Rapid assessment of fish biodiversity in southern Gulf of Carpentaria catchments

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1 Summary

No studies of freshwater fish populations or aquatic environments had been conducted at a catchment-wide level in the Southern Gulf region and so no basis existed for informed planning for the sustainable development and conservation of the region's rivers. As an initial step, the Southern Gulf Catchment Centre commissioned a rapid inventory of fish species and an assessment of aquatic habitat condition and potentially threatening processes.

During this project, we sampled 41 sites and mapped the distribution and abundance of a preliminary list of 50 species of freshwater fish in the Flinders, Leichhardt and Nicholson catchments. Four species are possibly undescribed and at least another four species remain to be positively identified by the Queensland museum. Two species had previously been recorded only from the Northern Territory. Another species was restricted to just one site in the region.

We believe at least two species, the locally known yellowfin perch or giant glassfish, *Parambassis gulliveri*, and the sprat, *Clupeoides cf. papuensis,* which is probably an undescribed species, have aquaculture potential. The biology of these species needs to be determined.

The Flinders catchment had the highest fish biodiversity, with 41 species. It also contained all the "new", rare and restricted species. The Flinders also had the widest distribution and highest abundance of the commercially and recreationally important barramundi, (*Lates calcarifer*), and a noticeably high abundance of prawns, particularly in lower reaches. The Flinders catchment is the most valuable contributor to fisheries resources in the southern Gulf of Carpentaria region.

Each river has a unique flow regime. The Gregory River, a tributary of the Nicholson, was the only major permanent stream. The Leichhardt catchment was characterised by highly variable flows that in lower reaches lasted for up to two weeks per event. Two sizeable dams exist in this catchment, and the impact on the flow regime was not defined. The Flinders catchment also has highly variable flows, but because of its much larger catchment area, flows in lower reaches sometimes persisted for five weeks per event. The flow regime has a vital influence on the reproduction, survival, distribution and abundance of fish species.

As we had just 20 days to survey 170 000 sq km of catchment, we did not identify aquatic habitat that was under immediate threat. We felt that overall, aquatic habitat was healthy. The noticeable exception was the bore drains. Admittedly these are artificial habitats, but they have been in existence for many decades, so have created a unique habitat that the region's wildlife would rely on. We discovered a fish in a bore drain that may be an undescribed species. Many bores in Australia are being capped as part of a water conservation program. In the southern gulf region, individual bores should be assessed for the presence of this fish before being capped. The practice of cleaning out bore drains by delving is also a potential threat to this species. A fish and wildlife survey of the region's bore drains is urgently required.

Each catchment was characterised by large, deep, permanent waterholes that provided habitat and refuge areas for fish and other wildlife, as well as water for cattle and humans. At present, waterholes in all catchments were in good shape. Noticeably,

large stretches of stream bank in all catchments had slumped into the channels and waterholes. Normally this would result in widening and shallowing. Most waterholes show no indication that they are silting up, so this may be a natural process. An understanding of the geomorphology of these rivers and the role of flows in maintaining these waterholes is urgently required and highly recommended. Meanwhile, a program to monitor the depth and width of strategic waterholes should be implemented as soon as possible.

An important aim of this project was to educate southern gulf residents about the fish biodiversity of the region, in particular, how to recognise species and assess aquatic habitat and potential threats. Public forums were held where the methodology was explained and the results of this project presented. We also spent time with catchment residents and passed on verbal and written information. This report should provide a reference to many of the concepts and methods we introduced. The appendix contains a full species list and habitat data for each site visited, which will provide baseline data for future studies. The knowledge gained from a project of this type is an essential element in planning for the management and sustainable development of natural resources in the southern Gulf of Carpentaria catchments.

2 Introduction

The southern Gulf of Carpentaria catchments are generally thought of as relatively unaffected by human activity, particularly when compared to catchments along Queensland's east coast. This may change. Many people are moving into the region as tourists. The natural resources, particularly the water resources, are being assessed for development opportunities, so more people, particularly miners, farmers and fishermen, are likely to move into the region (DNRM&E, 2004). Management plans will need to be compiled and implemented to ensure the sustainable use of the region's natural resources and the conservation of its biodiversity. Such plans will require good baseline data.

Natural resource management plans for the Flinders-Cloncurry, Leichhardt and Gregory-Nicholson catchments are being developed through the Southern Gulf Catchment Centre (SGCC) in Mt Isa. The focus is on naturally emerging priorities. However, the true state of the gulf rivers and their inhabitants was unknown, because even basic knowledge such as a species list, was incomplete.

Biodiversity is basically, the variety of life forms, and most people mean higher species numbers when they talk about higher biodiversity. Biodiversity can therefore be measured by the number of species, with particular reference to the number of endemic species (restricted to that area or region), and the number of rare or threatened species.

