley, S. H. (1982) *A Biological Resource Study of Fresh waters of the Lake Eyre Drainage, the Inland Drainage and the Gulf of Carpentaria Drainage.* Report for NT Fishing Industry Research and Development Trust Fund.

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Aquatic Ecological Habitat Descriptions and Data

Methods: O=observations; M=Macroinvertebrate net; S=Seine net; C=Cast Net; T=Trap; L=Line fishing; G+Gill Net D=Dip net; N=Night spotlighting.

	A1a	A1b	A2	A3	A4	A5a	A5b	A6	A7	A8	A9	A10	A11	A12
Date sampled	7.12.02	7.12.02	7.12.02	7.12.02	8.12.02	10.12.02	11.12.02	12.12.02	3.04.03	3.04.03	4.04.03	05.04.03	7.04.03	7.04.03
Methods	O,S,C,T,L, D,N	O,S,C,T,L, D,N	O,L	M	S,M	O,M,S,C,T ,L,D,N	O,S,C,T,L,D, N	O,M,S	O,N	O,L	O,M,T,L,G ,N	O,M,S	O,M	O,S,M
Lats/Longs	16^{0}29' N 136^{0}10' E	16^{0}29' N 136^{0}10' E	16^{0}29' N 136^{0}11' E	16^{0}29' N 136^{0}12' E	16^{0}28' N 136^{0}12' E	16^{0}32' N 136^{0}11' E	16^{0}32' N 136^{0}11' E	16^{0}25' N 136^{0}05' E	16^{0}24' N 136^{0}06' E	16^{0}45' N 136^{0}35' E	16^{0}27' N 136^{0}04' E	16^{0}36' N 136^{0}10' E	16^{0}25' N 136^{0}07' E	16^{0}26' N 136^{0}05' E
Location	Glyde River, junction of east branch	Glyde River, 150 upstream junction of east branch	Glyde River east branch	Glyde River upper east branch	Glyde River, main channel	Glyde River main channel	Glyde River main channel	McArthur River Mine crossing	McArthur R mine pit area	McArthur River, Top crossing	McArthur River Dirimini Waterhole	Glyde River, Amelia Springs	McArthur River at Mount Stubbs	Barney Creek below Surprise Ck junction
Habitat	small isolated pool in exposed sandstone gorge	small isolated pool in exposed sandstone gorge	large refuge pool fringed with melaleacas	small isolated pool on exposed sandstone stream	small isolated pool in exposed sandstone gorge	small isolated pool in exposed sandstone gorge	large permanent refuge pool in sandstone gorge	main channel of river	main channel of river	main channel of river	large permanent refuge pool	Off-river permanen t spring	main channel of river	ephemeral stream
Average width (m)	6	15	10	2	6	10	15	8	8	6	10	20	8	5
Average depth (m)	1	105	<2	1	0.5	1	0.75	1	1	>1	>2	>2	>2	0.5
Maximum depth (m)	<2	>2	<3	1	0.8	1.2	1	>2	1.5	>2	>3	>3	>2	0.8
Total habitat % - sand/silt bed	80-100	1-20	60-80	0	80-100	80-100	60-80	60-80	80-100	40-60	80-100	80-100	60-80	20-40
Total habitat % - gravel/rock bed	1-20	0	1-20	80-100	0	0	1-20	40-60	0	1-20	0	0	0	60-80
Total habitat % - riffle	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total habitat % - macrophyte	0	0	0	0	40-60	1-20	0	0	0	0	0	0	0	0
Total habitat % - snags	0	0	10	0	0	0	0	0	0	0	20	0	1-20	0

