Appendices

Appendix 1 Sampling site codes

Sampling sites

The following sampling sites are listed alphabetically by site code. Sites AJ, AK, AO and AT, those sampled by Midgley (1973) and referred to in the figures and tables of this volume, are included here.

Further site details are given in volume 1. Table 4 of volume 1 (pp 16–18) lists the sampling sites by catchment and includes information on zones, stream order, map references, grid references, latitude and longitude, elevation above sea level and distance from the estuary. Table 5 of volume 1 (p 19) lists the regularly and occasionally sampled sites, and groups them by drainage system and habitat type.

Code	Site name	Code	Site name
AJ	above Jim Jim Falls	FS	Fishless Billabong
AK	above Kolondjarluk Falls	FX	Flying Fox
AM*	Nabarlek Dam		
AT	above Twin Falls	GA	Goanna Billabong (on Baralil Ck)
AO	above Koolpin Gorge	GD	Magela bed
AU	Adgibongololo Ck	GL	Gulungul Billabong
		GN	Georgetown Billabong
BC	Birraduk Creek	GU	Magela bed
BD	Bowerbird Billabong		
BF	Magela Falls base	ID	Island Billabong
BM	Mt Brockman	IF	Magela riffle
BO	Buffalo Billabong	II	Surshar Billabong
BS	Baroalba Springs	IM	Indium Billabong
BX	Malabanbandju Billabong		
BY	Baroalba stream	JA	Jabiluka Billabong
		JD	Jim Jim Falls base
C1*	Costean 1	JJ	Ja Ja Billabong
C2	Coonjimba 2		
C3	Coonjimba 3	KD	Kolondjarluk (on Kolondjarluk Ck)
C4	Coonjimba 4		
CA	Coonjimba Billabong	LC	Little Coonjimba
CC	Cahills Crossing	LT	Leichhardt Billabong
CD	Bullwidgi Billabong		
CH	Cannon Hill Billabong (on anabranch)	MA	Muriella Park
CL	Corndorl Billabong	MD	Magela bed
CP	Camp 1 (on Kolondjarluk Ck)	MG	Magela bed
DA	Djalkmara Billabong	MI	Mudginberri corridor
DR	Deaf Adder	MJ	Magela bed

* artificial structure

Code	Site name	Code	Site name
MMa	Magela mouth	RS	Radon Springs
MMb	Tidal creek	RT*	Retention Pond 2
MU	Magela upstream		
MX	Magela Crossing	SD	Camp 2 (on Kolondjarluk Ck)
MY	Maybangul Billabong	SR	Namandi
		ST	Sawcut Gorge
N2	Nourlangie 2	SY	Tributary pools (on Hickey Ck)
N3	Nourlangie 3	SZ	Tributary pools (on Hickey Ck)
NC	Nourlangie crossing 2		
NE	Nourlangie East	TD*	Tailings dam
NN	Nankeen Billabong	TF	Magela Falls top
NR	Anbangbang Billabong	TW	Twin Falls
NS	Noranda pools (on Noranda Ck)		
NY	Nourlangie crossing	UU	Magela upstream
RF	Radon Falls	WL	Western Red Lily Billabong (on anabranch)
RH	Rock Hole		
RO*	Retention Pond 1	ZZ*	Bore site

* artificial structure

Appendix 2 Genus species data card B

Genus species card (type B)

The following variables are recorded on the genus species card. Columns on data card (80 columns wide) are shown in parentheses.

Sample reference code (1–17)
Date, time, sampling site, sampling method and mesh size.

Genus and species (18–54)
Generic and specific names follow the usage of the Australian Museum.

Total number (55–58)
Total number of fish per species per sample.

Total weight (59–64)
Total weight (in g x 10^{-1}) of fish per species per sample.

Length: minimum (65–68), maximum (69–72)
Minimum and maximum length (mm, TL or LCF) of fish per species per sample.

Species code (73–77)
Australian Museum fish family codes are used for fish captured during the study or recorded from 'freshwater' habitats. These codes are provided on the following pages and the names are as they appear in the data files.

Card type (80)
Genus species card coded as B.

Code	Family	Genus and species	Common name
00801	Carcharhinidae	*Carcharhinus leucas*	River whaler or bull shark
02301	Pristidae	*Pristis microdon*	River sawfish
03501	Dasyatidae	*Dasyatis fluviorum*	Brown river stingray
05402	Megalopidae	*Megalops cyprinoides*	Tarpon or ox-eye herring
08501	Clupeidae	*Nematalosa erebi*	Bony bream
08502	Clupeidae	*Nematalosa come*	Bony bream
08503	Clupeidae	*Hilsa kelee*	Black-spotted bream
08801	Osteoglossidae	*Scleropages jardinii*	Saratoga
18801	Ariidae	*Arius leptaspis*	Lesser salmon (forktailed) catfish
18803	Ariidae	*Arius leptaspis* *(= Hexanematichthys* sp. A*)*	Lesser salmon (forktailed) catfish
18804	Ariidae	*Arius proximus* *(= Hexanematichthys* sp. B*)*	Grey (forktailed) catfish
18805	Ariidae	*Arius graeffei* *(= Hexanematichthys* sp. C *= Arius australis)*	Blue (forktailed) catfish
19201	Plotosidae	*Anodontiglanis dahli*	Toothless catfish
19202	Plotosidae	*Neosilurus* sp. A	Eel-tailed catfish
19203	Plotosidae	*Neosilurus* sp. B	Eel-tailed catfish
19204	Plotosidae	*Porochilus obbesi*	Obbes' catfish