Fish are the dominant organisms in terms of biomass, feeding ecology and significance to humans, in aquatic ecosystems (World Conservation Monitoring Centre, 1998). Fish communities not only play a vital role in maintaining the ecological integrity of aquatic ecosystems, they are also used as an indicator of ecosystem health and freshwater biodiversity. Fish are excellent indicators of aquatic biodiversity and health because they:

- live in the water all their life, unlike many invertebrates

- represent a broad spectrum of community tolerances from very sensitive to highly tolerant and respond to physical and chemical stressors in characteristic response patterns
- are easy to collect with the right equipment, and are relatively easy to identify in the field
- live for several years so can reflect both short and long term changes
- have large ranges and are mobile, so are less affected by natural microhabitat differences than smaller organisms
- rely on the presence and healthy populations of other aquatic organisms to survive
- the sampling frequency for trend assessment is less than for short-lived organisms
- fish, particularly species such as barramundi, are highly visible and valuable components of the aquatic community to the public.

The Sustainable Fisheries section of the Animal Science Unit at the Freshwater Fisheries and Aquaculture Centre at Walkamin was asked by the SGCC to undertake a rapid assessment of the fish biodiversity in southern gulf catchments and identify significant issues relevant to the sustainability of the fish biodiversity. Funding for this project was provided by the National Heritage Trust under the NHT2 Interim Financial Agreement between the Queensland and Australian Governments.

Any views and recommendations expressed by the authors in this report may not necessarily be adopted by the Department of Primary Industries and Fisheries or by the Southern Gulf Catchment Centre.

3 Aims

This project's aims were to:

1. Identify during the available time, as many fish species as possible that exist in the freshwaters of the Flinders, Leichhardt and Nicholson catchments.
2. Describe the distribution and abundance status in these catchments of observed species, and make recommendations for the conservation of rare and threatened species.
3. Define what constitutes critical aquatic habitat in gulf catchments and make preliminary recommendations for its protection. Identify potential threats to fish and aquatic habitat health, and options for remedial action.
4. Build the capacity of the local fish care and catchment groups to: know their catchments from a biodiversity perspective; recognise fish species, particularly rare and exotic species; understand the normal ranges of water quality parameters and their implications to fish health; identify threats to the health of fish populations; identify, measure and classify aquatic habitat, particularly critical habitat; and to build a reporting network for unidentified species and unusual or suspicious events in their catchments.

4 Methods

This project was undertaken during the 2004 dry season between July and September. It consisted of three components: site selection, field sampling, and reporting/capacity building.

4.1 Site selection

Our aim was to collect as much information about the fish composition and distribution as possible during a one-month survey in the freshwaters of the Flinders, Leichhardt and Nicholson catchments. Site selection was critical to the achievement of this aim.

Advice and recommendations were widely sought, including hydrographers from the Department of Natural Resources and Mines (DNRM), project officers from the SGCC, mayors and officers from the local shire councils, officers from the Queensland Environmental Protection Agency (EPA), other researchers familiar with the catchments, and in particular, landholders and fishers.

To ensure a wide variety of habitat sites were surveyed we divided the catchments into upper, middle and lower regions and selected water bodies both in-stream and off-stream, of various sizes and permanency. Due to time constraints, sites were limited to those that could be accessed by vehicle within a few hours of off-road travel.

As a result, a preliminary list of sample sites was prepared. Final site selection was completed after extensive consultation with property owners/managers and SGCC aboriginal liaison officers to define and exclude any culturally sensitive areas. Access permission was then obtained from all landholders, and itineraries formulated and circulated.

4.2 Fish sampling

At all but three sites, fish were collected using a 7.5GPP Smith-Root electrofisher, mounted in a 4.0 m aluminium boat (Plate 1). In the three sites not accessible to the boat, a Smith-Root LR-24 backpack electrofisher was used (Plate 2). A maximum of two hours electrofishing was spent at each location. Only DC current was used, and the total power output was varied to achieve maximum fishing effectiveness in the different conductivities and water temperatures. All habitat types, including open and deep water, were sampled in as much of the waterbody as possible.

Plate 1 Boat electrofisher in operational mode, with anodes extended.

Plate 2 Smith-Root Model LR-24 backpack in use

Stunned fish were scooped up in specially constructed landing nets and each species recorded. Up to 20 individuals of each species were measured for total length in mm, then immediately returned unharmed to the water. Barramundi (*Lates calcarifer*) above 260 mm were tagged with dart tags, as part of a long-running program coordinated by Infofish Services to monitor movement and growth (Sawynok, 2004). The relative abundance of collected and observed fish was determined using a fish abundance scale (Table 1). A blank fish data sheet is appended.