Appendix J.2
Aquatic Site Description

	A1a	A1b	A2	A3	A4	A5a	A5b	A6	A7	A8	A9	A10	A11	A12
Water flow/level	1 - no flow	1 - no flow	1 - no flow	1 - no flow	1 - no flow	1 - no flow	1- no flow	2 - low	4 - high	3 - moderate	3 - moderate	2 - low	3 - moderate	2 - low
Visual Turbidity (scale 1-4)	2 - slight	3 - turbid	2 - slight	1 - clear	2 - slight	4 - opaque	2 - slight	3 - turbid	2 - slight	2 - slight	2 - slight	1 - clear	2 - slight	3 - turbid
Water surface scum	1 - not present	1 - not present	1 - not present	1 - not present	3 - widespread	2 - patchy, isolated	2 - patchy, isolated	2 - patchy, isolated	1 - not present	1 - not present	1 - not present	3 - widespread	1 - not present	1 - not present
Sediment coverage	4 - extensive	4 - extensive	1 - none	1 - none	3 - moderate	3 - moderate	3 - moderate	4 - extensive	3 - moderate	1 - none	1 - none	1 - none	2 - limited	1 - none
Sediment type	1 - sand	1 - sand	-	-	1 - sand	1 - sand	1 - sand	2 - fine clay	1 - sand	-	-	-	1 - sand	-
Max. sediment depth (cm)	>30	0-5	-	-	0-5	-	-	5-15	-	-	-	-	0-5	-
Bankside erosion	1 - none	1 - none	1 - none	1 - none	1 - none	1 - none	1 - none	1 - none	1 - none	1 - none	1 - none	1 - none	1 - none	1 - none
Vegetation cover of river %	<20	20-40	60-80	0-20	60-80	20-40	20-40	20-40	60-80	60-80	60-80	20-40	60-80	40-60
Algae - water column	2 - sparse	1 - none	1 - none	2 - sparse	3 - dense	2 - sparse	2 - sparse	1 - none	1 - none	1 - none	1 - none	1 - none	1 - none	1 - none
Algae - substrate (%)	2 - sparse	2 - sparse	2 - sparse	1 - none	3 - dense	2 - sparse	2 - sparse	2 - sparse	1 - none	1 - none	1 - none	1 - none	1 - none	1 - none
Aquatic vegetation	none	*Vallisneria giganteum Najas tenuifolium*	none	none	*Vallisneria giganteum Najas tenuifolium*	*Vallisneria giganteum Najas tenuifolium, Nymphaea violacea*	none	none	1 - none	1 - none	1 - none	*Nymphaea violacea*	1 - none	1 - none
Disturbance	1 - undisturbed	1 - undisturbed	1 - undisturbed	1 - undisturbed	1 - undisturbed	1 - undisturbed	1 - undisturbed	2 - low disturbance	2 - low disturbance	2 - low disturbance	2 - low disturbance	1 - undisturbed	1 - undisturbed	1 - undisturbed
Current weather	1 - fine, clear	1 - fine, clear	1 - fine, clear	1 - fine, clear	1 - fine, clear	1 - fine, clear	1 - fine, clear	1 - fine, clear	1 - fine, clear	1 - fine, clear	1 - fine, clear	1 - fine, clear	1 - fine, clear	1 - fine, clear
Rain in past week	4 - no rain	4 - no rain	4 - no rain	4 - no rain	4 - no rain	4 - no rain	4 - no rain	4 - no rain	4 - no rain	4 - no rain	4 - no rain	4 - no rain	4 - no rain	4 - no rain

Appendix J.3
Distribution of Freshwater Fishes of the McArthur River

Distribution of freshwater fishes in the McArthur River from 1975 to 2003

Sources: 1 =Current study; 2: Hollingsworth Dames & Moore (1992); 3: Hanley (1993); 4: Midgley (1975, 1982, 1994)
* not identified to species level, but likely to be one of the 3 recorded *Arius* species (not included in total count)
Note: taxonomy from previous studies updated to conform with Allen *et al* (2002).