Code	Family	Genus and species	Common name
19205	Plotosidae	*Neosilurus* sp. C	Eel-tailed catfish
19211–3	Plotosidae	*Neosilurus ater* (3 colour types)	Narrow-fronted tandan, butter jew or black catfish
19214–6	Plotosidae	*Neosilurus hyrtlii* (3 colour types)	Hyrtl's catfish
19217–9	Plotosidae	*Porochilus rendahli* (3 colour types)	Rendahl's catfish
23401	Hemirhamphidae	*Zenarchopterus caudovittatus*	Garfish
24501	Melanotaeniidae	*Melanotaenia nigrans*	Black-banded rainbow fish
24502	Melanotaeniidae	*Melanotaenia splendida inornata (= Melanotaenia maculata)*	Chequered rainbowfish
24503	Melanotaeniidae	*Melanotaenia splendida australis (= Melanotaenia australis)*	Red-tailed rainbowfish
24600	Atherinidae	*Craterocephalus* sp.	Hardyhead
24601	Atherinidae	*Craterocephalus marianae (= Craterocephalus marjoriae)*	Mariana's hardyhead
24602	Atherinidae	*Craterocephalus stercusmuscarum*	Fly-specked hardyhead
24603	Pseudomugilidae	*Pseudomugil tenellus*	Dainty blue-eye or delicate blue-eye
28501	Synbranchidae	*Ophisternon gutturale*	Swamp eel or one-gilled eel
31001	Ambassidae	*Ambassis agrammus*	Sail-fin perchlet or sail-fin glassfish
31002	Ambassidae	*Ambassis macleayi*	Reticulated perchlet or reticulated glassfish
31003	Ambassidae	*Denariusa bandata*	Pennyfish
31004	Centropomidae	*Lates calcarifer*	Silver barramundi
31005	Ambassidae	*Ambassis elongatus*	Yellow-fin perchlet or elongated glassfish
31006	Ambassidae	*Ambassis* sp.	Perchlet or glassfish
32101	Terapontidae	*Amniataba percoides*	Black-striped grunter or banded grunter
32102	Terapontidae	*Hephaestus fuliginosus*	Black grunter or bream
32103	Terapontidae	*Leiopotherapon unicolor*	Spangled grunter
32104	Terapontidae	*Syncomistes butleri*	Sharp-nosed grunter or Butler's grunter
32105	Terapontidae	*Pingalla midgleyi (= Pingalla* sp.*)*	Black-blotched anal-fin grunter or Midgley's grunter
32701	Apogonidae	*Glossamia aprion*	Mouth almighty
35901	Toxotidae	*Toxotes lorentzi*	Primitive archerfish
35902	Toxotidae	*Toxotes chatareus*	Common archerfish
35903	Toxotidae	*Toxotes jaculator*	Archerfish
36301	Scatophagidae	*Scatophagus* sp.	Butter fish or scat
38101	Mugilidae	*Liza alata (= Liza diadema)*	Ord River mullet
38102	Mugilidae	*Liza parmata*	Green-backed mullet
38103	Mugilidae	*Rhinomugil nasutus*	Mud mullet
38104	Mugilidae	*Liza macrolepis*	Mullet
42801	Gobiidae	*Glossogobius giuris*	Flathead goby
42802	Gobiidae	*Glossogobius aureus*	Golden goby

Code	Family	Genus and species	Common name
42901	Eleotrididae	*Hypseleotris compressa* *(= Hypseleotris compressus)*	Northern carp gudgeon or empire gudgeon
42902	Eleotrididae	*Mogurnda mogurnda*	Purple-spotted gudgeon
42903	Eleotrididae	*Oxyeleotris lineolata*	Sleepy cod
42904	Eleotrididae	*Prionobutis microps*	Small-eyed sleeper or gudgeon
42905	Eleotrididae	*Oxyeleotris selheimi*	Black-banded gudgeon
45101	Belonidae	*Strongylura krefftii*	Freshwater longtom
46201	Soleidae	*Aseraggodes klunzingeri*	Tailed sole
46202	Soleidae	*Brachirus salinarum*	Salt-pan sole
46301	Cynoglossidae	*Cynoglossus heterolepis*	Tongue sole

Appendix 3 Biology data card C

Biology card (type C)

The following variables are recorded on the biology card. Columns on data card (80 columns wide) are shown in parentheses.