Field identifications of species were referenced to Allen *et al*. (2002). Any species not immediately identifiable were preserved in formalin and sent to the Queensland Museum for positive identification. Samples of species not previously recorded from the area were also preserved and lodged with the museum. All fish nomenclature in this report was according to the current usage by the Queensland Museum (Jeff Johnson, *pers. comm*.).

Table 1 Fish abundance scale.

Scale	1	2	3	4	5	6	7	8
Number of fish	1	2 - 9	10 - 50	51 - 100	101 - 500	501 - 1000	1001 - 5000	> 5000

4.3 Habitat description

The aquatic and riparian habitat was assessed as per a modified Anderson method that was used successfully to describe the aquatic habitats of Cape York during the CYPLUS program (Herbert, *et al*. (1995). Details collected included hydrology, riparian vegetation types, substrates, in-stream cover and disturbance ratings. Blank habitat data sheets are appended. Unique habitat features or disturbances such as bank slumping were also noted. A digital photographic record was taken of all sites visited. Any habitats that were potential spawning sites, nursery areas or corridors for migrating species were provisionally classified as critical.

Water quality parameters measured were dissolved oxygen, pH, temperature and conductivity using a TPS 90FL meter. Secchi disc transparency was measured with a standard 250 mm black and white metal disc. Water depth was measured with a Lowrance depth sounder and the average depth estimated from continuous readings. The length of the water body was recorded from a Global Positioning System (GPS) reading of distance travelled. Average width was estimated by eye. Rather than distance from the river mouth, which may not have been the distance an estuarine spawning fish travelled during overland flows, the Australian Height Datum (AHD) or height above mean sea level at each site was used. AHD was read from a GPS. These readings were later verified against contour lines on 1:100 000 topographic maps and are within 10 m of accuracy.

Flow data for the three rivers was supplied by DNRM in a raw format. This data was then manipulated and graphed to acquire an understanding of the flow characteristics of each catchment and how it may influence fish populations and river geomorphology.

4.4 Capacity building

An important aim of this project was to increase the capacity of Southern Gulf catchment organisations and residents to understand and become familiar with the parameters used to describe and assess the condition of the region's catchments. Prior to the commencement of this project, members of the community catchment and fish care groups and other interested individuals and organisations were given a thorough briefing on the aims of the project, the parameters to be measured, and the significance and interpretation of each parameter. Subsequently, several members of the fish care group, water management officers from DNRM, the Richmond Shire aquaculture project officer, and many landholders, accompanied us for several days and received on-site training in the identification of fish species, measurement of water quality variables and the objective assessment of freshwater aquatic habitat. By the completion of this project, they will have the methodology to classify and monitor aquatic habitat and identify threatening processes and trends.

This report builds on previous extension work by providing a description of important aspects of the flow dynamics as well as a baseline fish inventory and habitat description for future reference. We also provide the gulf community with recommendations for further research and monitoring.

5 Results

5.1 Sample sites

We sampled 41 sites and approximately 170 000 sq km of the southern gulf region, during 20 days between July and August 2004. **Figure 1** is a map showing the distribution of all sites, which are briefly described in **Table 2**. There were 20 sites in the Flinders catchment, 10 in the Leichhardt and 11 in the Nicholson catchment. A full description of each site is provided in the appendices. Note Martin's Waterhole is nominally in the Norman River catchment, but in higher flows, the nearby Saxby River, a major tributary of the Flinders River, also flows through this waterhole (Makim, *pers. comm.*).