Name of Fish		McArthur River middle reaches	Barney/Surprise Creeks	Upper McArthur River and tributaries	Glyde River
Common Name	**Scientific Name**				
Freshwater Sawfish	*Pristis microdon*	4		4	4
Mullet	Mugilidae sp	4			
Bony Bream	*Nematalosa erebi*	1,4	1	2,4	1,4
Ox-eye Herring	*Megalops cyprinoides*	1		4	
Berney's Catfish	*Arius berneyi*	1			1
Salmon Catfish	*Arius leptaspis*	2			
Gulf Shovel-nosed Catfish	*Arius paucus*	1,2		4	1
*Catfish	*Arius spp.*	4		4	4
Black Catfish	*Neosilurus ater*			4	1
Hyrtl's Catfish	*Neosilurus hyrtlii*	1,4	1,2,3	2,4	
Rendahl's Catfish	*Porochilus rendahli*	4	2	4	
Long Tom	*Strongylura krefftii*	1,4	1	4	1,4
Fly-specked Hardyhead	*Craterocephalus stercusmuscarum*	1,4		2,4	1,4
Chequered Rainbowfish	*Melanotaenia splendida inornata*	1,2,4	1,2,3	2,4	1
Macleay's Glassfish	*Ambassis macleayi*	1,4		2,4	1,4
Northwest Glassfish	*Ambassis sp*		1,2,3		
Purple-spotted Gudgeon	*Mogurnda mogurnda*			4	
Barramundi	*Lates calcarifer*	4		4	1,4

Appendix J.3
Distribution of Freshwater Fishes of the McArthur River

Name of Fish		McArthur River middle reaches	Barney/Surprise Creeks	Upper McArthur River and tributaries	Glyde River
Common Name	**Scientific Name**				
Barred Grunter	*Amniataba percoides*	1,4	1	1,2,4	1,4
Sooty Grunter	*Hephaestus fuliginosus*	1,2,4	3	2,4	1,4
Spangled Perch	*Leiopotherapon unicolor*	1,2,4	1,2,3	1,2,4	1,4
Gulf Grunter	*Scortum ogilbyi*			4	
Spotted Scat	*Scatophagus argus*	1			
Mouth Almighty	*Glossamia aprion*	1,2,4		1,2,4	1
Seven-spot Archerfish	*Toxotes chatareus*	1,2,4	1,3	2,4	1,4
Flathead Goby	*Glossogobius giurus*	1,4	3	2	1,4
Sleepy Cod	*Oxyeleotris lineolata*	1,2,4		4	1
Selheim's Sole	*Brachirus selheimi*	4			
TOTAL Species	**27**	**23**	**11**	**21**	**17**

Appendix J.4
Results of Aquatic Surveys

Results of McArthur River Aquatic Surveys 2002-2003

Aquatic Survey Methods: O=observations; M=Macroinvertebrate net; S=Seine net; C=Cast Net; G=Gill Net;T=Trap; L=Line fishing; D=Dip net; N=Night spotlighting.

Common name	Scientific name	A1a	A1b	A2	A3	A4	A5a	A5b	A6	A7	A8	A9	A10	A11	A12	Total
Bony Bream	*Nematalosa erebi*	O	O			S	S	O		O		O	O		S	**9**
Ox-eye Herring	*Megalops cyprinoides*											O				**1**
Berney's Catfish	*Arius berneyi*			L				T				G,L				**3**
Gulf Shovel-nosed Catfish	*Arius paucus*		L	L								L				**3**
Black Catfish	*Neosilurus ater*							O					O			**2**
Hyrtl's Catfish	*Neosilurus hyrtlii*	O							S	O		O			O,S	**5**
Long Tom	*Strongylura krefftii*	O					S	O		O		O			O	**6**
Fly-specked Hardyhead	*Craterocephalus stercusmuscarum*					S	S	T					O			**4**
Chequered Rainbowfish	*Melanotaenia splendida inornata*	O	O	O				O	S	O	O	O	O	O	O,S	**11**
Macleay's Glassfish	*Ambassis macleayi*	O,T	T			S	S	T	S	O		O				**8**
Glassfish	*Ambassis sp.*														S	**1**
Barramundi	*Lates calcarifer*			L		S		L					O			**4**
Barred Grunter	*Amniataba percoides*	O,T		O		S	S	O	S		O	O,T	O	O	O,S	**11**
Sooty Grunter	*Hephaestus fuliginosus*	O,T	L	L			S	L	O			L,O,T	O			**8**
Spangled Perch	*Leiopotherapon unicolor*						S			O	O	O	O	O	O,S	**7**
Spotted Scat	*Scatophagus argus*									O		O				**2**
Mouth Almighty	*Glossamia aprion*					S	S		S	O						**4**
Seven-spot Archerfish	*Toxotes chatareus*	O	O	O				T,O	O	O	O	O,G	O	O	O	**11**
Flathead Goby	*Glossogobius giurus*	O				S	S	O	S	O		O	O	O		**9**
Sleepy Cod	*Oxyeleotris lineolata*	T	T					O	O	O		O				**6**