Sample reference code (1–17)
Date, time, sampling site, sampling method and mesh size.

Species code (18–22)
See Appendix 2.

Fish numbers (23–25)
In each sample, for each species, fish were numbered individually up to 100; these columns record the individual's number. For samples with more than 100 fish per species, 100 fish were randomly subsampled for measurement.

Genus and species (26–58)
See Appendix 2.

Fish length (59–62)
Length of each fish (LCF or TL in mm)

Fish weight (63–68)
Weight of each fish, in g x 10^{-1}

Sex (69)
M = male; J = juvenile or indeterminate; F = female; H = hermaphrodite

Gonad weight (70–75)
Gonad weight recorded (in g) to two decimal places for larger species and to three decimal places for small species.

Gonad stage (76)
Stages I–VII: I (immature virgin); II (developing virgin/recovering spent); III (developing); IV (maturing); V (mature); VI (ripe); VII (spent). The stages are described in detail in the Materials and Methods section in this volume.

Fullness (77)
Coded as follows (adapted from Ball, 1961):

0 = empty; 1 = ¼ full; 2 = ½ full; 3 = ¾ full; 4 = full; 5 = distended and full; 6 = distended, remnants only

Number of stomach contents cards (78–79)
Number of stomach contents cards (type D) used per specimen recorded on biology card

Card type (80)
Biology data card coded as C

Appendix 4 Stomach contents data card D

Stomach contents card (type D)

The following variables are recorded in the stomach contents card. Columns on data card (80 columns wide) are shown in parentheses.

Sample reference code (1–17)
Date, time, sampling site, sampling method and mesh size (if applicable).

Species code (18–22)
See Appendix 2.

Fish numbers (23–24)
See Appendix 3.

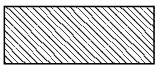
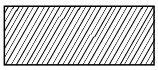
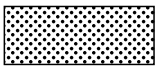
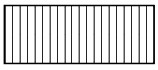
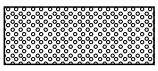
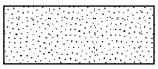
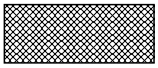
Item (25–48, 52–76)
Stomach contents food items. Taxonomic item prefixes (25–27, 52–54) as follows:

Item prefix	Taxon	Item prefix	Taxon
KIN	Kingdom	SBF	Subfamily
SPP	Superphylum	TRI	Tribe
PHY	Phylum	GEN	Genus
SBP	Subphylum	SPG	Supergenus
SPC	Superclass	SBG	Subgenus
CLA	Class	SPS	Superspecies
SBC	Subclass	SPE	Species
DIV	Division	SBS	Subspecies
SPO	Superorder	Miscellaneous:	
ORD	Order	EMP	empty
SBO	Suborder	DEC	decomposed
SEC	Section	DAM	damaged
SPF	Superfamily	LIQ	liquid
FAM	Family	MAT	material

Percentage (49–51, 77–79)
Percentage volume of each food type in stomach contents recorded to nearest 5%.

Card type (80)
Stomach contents data card coded as D.

Appendix 5 Key to length-frequency distributions showing habitat preferences

Shading	Habitat type	SITES	
		Magela Creek	Nourlangie Creek
Escarpment area waterbodies			
	Mainchannel waterbodies	BD	ST
Lowland habitats			
	Sandy creekbed sites upstream of RUPA*	MU, MJ, MG	
	Sandy creekbed sites downstream of RUPA	GD, MD	NC, NY
	Shallow backflow billabongs upstream of RUPA	FS	
	Shallow backflow billabongs downstream of RUPA	CL, GL, CA, DA	
	Shallow backflow billabongs		NR
	Channel (deep & steep-sided) backflow billabongs	GN, IM, GA	BX
Corridor waterbodies			
	Sandy mainchannel billabongs	MI	NE, SR
	Muddy anabranch billabongs	BO	FX
Floodplain waterbodies			
	Floodplain billabongs	ID, JJ, LT, JA, NN	N3

RUPA – Ranger Uranium Project Area

* The position relative to RUPA is not relevant for Nourlangie Creek sites.

Site codes are shown in appendix 1.

Appendix 6 *In situ* means, standard errors and ranges (with sample sizes) of physico-chemical parameters (except visibility) in which various fish species were captured during the study