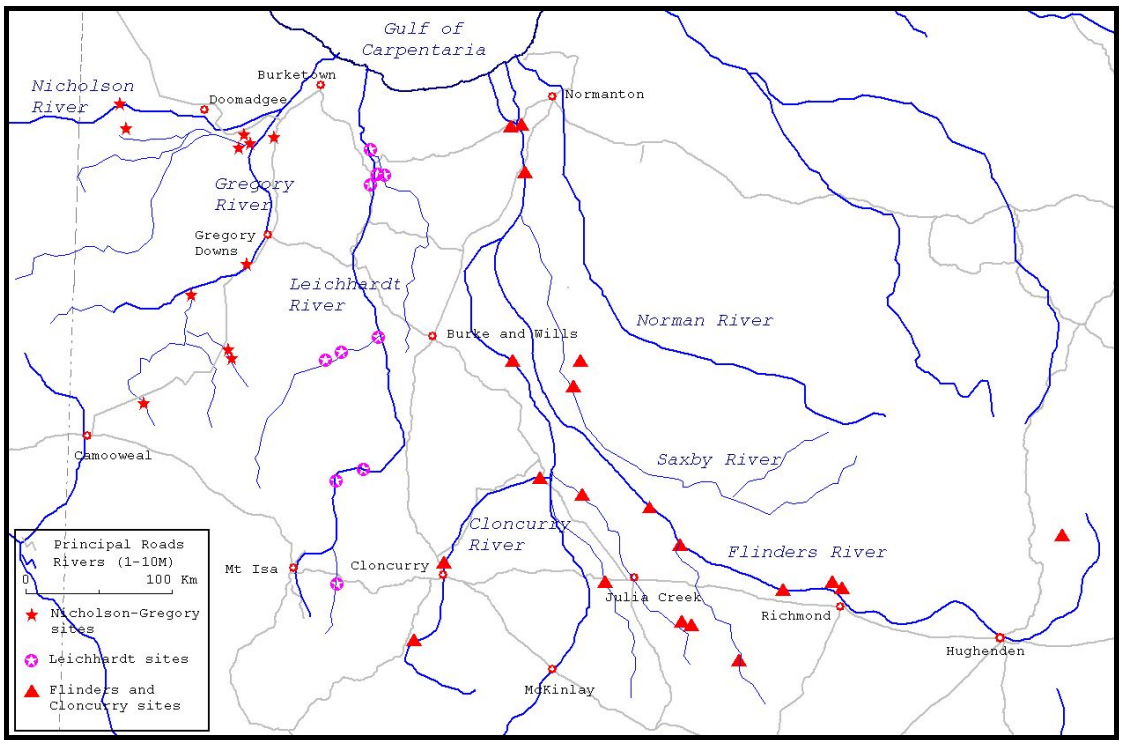

Figure 1 Fish sampling sites (41) in southern Gulf of Carpentaria catchments.

Table 2 List of all sites, sorted by date sampled.

Date	Catchment	Stream	Site	Latitude	Longitude	AHD (m)
25-Jul-04	Leichhardt	East Leichhardt River	1st hole below dam wall	20 47.119	139 47.622	353
25-Jul-04	Flinders	Cloncurry River	Malbon crossing	21 05.462	140 19.159	260
25-Jul-04	Flinders	Cloncurry River	2 Mile waterhole	20 40.516	140 29.673	191
26-Jul-04	Flinders	Eastern Creek	Eddington Waterhole	20 39.509	141 32.709	110
26-Jul-04	Flinders	Julia Creek	Dalgonally Waterhole	20 08.071	141 20.882	91
27-Jul-04	Flinders	Cloncurry River	Sedan Dip	20 02.736	141 05.306	102
27-Jul-04	Leichhardt	Leichhardt River	Rocky Bar	20 04.334	139 56.588	162
28-Jul-04	Leichhardt	Leichhardt River	behind Julius Dam wall	20 07.798	139 43.366	209
28-Jul-04	Leichhardt	Gunpowder Creek	Flying Fox Hole	19 20.946	139 46.491	101
29-Jul-04	Leichhardt	Gunpowder Creek	Alsace Waterhole	19 23.837	139 38.037	105
29-Jul-04	Leichhardt	Leichhardt River	Bluey's waterhole	19 14.054	139 59.045	70
30-Jul-04	Leichhardt	Alexandra River	Abdy's Waterhole	18 14.993	139 56.226	26
31-Jul-04	Leichhardt	Leichhardt River	Floraville	18 14.044	137 52.763	17
31-Jul-04	Leichhardt	Alexandra River	Washpool	18 15.020	139 53.851	24
31-Jul-04	Leichhardt	Leichhardt River	below Leichhardt Falls	18 12.931	139 53.433	6
07-Aug-04	Flinders	Porcupine Creek	Mt Emu Plains	20 10.638	144 31.433	747
08-Aug-04	Flinders	Flinders River	Harrogate	20 38.725	142 43.282	180
08-Aug-04	Flinders	Eight Mile Creek	Silver Hills old dam	20 36.489	143 06.116	218
08-Aug-04	Flinders	Eight Mile Creek	Silver Hills house dam	20 36.103	143 04.739	220
09-Aug-04	Flinders	Rupert Creek	Tarbrax Waterhole	21 05.902	142 27.901	157
09-Aug-04	Flinders	Alick Creek	Proa bore No 2 drain	20 52.854	142 08.279	163
09-Aug-04	Flinders	Julia Creek	Proa 1950 bore drain	20 52.589	142 07.518	163
10-Aug-04	Flinders	Flinders River	Punchbowl waterhole	20 25.756	142 02.661	130
10-Aug-04	Flinders	Flinders River	Rocky Waterhole	20 14.557	141 50.894	120
11-Aug-04	Flinders	Gidya Creek (Norman R.)	Martins Waterhole	19 18.784	141 17.635	63
11-Aug-04	Flinders	Saxby River	Lyrian Waterhole	19 27.266	141 16.568	68
12-Aug-04	Flinders	Cloncurry River	10 Mile Waterhole	19 19.940	140 51.018	56
12-Aug-04	Flinders	Flinders River	Walkers Bend	18 09.736	140 51.473	12
13-Aug-04	Flinders	Flinders River	Burketown Crossing	17 52.564	140 46.869	5
13-Aug-04	Flinders	Bynoe River	Burke & Wills monument	17 52.710	140 49.479	5
19-Aug-04	Nicholson	O,Shanassy River	10 Mile Waterhole	19 41.650	138 27.214	267
19-Aug-04	Nicholson	Seymour River	Middle Pool	19 20.572	139 01.498	228
20-Aug-04	Nicholson	Seymour River	Rock Pool	19 21.660	139 02.866	261
20-Aug-04	Nicholson	O,Shanassy River	Riversleigh	19 04.432	138 46.117	148
21-Aug-04	Nicholson	Gregory River	Pear Tree (reach 3)	18 51.260	139 06.037	84
22-Aug-04	Nicholson	Accident Creek	Bowthorn	18 05.732	138 18.583	92
22-Aug-04	Nicholson	Nicholson River	Kingfisher	17 53.848	138 14.631	83
23-Aug-04	Nicholson	Gregory floodway	Pandanus Waterhole	18 01.545	139 02.970	28
23-Aug-04	Nicholson	Bull Creek	Pelican Waterhole	18 07.289	139 01.401	30
24-Aug-04	Nicholson	Gregory River	Lake Corinda	18 06.267	139 04.769	31
24-Aug-04	Nicholson	Beames Brook	Brookdale	18 03.641	139 15.876	22