Common name	Scientific name	A1a	A1b	A2	A3	A4	A5a	A5b	A6	A7	A8	A9	A10	A11	A12	Total
																0
																0
Freshwater Crocodile	*Crocodylus johnstoni*	O	O	O			S	O	O	O		O				**8**
Worrell's Turtle	*Emydura worrelli*	O,T	O				S	T,L,O		O		L,T	O			**7**
Arafura File Snake	*Acrochordus arafurae*									O		O				**2**
Freshwater Mussel	*Velesunio angasi*	O	O							O		O				**4**
Giant Freshwater Prawn	*Macrobrachium rosenbergii*	T	T						O							**3**
Freshwater Crayfish	*Cherax quadricarinatus*								O	O		O				**3**
Freshwater Crab	*Holthusiana transversa*														O	**1**

Other Aquatic Survey Results

Sources: 1 =Current study; 2: Hollingsworth Dames & Moore (1992); 3: Hanley (1993); 4: Midgley (1975, 1982, 1994)

Common Species Name	Scientific Species Name	Survey			
Freshwater Crocodile	*Crocodylus johnstoni*	1			1
Worrell's Turtle	*Emydura worrelli*	1			1
Arafura File Snake	*Acrochordus arafurae*	1			
Freshwater Mussel	*Velesunio angasi*	1,2,4	1,3	4	1,4
Freshwater snail	*Notopala sp*		3		
Giant Freshwater Prawn	*Macrobrachium rosenbergii*	1,2,4	3	4	1,4
Freshwater Prawn	*Macrobrachium sp*	4		4	4
Freshwater Crayfish	*Cherax quadricarinatus*	1,2,4		4	1,4
Freshwater Crab	*Holthusiana transversa*		1,2,3	4	

Appendix J.5
Aquatic Macroinvertebrates

Appendix J.5a Aquatic Macroinvertebrate Diversity

In-stream macroinvertebrate species diversity (Shannon-Weiner diversity index) was greatest in the macrophyte edge habitat sample on Amelia Creek Aq 10 (Shannon-Weiner Diversity 2.97). This sample scored the highest species richness for any sample (Species Richness 6.81). This site differs from all other sites sampled in that Amelia Creek represents permanent spring-fed aquatic habitat and supports dense aquatic macrophytes at the edge site sampled.

Riffle habitats on Amelia Creek (Aq10, Shannon-Weiner Diversity 2.47) and on the main McArthur River channel (Aq7, Shannon-Weiner Diversity 2.27) also displayed high species diversity relative to other habitats/sites sampled. Sand bed habitats and edge habitat on the Glyde and McArthur Rivers recorded moderate to low levels of species richness/diversity, the poorest result at sand bed habitat Site Aq1 Glyde River late dry season (Shannon-Weiner Diversity 0.325, Species Richness 1.96). This site also recorded the lowest evenness (0.117) for any sample, indicating the domination of the sample by a few abundant taxa, caused by the presence of a very high density of one type of microcrustacea (Ostracoda).

A dendrogram for hierarchical clustering of the twelve aquatic macroinvertebrate samples using group-average linking of Bray-Curtis similarities is presented below. Riffle and edge habitats form a distinct group which includes samples that displayed moderate to high species richness and diversity relative to other sites. Sand bed and rock pool habitats form another distinct grouping. The sand bed habitat sampled at Aq1 on the Glyde River (12/2002) shows a low level of similarity with other samples and falls between these two groupings, possibly due to the presence of macrophytes in the vicinity of the sample site. It is notable that riffle habitats sampled in the late wet season/early dry season (Surprise Creek Aq 12 and McArthur River Aq 7) display a low level of similarity to similar habitats sampled during the late dry season (for example riffle habitat at Aq6). This may be due in part to the influence of major flooding that occurred prior to the collection of the April 2003 samples, and which caused major scouring and relocation of sediment in the river/creek channels.