		Temperature (°C)				Dissolved Oxygen (mg/L)				pH				Conductivity µS/cm	
Fish species		Range	Mean	Standard error	N	Range	Mean	Standard error	N	Range	Mean	Standard error	N	Range	N
No catch	S	26–41	30.9	0.13	409	1.0–9.7	5.7	0.08	374	4.8–8.6	6.20	0.04	378	2–1600	377
	B	23–34	28.7	0.10	406	0.0–6.7	3.6	0.12	336	4.5–7.4	5.90	0.03	345	2–1600	351
M. cyprinoides	S	23–34	29.8	0.31	76	1.9–9.7	6.2	0.23	68	5.3–9.1	6.45	0.11	69	2–200	68
	B	23–34	28.0	0.27	76	0.2–7.4	2.8	0.27	62	5.2–7.1	6.03	0.06	66	4–280	66
N. erebi	S	23–38	31.0	0.13	229	2.7–9.7	6.3	0.10	189	5.1–8.6	6.21	0.10	200	2–500	195
	B	23–35	28.8	0.17	226	0.2–9.5	3.9	0.14	199	4.8–6.8	5.86	0.14	180	6–480	186
S. jardinii	S	23–33	28.2	0.41	35	3.0–6.8	5.8	0.26	27	4.1–6.8	5.90	0.12	29	6–80	29
	B	23–31	27.3	0.38	35	1.7–6.8	3.8	0.49	14	4.5–6.5	5.80	0.09	26	6–58	24
A. leptaspis	S	26–34	30.3	0.18	248	0.1–9.7	5.8	0.12	201	4.8–9.1	6.10	0.05	230	2–498	226
	B	23–32	28.3	0.14	245	0.2–7.4	2.9	1.68	301	4.3–7.1	5.75	0.04	220	4–478	224
A. proximus	S	29–34	30.0	0.69	7	5.3–7.8	6.7	0.37	7	5.7–6.3	6.20	0.09	17	10–70	7
	B	26–31	26.7	0.69	7	2.0–4.9	3.5	0.41	7	5.2–5.9	5.70	0.12	17	10–58	7
A. graeffei	S	28–31	29.3	0.34	15	4.4–6.5	5.6	0.24	15	6.1–7.0	6.64	0.07	15	10–160	16
	B	27–31	28.7	0.39	15	0.6–4.9	3.2	0.42	15	6.1–7.0	6.60	0.07	15	10–160	16
A. dahli	S	27–33	30.2	0.41	19	4.4–7.4	5.8	0.23	17	5.4–7.0	6.20	0.12	17	6–24	17
	B	26–32	28.6	0.43	19	0.6–6.8	4.5	0.48	17	5.1–7.0	6.11	0.11	17	6–47	17
Neosilurus sp. A	S	22–35	31.3	0.18	102	0.1–8.8	5.8	0.18	74	4.8–8.1	5.90	0.06	88	2–160	86
	B	25–34	29.4	0.18	98	0.4–6.8	3.5	0.19	70	4.5–6.8	5.65	0.18	81	4–234	82
Neosilurus sp. B	S	26–37	29.9	0.18	30	3.3–7.4	5.8	0.23	22	4.5–6.5	5.80	0.11	26	6–58	27
	B	26–30	28.2	0.31	29	0.9–7.4	5.2	0.48	19	5.3–6.5	5.82	0.11	24	6–58	24
Neosilurus sp. C	S	27–41	30.9	0.38	45	3.8–8.8	6.1	0.16	34	4.3–8.8	6.37	0.19	36	6–230	36
	B	27–34	28.9	0.25	44	0.5–6.0	3.3	0.24	28	4.5–7.4	5.97	0.16	31	6–280	32
N. ater	S	23–33	28.5	0.37	55	2.7–8.2	5.5	0.21	50	4.0–7.2	6.10	0.08	49	2–120	48
	B	23–32	27.3	0.33	55	0.6–6.2	3.4	0.25	44	5.3–7.0	5.92	0.40	45	2–70	44
N. hyrtlii	S	25–37	29.4	0.41	45	0.2–9.5	6.5	0.36	36	4.0–8.6	6.30	0.14	36	4–620	37
	B	23–36	27.2	0.39	45	1.0–9.7	3.7	0.43	27	5.2–7.3	6.02	0.08	32	4–620	33
P. rendahli	S	26–38	30.1	0.38	58	1.0–9.7	5.6	0.41	36	4.8–7.7	6.15	0.09	37	2–620	36
	B	23–34	28.0	0.35	58	2.0–9.5	3.8	0.53	26	5.2–7.3	5.98	0.10	26	10–600	28
S. krefftii	Si	24–38	30.4	0.22	113	3.7–9.1	6.3	0.17	76	4.5–8.6	6.42	0.09	75	6–98	78
	B	24–34	28.7	0.21	111	0.2–7.0	3.9	0.27	60	4.5–7.3	6.01	0.07	52	4–78	69