The uppermost site in the Flinders catchment was on Mount Emu Plains at the stream gauge in Porcupine Creek, at AHD 747 m. This was the highest site we surveyed. There may have been permanent waterholes further upstream in the mountains. Tarbrax, southwest of Richmond, was the southernmost site. It was the uppermost permanent waterhole in that direction, as was the Malbon Crossing on the Cloncurry River. The lowest sample site was at the Burketown crossing, at AHD 5 m. The

salinity measured 1.78 ppt. On the downstream side of the crossing, we observed estuarine jellyfish, indicating the saltwater tide pushed up to this point.

In the Leichhardt catchment, dam walls at East Leichhardt and Lake Julius were the upstream limits. We had intended sampling the upstream reaches of Gunpowder Creek, but the travel time to reach this area prevented us from doing so. The lowest site in the Leichhardt River was downstream of the Leichhardt Falls at New Armraynald. This was just above tidal influence.

In the Nicholson catchment, 10 Mile Waterhole on the O'Shannassy River was the upstream permanent water limit in the southern direction. Western upper reaches were in the Northern Territory and therefore not sampled. Sample sites were chosen in Boodjamulla (Lawn Hill) National Park but time prevented us from navigating the administrative requirements. The lowest site in the Nicholson catchment was at AHD 22 m. One of us (Vallance) had surveyed the lower reaches of this catchment at Escott just one month previously as a member of the DPI&F Long Term Monitoring Program (LTMP) team. Extracts from this data are included in the results (**Table 11**).

5.2 Fish biodiversity

Using the rapid sampling techniques described in Section 4.2, we measured 2764 fish and identified a preliminary total of 50 fish species in the freshwaters of the southern gulf catchment region. Some goby specimens are awaiting positive identification at the Queensland museum, so this number may increase by one or two. Note also that we did not identify rainbowfish at the subspecies level, for example, *Melanotaenia splendida inornata*. The occurrence and number of species in the individual catchments are shown in Table 3. We found 41 species in the Flinders catchment, 30 species in the Leichhardt and 30 species in the Nicholson catchments. Of particular interest was the absence of sooty grunter, *Hephaestus fuliginosus*, in the Flinders catchment, although it is reputed to occur (Pocock, *pers. comm*.; Stewart, *pers. comm*.). Eleven species were only found in the Flinders catchment. The Leichhardt catchment had three unique species, as did the Nicholson.

The most widespread species was the bony bream, *Nematolosa erebi*, which occurred in 38 of the 41 sites (**Table 4**). Bony bream were also the most abundant species in the region, with 1 000 or more individuals captured or seen on average at each site. The most widespread (31 sites) and abundant (500 per site on average) angling species was the sleepy cod, *Oxyeleotris lineolata*. Barramundi, *Lates calcarifer*, were found at 19 sites, three of these from fish stocking. It should be noted that the abundance of some deepwater species such as Carpentaria catfish, *Arius paucus*, might be underestimated due to sampling bias. Electrofishing is normally effective to depths of approximately four metres, and less while the boat is moving quickly. We noted numbers of fish showing on the depth sounder in deep water on several occasions. By remaining motionless over deep fish soundings with the power on for 30 seconds, some fish were eventually brought to the surface. They were usually catfish of various species.