Appendix J.5b Aquatic Macroinvertebrate Sampling Results December 2002/April 2003

Tributaries: GL = Glyde River; MC = McArthur River; AC = Amelia Creek; SC = Surprise Creek Habitats: SB = Sandbed Habitat; RP = Rock Pool Habitat; ED = Edge Habitat; RIF = Riffle Habitat; ME = Macrophyte Edge Habitat

Order/Class	Family	Genus/species	Aq1 GL SB	Aq2 GL SB	Aq3 GL RP	Aq4 GL SB	Aq5 GL SB	Aq6 MC RIF	Aq7 MC RIF	Aq10.1 AC RIF	Aq10.2 AC ME	Aq11 MC ED	Aq12.1 SC RIF	Aq12.2 SC ED	Total No.
Annelida	Tubificidae	Tubificidae type 1		1	8										9
Annelida	Naididae	Naididae type 1		33		54									87
Mollusca	Lymnaeidae	*Austropeplea tomentosa*					14	6			1			1	22
Mollusca	Hydriidae	*Velesunio angasi*	1												1
Mollusca	Planorbidae	*Gyraulus sp.*		2		39	72	4		2					119
Mollusca	Planorbidae	*Amerianna sp.*				3	18								21
Mollusca	Ancylidae	*Ferrissia* sp. ?												1	1
Mollusca	Corbiculidae	*Corbicula sp.*						1	1						2
Mollusca	unident mollusca	*Gen. sp. unident*									1				1
Acarina	Unionicolidae	Unionicolinae sp.1				6					30				36
Acarina	Unionicolidae	Unionicolinae sp. 2				5	1					3			9
Acarina	Unionicolidae	Pionatacinae sp. 1				1									1
Acarina	Anisitsiellidae	Anisitsiellidae sp. 1									5				5
Acarina	Arrenuridae	*Arrenurus* sp. 1	5				1								6
Acarina	Hygrobatidae	Hygrobatidae sp 1	1												1
Acarina	Hygrobatidae	Hygrobatidae sp 2	5			3				6	30				44
Acarina	Pionidae	Pionidae sp 1	1												1
Acarina	Acarina	*Gen. sp. unident*								1	8				9
Crustacea	Limnadiidae	Limnadiidae sp 1			4		2								6
Crustacea	Daphniidae	Dapniidae type 1			82	380	100	20							582
Crustacea	Daphniidae	Dapniidae type 2		1	4										5
Crustacea		Ostracoda sp.	2000	85		100		200		20	5			30	2440

Appendix J.5
Aquatic Macroinvertebrates

Order/Class	Family	Genus/species	Aq1 GL SB	Aq2 GL SB	Aq3 GL RP	Aq4 GL SB	Aq5 GL SB	Aq6 MC RIF	Aq7 MC RIF	Aq10.1 AC RIF	Aq10.2 AC ME	Aq11 MC ED	Aq12.1 SC RIF	Aq12.2 SC ED	Total No.
Crustacea		Cyclopoida sp.	60	18		20	35	15		5	15				168
Crustacea	Atyidae	*Caridinides wilkinsi*				1		5		1	7	2			16
Crustacea	Palaemonidae	*Macrobrachium rosenbergii*									5	2			7
Crustacea	Parastacidae	*Cherax quadricarinatus*												1	1
Crustacea	Sundathelphusidae	*Holthuisiana transversa*												1	1
Ephemeroptera	Baetidae	*Baetidae sp.1*	12		29	7		1	31	63	19	180	4	11	357
Ephemeroptera	Baetidae	*Baetidae sp.2*						2	1	2	2				7
Ephemeroptera	Caenidae	*Caenidae sp.1*	4			14		2	16		13	45	9	4	107
Ephemeroptera	Caenidae	*Caenidae sp.2*				1		2		11	1		47	28	90
Odonata	Leptophlebiidae	*Leptophlebiidae sp.1*											3		3
Odonata	Leptophlebiidae	*Leptophlebiidae sp.2*	1												1
Odonata	Coenagrionidae	*Pseudagrion sp.1*				1	1	1		1	2				6
Odonata	Coenagrionidae	*Ishnura sp. 1*					2								2
Odonata	Gomphiidae	*Austrogomphus mjobergi*										1			1
Odonata	Libellulidae	Libellulidae sp. 1				3	2								5
Odonata	Libellulidae	Libellulidae sp. 2				2	1								3
Odonata	Libellulidae	*Nannophlebia mudginberri*											1	2	3
Odonata	Libellulidae	*Nannodiplax rubra*							2						2
Odonata	Libellulidae	*Diplacodes sp 1*						4							4
Odonata	Libellulidae	*Zyxomma sp. 1*			13										13
Hemiptera	Corixidae	*Micronecta type 1*	10								39				49
Hemiptera	Corixidae	*Micronecta type 2*			3	1	2								6
Hemiptera	Corixidae	*Micronecta type 3*		2		33	54	2			12	2		1	106
Hemiptera	Corixidae	*Micronecta type 4*									3				3
Hemiptera	Naucoridae	*Naucoris sp. 1*					1								1
Hemiptera	Gerridae	Gerridae sp. 1							2			1	2	1	6