Appendix 6 continued

Fish species		Temperature (°C)				Dissolved Oxygen (mg/L)				pH				Conductivity µS/cm	
		Range	Mean	Standard error	N	Range	Mean	Standard error	N	Range	Mean	Standard error	N	Range	N
M. nigrans	S	23–35	28.2	0.37	46	3.7–7.2	5.7	0.21	27	3.9–6.7	5.11	0.17	27	4–180	29
	B	23–32	27.5	0.32	42	5.0–6.8	5.6	0.31	6	3.9–6.2	5.30	0.02	15	4–12	20
M. splendida inornata	S	23–40	30.6	0.19	210	0.9–8.2	5.8	0.13	86	4.6–8.3	6.14	0.08	93	2–220	100
	B	23–36	29.5	0.17	207	2.0–6.8	4.9	0.43	22	4.5–7.3	5.92	0.13	36	2–64	40
C. marianae	S	25–40	30.5	0.32	54	3.2–8.2	6.2	0.17	39	4.3–8.3	6.35	0.15	34	4–160	38
	B	23–35	29.6	0.35	53	5.2–6.8	6.2	0.29	6	5.4–7.0	6.15	0.23	6	2–64	14
C. stercusmuscarum	S	25–43	30.9	0.21	144	0.9–8.2	5.7	0.18	48	4.0–8.1	6.14	0.11	56	4–220	60
	B	24–36	29.7	0.19	144	2.5–6.8	5.3	0.45	8	5.1–7.0	6.12	0.19	10	2–110	15
P. tenellus	S	27–38	31.4	0.44	49	5.0–7.8	6.6	0.25	13	5.0–7.1	6.02	0.18	12	6–120	14
	B	25–36	30.1	0.40	48	5.2–5.9	5.5	0.35	2	–	–	–	0	12	1
A. agrammus	S	25–41	31.3	0.27	117	1.3–7.8	5.9	0.18	46	4.8–9.1	6.40	0.11	63	4–220	55
	B	24–38	29.7	0.24	116	2.5–6.8	4.4	0.57	8	4.5–6.7	5.98	0.18	12	6–62	13
A. macleayi	S	25–38	30.6	0.30	88	1.0–9.1	6.2	0.27	35	4.8–7.7	6.19	0.10	44	2–620	42
	B	23–34	29.3	0.28	88	0.5–9.5	4.6	0.46	26	5.3–7.0	6.07	0.09	32	2–620	33
D. bandata	S	25–38	30.0	0.28	87	3.7–7.8	5.9	0.23	25	4.8–8.1	6.36	0.13	31	4–220	31
	B	25–38	29.7	0.27	87	2.9–6.2	4.3	0.97	3	4.5–6.7	6.09	0.27	8	8–60	7
L. calcarifer	S	26–35	30.3	0.63	18	3.0–6.8	5.0	0.33	11	4.0–7.7	6.08	0.27	13	4–160	14
	B	24–33	28.2	0.54	17	0.0–6.8	3.3	0.73	9	5.1–6.3	5.90	0.14	10	4–110	10
Ambassis spp.	S	27–36	30.9	0.39	34	3.7–6.6	5.3	0.34	8	5.5–7.2	6.30	0.52	12	6–160	12
	B	25–35	29.8	0.36	33	5.2	5.2	0.0	1	–	–	–	0	12–170	3
A. percoides	S	23–40	30.2	0.22	177	3.9–9.7	6.2	0.10	116	5.0–8.6	6.25	0.06	129	2–160	129
	B	23–35	28.9	0.19	177	0.2–9.5	4.8	0.20	82	4.5–7.3	6.03	0.04	104	2–230	107
H. fuliginosus	S	23–34	28.2	0.43	43	3.8–7.4	6.0	0.19	31	4.0–6.7	5.57	0.14	17	6–80	30
	B	23–24	27.6	0.43	41	5.0–7.4	6.4	0.26	12	4.5–6.5	5.65	0.15	5	6–12	21
L. unicolor	S	23–40	30.2	0.25	156	0.9–9.1	6.3	0.15	98	4.0–8.6	6.12	0.08	100	6–620	100
	B	23–35	28.9	0.22	156	0.2–9.5	4.5	0.33	60	4.5–7.3	5.84	0.07	72	4–620	76
S. butleri	S	23–34	28.9	0.53	38	5.0–7.4	6.2	0.19	31	4.5–6.7	5.95	0.09	31	2–50	31
	B	23–34	28.4	0.48	37	3.8–7.2	5.7	0.27	20	4.5–6.7	5.71	0.19	27	2–60	29
P. midgleyi	S	23–35	27.6	0.42	41	3.8–8.2	5.9	0.22	28	4.0–7.1	5.40	0.17	26	2–80	29
	B	23–35	27.4	0.43	41	5.0–7.4	5.9	0.25	11	4.5–7.0	5.67	0.18	19	2–64	21
G. aprion	S	25–38	30.6	0.20	158	1.3–9.7	6.2	0.19	73	4.9–8.1	6.30	0.07	84	2–620	86
	B	23–35	29.0	0.19	158	0.2–9.6	4.8	0.37	40	4.5–7.3	5.90	0.09	49	2–100	53