Table 3 List of all fish species found in southern Gulf of Carpentaria catchments. ***** indicates presence in that catchment.

Common Name	Species (50)	Flinders (41)	Leichhardt (30)	Nicholson (30)
Archerfish	*Toxotes chatareus*	*	*	*
Banded grunter	*Amniataba percoides*	*	*	*
Barramundi	*Lates calcarifer*	*	*	*
Berney's catfish	*Arius berneyi*	*	*	*
Black catfish	*Neosilurus ater*	*	*	*
Bony bream	*Nematolosa erebi*	*	*	*
Carpentaria catfish	*Arius paucus*	*	*	*
Diamond mullet	*Liza alata*	*	*	-
Eastern rainbowfish	*Melanotaenia splendida*	*	*	*
Forktailed catfish	*Arius graeffei*	*	*	-
Freshwater anchovy	*Thryssa scratchleyi*	*	*	*
Giant glassfish	*Parambassis gulliveri*	*	*	*
Golden goby	*Glossogobius aureus*	*	*	*
Gulf grunter	*Scortum ogilbyi*	*	*	*
Hyrtl's tandan	*Neosilurus hyrtlii*	*	*	*
Long tom	*Strongylura krefftii*	*	*	*
Mouth almighty	*Glossamia aprion*	*	*	*
Reticulated glassfish	*Ambassis macleayi*	*	*	*
Sleepy cod	*Oxyeleotris lineolata*	*	*	*
Spangled perch	*Leiopotherapon unicolor*	*	*	*
Square-blotched goby	*Glossogobius sp. C*	*	*	*
Striped sleepy cod	*Oxyeleotris selheimi*	*	*	*
Toothless catfish	*Anodontiglanis dahli*	*	*	*
unknown goby	*Glossogobius sp.*	*	*	*
Crimson-tipped flathead gudgeon	*Butis butis*	*	-	-
Freshwater sole	*Brachirus selheimi*	*	-	-
Freshwater stingray	*Himantura chaophrya*	*	-	-
new catfish	*Porochilus sp.*	*	-	-
Northern trout gudgeon	*Mogurnda mogurnda*	*	-	-
Northwest glassfish	*Ambassis sp.*	*	-	*
Nurseryfish	*Kurtus gulliveri*	*	-	-
Papuan river sprat	*Clupeoides cf. papuensis*	*	-	-
Rendahl's catfish	*Porochilus rendahli*	*	-	*
River gar	*Zenarchopterus spp*	*	-	-
Salmon catfish	*Arius leptaspis*	*	-	-
Saltpan sole	*Brachirus salinarum*	*	-	-
Small-eyed sleeper	*Prionobutis microps*	*	-	-
Small-mouthed catfish	*Cinetodus froggatti*	*	-	-
Speckled goby	*Redigobius bikolanus*	*	-	-
Spotted scat	*Scatophagus argus*	*	-	-
Tadpole goby	*Chlamydogobius ranunculus*	*	-	-
Elongate glassfish	*Ambassis elongatus*	-	*	*
Ponyfish	*Leiognathus equulus*	-	*	-
Silver biddy	*Gerres filamentosus*	-	*	-
Snub-nosed gar	*Arrhampus sclerolepis*	-	*	-
Sooty grunter	*Hephaestus fuliginosus*	-	*	*
Strawman	*Craterocephalus stramineus*	-	*	*
Fly-specked hardyhead	*Craterocephalus stercusmuscarum*	-	-	*
Mariana's hardyhead	*Craterocephalus marianae*	-	-	*
Neil's grunter	*Scortum neili*	-	-	*

Table 4 Frequency of occurrence and average abundance rating (see **Table 1** for scale) of common fish species in southern Gulf of Carpentaria catchments.