Order/Class	Family	Genus/species	Aq1 GL SB	Aq2 GL SB	Aq3 GL RP	Aq4 GL SB	Aq5 GL SB	Aq6 MC RIF	Aq7 MC RIF	Aq10.1 AC RIF	Aq10.2 AC ME	Aq11 MC ED	Aq12.1 SC RIF	Aq12.2 SC ED	Total No.
Hemiptera	Nepidae	*Cercotmetus sp*									1				1
Hemiptera	Notonectidae	*Anisops* sp. 1			8	4									12
Hemiptera	Notonectidae	*Anisops* sp. 2				11					2				13
Hemiptera	Notonectidae	Notonectidae sp. 3						1			1				2
Hemiptera	Pleidae	*Paraplea sp.*			2	4	60				5	1			72
Hemiptera	Veliidae	*Microvelia sp.*									1				1
Hemiptera	Mesoveliidae	*Mesovelia sp.*					1			2	1				4
Hemiptera	Mesoveliidae	Mesoveliidae sp.2									2				2
Coleoptera	Hydrophilidae	*Berosus sp.* (adult)			1										1
Coleoptera	Hydrophilidae	*Helochares* (adult)	1												1
Coleoptera	Hydrophilidae	*Hydrochus sp. 1* (adult)			1						1	1	1		4
Coleoptera	Hydrophilidae	*Hydrochus sp. 2* (adult)		2			2								4
Coleoptera	Dytiscidae	*Hyphydrus sp. 1* (adult)			1		4				1				6
Coleoptera	Dytiscidae	*Hyphydrus sp. 2* (adult)				1	2								3
Coleoptera	Dytiscidae	*Sternopriscus sp.* (adult)									3	1			4
Coleoptera	Dytiscidae	*Bidessodes sp.* (adult)									24				24
Coleoptera	Dytiscidae	*Rhantaticus congestus* (adult)			1										1
Coleoptera	Dytiscidae	*Laccophilus sp. 1* (adult)			3		1								4
Coleoptera	Dytiscidae	*Laccophilus sp. 2* (adult)			1		1				2				4
Coleoptera	Dytiscidae	*Hydaticus sp.* (adult)								2					2
Coleoptera	Elmidae	*Austrolimnus sp.*												1	1
Coleoptera	Gyrinidae	*Dineatus sp.* (adult)			1										1
Coleoptera	Noteridae	Noteridae sp. (adult)									1				1
Coleoptera	Hydraenidae	*Hydraena sp.* (adult)									4				4
Diptera	Ceratopogonidae	Ceratopogoninae type 1		1								3	1	2	7
Diptera	Ceratopogonidae	Ceratopogoninae type 2		46			2							1	49