Appendix 6 continued

Fish species		Temperature (°C)				Dissolved Oxygen (mg/L)				pH				Conductivity µS/cm	
		Range	Mean	Standard error	N	Range	Mean	Standard error	N	Range	Mean	Standard error	N	Range	N
T. chatareus	S	26–36	30.8	0.22	142	4.3–9.7	6.3	0.11	91	4.6–7.2	6.13	0.05	97	2–420	100
	B	24–34	29.5	0.21	139	0.2–7.4	4.1	0.24	74	4.8–7.3	5.84	0.08	83	2–440	86
T. lorentzi	S	29–34	30.2	1.07	6	6.2–7.4	6.9	0.36	3	5.3–6.5	5.70	0.38	3	2–14	3
	B	29–32	29.5	0.67	6	7.4	7.4	0.0	1	5.3–6.5	5.70	0.38	3	10–14	3
L. alata	S	27–35	30.7	0.74	14	0.1–8.0	4.8	0.98	8	5.1–7.4	6.31	0.29	10	8–160	9
	B	26–34	29.7	0.74	14	0.4–3.2	2.4	0.42	6	5.1–7.3	5.94	0.31	7	8–230	8
G. giuris	S	23–38	30.6	0.47	38	5.4–7.4	6.4	0.17	14	5.6–8.3	6.50	0.17	17	4–56	22
	B	23–35	29.7	0.43	38	5.2–6.8	6.3	0.53	3	5.1–6.7	6.20	0.16	5	6–36	8
G. aureus	S	29–36	31.5	1.23	6	6.1	6.1	0.0	1	6.8	6.80	0.0	4	24–160	4
	B	28–33	30.0	0.93	6	–	–	–	–	–	–	–	–	24	1
H. compressa	S	28–36	30.8	0.49	19	3.7–7.8	6.1	0.67	6	5.0–9.1	6.90	0.38	12	4–160	10
	B	27–33	29.9	0.35	15	–	–	–	–	–	–	–	0	18	1
M. mogurnda	S	25–36	30.1	0.31	46	3.0–7.8	5.6	0.24	28	3.9–8.3	5.90	0.23	28	6–200	28
	B	24–35	28.9	0.30	42	2.9–5.5	4.8	0.49	6	3.9–6.7	5.14	0.33	8	4–60	8
O. lineolata	S	26–38	31.1	0.37	63	1.0–9.1	5.9	0.41	23	4.8–9.1	6.36	0.20	24	4–500	25
	B	23–35	29.3	0.36	62	1.7–9.5	4.6	0.56	13	4.5–7.1	6.09	0.19	14	2–480	16

S : surface B : bottom

Appendix 7 Visibility (ranges, means and standard errors with samples sizes) and *in situ* percentage dominance of substrates and hydrophyte types at sites in which various fish species were captured during the study period