Common name	Species	# Sites	Average abundance
Bony bream	*Nematolosa erebi*	38	6.9
Sleepy cod	*Oxyeleotris lineolata*	31	4.9
Eastern rainbowfish	*Melanotaenia splendida*	30	5.2
Spangled perch	*Leiopotherapon unicolor*	29	4.6
Archerfish	*Toxotes chatareus*	28	3.3
Banded grunter	*Amniataba percoides*	24	4.4
Mouth almighty	*Glossamia aprion*	24	4.5
Gulf grunter	*Scortum ogilbyi*	24	2.5
Barramundi	*Lates calcarifer*	19	3.3
Golden goby	*Glossogobius aureus*	17	3.3
Carpentaria catfish	*Arius paucus*	16	3.1
Forktailed catfish	*Arius graeffei*	15	3.8
Giant glassfish	*Parambassis gulliveri*	15	4.7
Reticulated glassfish	*Ambassis macleayi*	14	5.4
Striped sleepy cod	*Oxyeleotris selheimi*	14	3.7
Long tom	*Strongylura krefftii*	14	3.1
Square-blotched goby	*Glossogobius sp. C*	12	2.9
Sooty grunter	*Hephaestus fuliginosus*	12	2.6
Toothless catfish	*Anodontiglanis dahli*	11	1.9
Freshwater anchovy	*Thryssa scratchleyi*	11	4.5
Berney's catfish	*Arius berneyi*	10	2.1
Hyrtl's tandan	*Neosilurus hyrtlii*	9	2.1
Black catfish	*Neosilurus ater*	7	1.6
Fly-specked hardyhead	*Craterocephalus stercusmuscarum*	6	4.3
Rendahl's catfish	*Porochilus rendahli*	6	3.2
Strawman	*Craterocephalus stramineus*	3	7.7
Diamond mullet	*Liza alata*	3	3.0
Freshwater sole	*Brachirus selheimi*	2	2.0
Crimson-tipped flathead gudgeon	*Butis butis*	2	2.0
Small-eyed sleeper	*Prionobutis microps*	2	2.0

5.2.1 Newly discovered and rare species

Table 5 indicates the species that may be new to science, have a new distribution, or were found at single sites in low numbers. This list also contains species identifications yet to be confirmed by the Queensland museum.

Field identification of some species of gobies is difficult. For example, the difference between a square blotch goby and a flathead goby is the number of rows of microscopic sensory pores below the eye. The flathead goby sometimes also has a faint light patch at the front of the first dorsal fin. Consequently, we identified very few gobies as flathead gobies, and tended to identify small gobies with blotches as square blotch gobies. There were several similarly blotched gobies with a distinctive dark spot at the front of the first dorsal fin, which are listed in Table 5 as "unknown goby". There were two other unidentifiable gobies also lumped in with the "unknown goby" name.

The other species of note lodged with the museum is what we identified as a saltpan sole. Rather than a pointed tail, this fish had a distinct rounded tail similar to the tailed sole, *Aseraggodes klunzingeri*, but with a saltpan sole colouration. This fish may also be an undescribed species.

Table 5 New and rare fish species in southern Gulf of Carpentaria catchments.

Common name	Species	# Sites	Average abundance	Catchment	Comment
Papuan river sprat	*Clupeoides cf. papuensis*	3	5.3	Flinders	new?
new catfish	*Porochilus sp.*	1	1.0	Flinders	new?
Tadpole goby	*Chlamydogobius ranunculus?*	1	7.0	Flinders	new?
Saltpan sole	*Brachirus salinarum?*	1	1.0	Flinders	new?
unknown goby	*Glossogobius sp.*	4	2.3	All	unidentified
Northwest glassfish	*Ambassis sp.*	4	6.5	Flinders & Nicholson	undescribed
Elongate glassfish	*Ambassis elongatus?*	4	2.8	Leichhardt & Nicholson	museum to id
Salmon catfish	*Arius leptaspis?*	1	3.0	Flinders	museum to id
Small-mouthed catfish	*Cinetodus froggatti*	1	3.0	Flinders	NT only
Mariana's hardyhead	*Craterocephalus marianae*	1	3.0	Nicholson	NT only
Nurseryfish	*Kurtus gulliveri*	1	1.0	Flinders	rare
Freshwater stingray	*Himantura chaophrya?*	1	1.0	Flinders	rare
Neil's grunter	*Scortum neili?*	1	1.0	Nicholson	vagrant?
Northern trout gudgeon	*Mogurnda mogurnda*	1	3.0	Flinders	restricted?
River gar	*Zenarchopterus spp*	1	2.0	Flinders	
Speckled goby	*Redigobius bikolanus*	1	1.0	Flinders	estuarine
Spotted scat	*Scatophagus argus*	1	1.0	Flinders	species
Silver biddy	*Gerres filamentosus*	1	5.0	Leichhardt	no
Snub-nosed gar	*Arrhampus sclerolepis*	1	4.0	Leichhardt	concerns
Ponyfish	*Leiognathus equulus*	1	3.0	Leichhardt	

The fish tentatively labelled the Papuan River sprat, *Clupeoides cf. papuensis*, is probably an undescribed species. It was detected at three sites in the Flinders catchment, with a particularly high abundance (> 5000) at Dalgonally Waterhole. Despite its abundance, just a single specimen had been recorded previously, from the Alexandra River near the falls (Johnson, *pers. comm*.). The minimum sizes of 19 mm were post larvae, so it was obviously breeding at both upper and lower ends of the Flinders catchment. The maximum total length recorded by us was 53 mm. The

known range of the described species, *Clupeoides papuensis*, is described by Allen (1991) as from central-south New Guinea including the Digul, Strickland and Fly Rivers. In the Fly River, it has been observed at sites over 900 km from the sea. Maximum length was given as 80 mm (Allen, 1991).