Appendix J.5
Aquatic Macroinvertebrates

Order/Class	Family	Genus/species	Aq1 GL SB	Aq2 GL SB	Aq3 GL RP	Aq4 GL SB	Aq5 GL SB	Aq6 MC RIF	Aq7 MC RIF	Aq10.1 AC RIF	Aq10.2 AC ME	Aq11 MC ED	Aq12.1 SC RIF	Aq12.2 SC ED	Total No.
Diptera	Ceratopogonidae	Ceratopogonidae type 3						3	1						4
Diptera	Ceratopogonidae	Ceratopogonidae type 4						2		5	1				8
Diptera	Ceratopogonidae	*Formypomyia sp.*											1		1
Diptera	Chironomidae	Chironominae type 1	4	1	84	17		2		12	10	15	15	28	188
Diptera	Chironomidae	Chironominae type 2			1						1				2
Diptera	Chironomidae	Chironominae type 3			2	4	1		1						8
Diptera	Chironomidae	Chironominae type 4				1	4						4		9
Diptera	Chironomidae	Chironominae type 5		11				1	26	3		3		5	49
Diptera	Chironomidae	Chironominae type 6							1	2			6		9
Diptera	Chironomidae	Chironominae type 7 "Amelia"								7	1				8
Diptera	Chironomidae	Orthocladiinae type 1	8		3	5	2	13			1	1		12	45
Diptera	Chironomidae	Orthocladiinae type 2	6		1	8	2	3		1			9		30
Diptera	Chironomidae	Orthocladiinae type 3			2			17		3	2	9	16	3	52
Diptera	Chironomidae	Orthocladiinae type 4							5				6		11
Diptera	Chironomidae	Tanypodinae type 1						1							1
Diptera	Dolichopodidae	Dolichopodidae sp. 1											2		2
Diptera	Simulliidae	*Simulium sp.*							15				1		16
Trichoptera	Hydroptilidae	Hydroptilidae sp.	2							8					10
Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*							20	8			293		321
Trichoptera	Hydropsychidae	Hydropsychidae sp. 2							10	3			13		26
Trichoptera	Polycentropodidae	Polycentropodidae sp. 1							6				10	2	18
Trichoptera	Leptoceridae	*Triaenodes sp.*											10	1	11
Trichoptera	Leptoceridae	*Oecetis sp.*								2	1	13			16
Trichoptera	Philopotamidae	*Chimarra sp.*							11	8			1		20
Lepidoptera	Pyralidae	Nymphulinae sp.								1					1
		Total no. individuals (all)	2121	203	255	729	388	308	149	179	264	283	455	136	5470

Order/Class	Family	Genus/species	Aq1 GL SB	Aq2 GL SB	Aq3 GL RP	Aq4 GL SB	Aq5 GL SB	Aq6 MC RIF	Aq7 MC RIF	Aq10.1 AC RIF	Aq10.2 AC ME	Aq11 MC ED	Aq12.1 SC RIF	Aq12.2 SC ED	Total No.
		Total Taxa (99)	16	12	22	28	27	23	16	25	39	17	22	20	
		Total Insect Taxa (72)	9	6	18	17	19	16	15	18	29	14	22	16	
		Total no. individuals (insects)	48	63	157	117	145	57	148	144	157	276	455	102	1869
		Species Richness (Margalef)[1]	1.96	2.07	3.79	4.1	4.36	3.84	3	4.63	6.81	2.83	3.43	3.87	
		Shannon-Weiner Diversity[2]	0.325	1.61	1.92	1.86	2.18	1.55	2.27	2.47	2.97	1.36	1.53	2.22	
		Evenness (Peilou's)[3]	0.117	0.648	0.622	0.559	0.662	0.495	0.82	0.769	0.81	0.479	0.496	0.742	

1. Species Richness (Margalef): *Species richness (d)* measure of the total number of species present (S) for a given number individuals (N) $d=(S-1)/\log N.$.

2. Shannon-Weiner Diversity Index: $H' = -\ _i\, p_i\ (\log p_i)$ where p_i is the proportion of the total count (Log base e).

3. Pielou's Evenness Index: A measure of how evenly the individuals recorded in a sample are distributed among the known taxa, where low evenness indicates domination of the sample by a few abundant taxa and high evenness indicates low levels of dominance by a few taxa. $J' = H'(observed)/H'_{max}$ where H'_{max} is the maximum possible diversity achievable if all taxa where equally abundant (Clarke & Warick 1994).

Appendix J.5c McArthur/Glyde River Project Area Aquatic Macroinvertebrate Dendogram for Hierarchical Clustering for 12 Aquatic Macroinvertebrate Samples using Group-average Linking of Bray-Curtis Similarities