Fish species	Visibility (cm)*				Substrates								Hydrophytes					
	Range	Mean	SE	N	Boulder/ bedrock	Rock	Gravel	Sand	Mud	Clay	Leaf litter	N	Emer-gent	Submer-gent	Floating attached	Floating un-attached	N	Veg Occ Index
No catch	1–270	64.7	3.9	332	0.0	3.4	4.2	21.2	39.4	28.6	3.2	1261	25.0	40.2	26.8	8.1	410	69.7
M. cyprinoides	4–270	86.2	7.0	63	3.9	2.2	1.7	16.0	35.9	36.4	3.9	231	20.9	50.0	23.6	5.5	76	78.5
N. erebi	1–360	65.0	4.4	208	0.2	1.5	5.1	17.6	38.0	33.0	4.6	669	24.6	45.4	25.6	2.4	225	73.9
S. jardinii	4–360	130.0	28.0	14	11.9	11.9	0.9	42.2	10.1	13.8	9.2	109	15.7	44.7	28.9	10.5	34	62.2
A. leptaspis	1–360	76.0	4.8	234	0.4	1.4	2.1	11.3	43.6	40.6	1.65	729	24.0	44.6	25.3	6.0	247	79.5
A. proximus	90–210	130.0	20.7	7	0.0	0.0	0.0	0.0	51.0	49.0	0.0	21	3.6	60.7	21.4	14.3	8	100.0
A. graeffei	15–190	117.0	18.8	15	0.0	0.0	0.0	71.1	13.3	15.6	0.0	45	28.5	42.9	14.3	14.3	15	20.0
A. dahli	3–210	136.3	15.8	17	0.0	3.5	0.0	57.9	24.6	7.0	7.0	57	9.1	63.6	27.3	0.0	9	21.1
Neosilurus sp. A	1–270	93.2	7.8	92	0.6	0.3	1.6	31.9	30.3	7.2	7.2	304	35.0	42.3	18.7	4.1	134	70.8
Neosilurus sp. B	15–250	136.0	18.6	15	8.6	19.3	2.2	47.3	5.4	7.5	9.7	93	9.1	22.7	27.3	40.9	29	30.0
Neosilurus sp. C	3–150	41.7	5.8	40	4.4	0.0	6.7	8.9	49.6	25.2	5.2	135	27.7	38.8	26.6	6.6	45	63.6
N. ater	2–360	94.8	12.7	39	0.0	0.0	1.8	24.0	21.7	39.8	3.6	166	24.6	41.5	26.2	8.5	54	65.0
N. hyrtlii	1–170	39.9	6.7	37	1.5	3.0	6.0	14.2	41.8	28.4	5.2	134	21.0	42.5	32.8	3.7	50	64.4
P. rendahli	1–170	31.1	5.1	51	0.0	0.0	6.7	6.7	57.8	28.9	0.0	180	27.2	41.7	25.6	5.5	55	89.8
S. krefftii	1–360	72.1	8.4	80	2.0	2.8	7.1	23.9	36.4	22.7	5.1	352	29.1	43.1	26.1	1.7	115	74.2
M. nigrans	30–200	136.0	31.4	5	22.0	17.0	2.1	39.7	4.3	0.0	14.9	141	32.0	34.0	20.0	14.0	45	23.4
M. splendida inornata	1–270	44.0	4.2	95	3.3	5.4	4.8	32.5	24.7	19.8	9.5	628	34.4	42.6	18.8	4.1	211	72.1
C. marianae	1–130	44.3	13.2	11	0.6	8.1	1.8	62.1	5.6	4.3	17.4	161	34.4	50.8	13.1	1.6	53	46.3
C. stercusmuscarum	2–190	48.0	4.9	67	1.1	5.5	5.0	37.2	21.0	21.0	9.4	438	34.1	44.5	17.8	3.5	148	78.8
P. tenellus	3–360	49.6	14.2	26	1.4	8.3	3.4	12.5	34.0	38.9	1.4	144	37.8	39.4	16.3	6.4	50	91.8
A. agrammus	1–360	32.0	5.4	78	1.0	1.0	4.1	32.1	42.0	10.6	9.2	293	36.6	35.4	24.7	5.0	115	80.2
A. macleayi	1–150	47.6	5.8	59	0.7	3.6	7.8	29.0	27.0	20.4	5.8	279	34.4	41.6	19.1	5.0	82	76.4
D. bandata	1–110	34.8	4.4	52	0.0	0.0	3.0	18.6	43.0	31.6	3.8	263	30.6	43.5	20.7	5.2	86	93.2
L. calcarifer	3–120	54.2	10.2	17	2.6	0.0	0.0	19.2	46.2	26.9	5.1	78	43.1	40.3	12.5	4.2	26	88.9
Ambassis spp.	1–190	36.6	9.6	22	0.0	9.6	1.9	18.3	39.4	24.0	6.7	104	31.1	45.5	20.3	2.1	36	80.0
A. percoides	1–360	111.7	8.2	101	2.5	7.1	3.6	42.8	20.0	15.5	8.6	523	26.4	45.6	22.4	3.6	175	54.2
H. fuliginosus	90–360	180.0	33.5	7	22.3	21.5	2.3	40.0	0.0	0.0	13.9	130	43.5	26.1	4.3	26.1	45	14.6

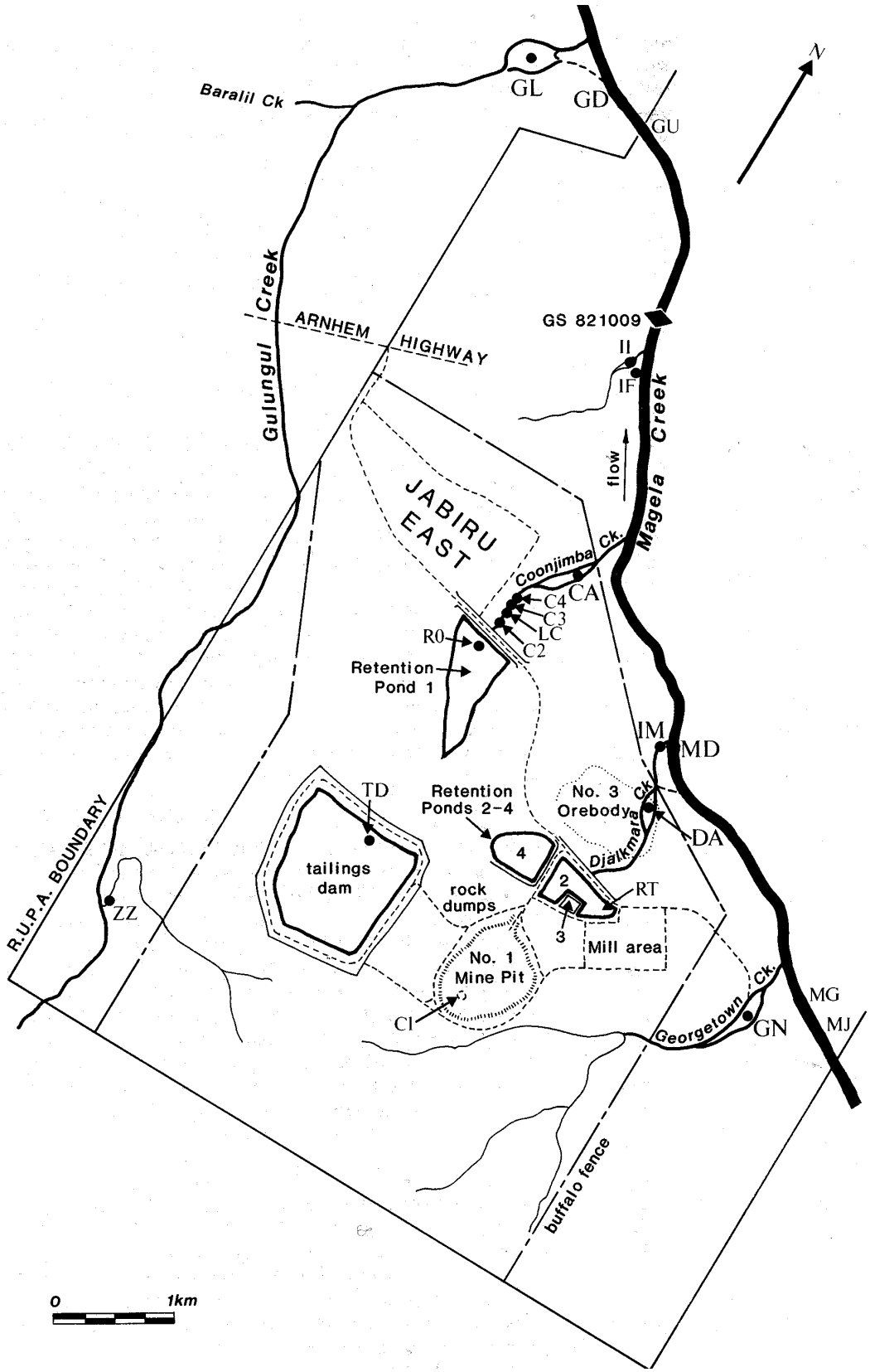
Appendix 7 continued

Fish species	Visibility (cm)*				Substrates								Hydrophytes					
	Range	Mean	SE	N	Boulder/ bedrock	Rock	Gravel	Sand	Mud	Clay	Leaf litter	N	Emer-gent	Submer-gent	Floating attached	Floating un-attached	N	Veg Occ Index
L. unicolor	1–360	62.0	8.0	80	6.7	7.9	7.5	30.3	22.5	17.5	7.5	479	30.1	44.2	22.6	3.1	155	62.7
S. butleri	50–360	171.2	19.4	16	10.6	19.5	0.8	48.0	0.0	11.4	9.8	123	63.2	21.1	0.0	15.8	38	40.0
P. midgleyi	100–360	188.0	46.0	5	20.3	20.3	3.3	45.5	0.0	0.0	10.6	123	17.8	35.7	7.1	39.3	42	27.9
G. aprion	1–200	40.6	4.0	106	2.8	4.0	3.8	22.7	38.2	23.8	4.7	471	30.0	43.6	21.6	5.0	155	86.8
T. chatareus	1–360	82.8	6.5	99	2.1	5.2	5.3	31.7	25.1	21.8	8.7	426	35.1	40.3	21.7	2.8	140	67.8
T. lorentzi	60–130	95.0	35.0	2	22.2	5.6	11.1	50.0	0.0	5.6	5.6	18	0.0	100.0	0.0	0.0	6	17.0
L. alata	1–150	32.8	12.2	13	3.5	1.8	0.0	12.3	66.7	15.8	0.0	57	44.3	40.9	9.8	4.9	20	94.7
G. giuris	1–360	75.8	26.3	13	1.7	11.1	2.6	53.0	11.1	6.8	13.6	117	38.9	45.3	10.5	5.3	44	66.0
G. aureus	10–110	58.3	21.7	6	4.8	14.3	0.0	66.7	9.5	0.0	4.8	21	24.1	48.3	13.8	13.8	6	83.3
H. compressa	3–110	24.6	6.8	17	0.0	8.7	3.5	10.5	56.1	17.5	3.5	57	32.0	46.4	16.0	5.6	19	100.0
M. mogurnda	1–190	24.5	6.8	31	5.8	5.3	2.4	22.2	35.3	20.3	8.7	207	32.0	44.0	17.6	6.5	66	75.4
O. lineolata	1–100	26.3	4.3	46	0.0	2.2	6.4	15.9	49.7	22.8	3.2	189	29.1	44.3	21.0	5.7	63	80.0
Statistics across all sites		66.0	25.7	2218	4.1	6.3	4.0	39.1	29.8	20.8	6.6		27.7	39.5	27.2	5.6		

*Reading here is for 'non-M' visibility

SE = Standard error

Appendix 8 Layout of Ranger Uranium Project Area



Layout of Ranger Uranium Mine Project Area (as at 1979–80) in relation to the Magela Creek drainage system, showing locations of sampling sites not included on map 2. Regular sampling sites are identified by larger type, occasional sites by smaller type.