A goby we found in a bore drain on Proa station has been preliminarily identified by the Queensland Museum as the tadpole goby, *Chlamydogobius ranunculus*. The fish were highly abundant from 80 to 200 m downstream of the bore head, then rapidly became less numerous until they were virtually absent 1 km downstream. Where fish were most abundant, the water temperature was 30.6 ^{o}C, the conductivity was 557 μs/cm, and pH was 8.32. At the bore head 40 m upstream, the water temperature was 48.1 ^{o}C, conductivity, 568 μs/cm and pH, 7.89. The goby ranged in size from 17 to 46 mm. The smaller sizes were juveniles, so this species was breeding at this site.

Plate 3 shows an unidentified plotosid catfish, 435 mm long, tentatively assigned to the *Porochilus* genus by the Queensland museum (Johnson, *pers. comm*.). Just one specimen was collected, at 10 Mile Waterhole in the Flinders catchment. Obviously, nothing is known about this fish, so further study is recommended.

Plate 3 Undescribed species of catfish from the Flinders River. Note the vertical sensory pores that join the lateral line.

Prior to this survey, the small-mouthed catfish, *Cinetodus froggatti*, had only been found in Australia in the Roper River system in the Northern Territory. It is more common and widespread in southern New Guinea (Allen *et al*., 2002). We collected more than 50 individuals ranging between 100 mm and 435 mm from the freshwater reaches of the lower Bynoe River near the Burke and Wills monument. Populations in New Guinea breed in the estuary from October to February (Allen *et al*., 2002) and feed entirely on small molluscs, which are swallowed whole. The conservation status of this species in Queensland waters is unknown and requires further research.

Mariana's hardyhead, *Craterocephalus marianae*, is another species thought to be restricted to a limited area of the Northern Territory. Our surveys detected them at one site in the O'Shannassy River, which is a tributary of the Gregory River in the Nicholson catchment. While this fish was relatively abundant, it was the only site we

recorded it. Further survey work might extend its range. Otherwise, this species would be vulnerable to localised extinctions.

The nurseryfish, *Kurtus gulliveri*, is a unique species that has a restricted distribution in Queensland, the Northern Territory and Western Australia (Allen 2002). The male of this species develops a hook structure on his forehead, which is used to carry eggs until they hatch. Allen *et al*., (2002) listed a maximum size of about 280 mm. However, our single specimen from Lyrian Waterhole was a female of 383 mm total length (**Plate 4**). Marsden (*pers. comm*.) found numbers of small nurseryfish in this waterhole during a cursory look in 2000, so they probably breed here.

Plate 4 Female nurseryfish from Lyrian Waterhole on the Saxby River.

We also found just one freshwater stingray, in the Flinders River at Walker's bend. It was far too big and lively to bring into the boat, so we conservatively estimated the disc width to be 1 000 mm. Allen *et al*., (2002) claimed just one species of stingray in Australian freshwaters, and this specimen matched Allen's description. Particularly noticeable was the 40 mm wide dark band on the perimeter of the underside of the disc. Allen *et al*., (2002) also stated that reliable records of this species had previously existed only from the Gilbert River in Queensland. However, during surveys of Cape York streams, Herbert *et al*., (1995) found stingrays in a number of westward flowing streams. Stingrays were particularly common in the Wenlock River up to the waterfall, 200 km upstream. Again, as they had no means of preserving such large fish for forwarding to the museum for positive identification, Herbert *et al*., (1995) labelled these stingrays as "*Dasyatis fluviorum?*". Our record extends the range of *Himantura chaophrya* to include the Flinders River.

Another species that we found in the Flinders River but did not record was a dead sawfish (**Plate 5**). Sawfish species are identified by the number of teeth on the saw, and the saw on this one had been removed. There are a number of species known to occur in these rivers. They are currently being studied by Stirling Peverell, from DPI &F. The taking of sawfish just for the saw is discussed later.

Plate 5 Dead sawfish, *Pristis sp*, on the bank of the Flinders River at Walker's bend. The saw had been removed, but when alive, this specimen would have been near 4 m long.

5.3 Fish distribution in each catchment

By recording AHD at each site, we were able to compare fish distributions throughout the catchment and identify preferred habitat or areas where upstream dispersal was limited by fish barriers. These barriers could be physical such as a waterfall, man-made structures such as a dam wall or culvert, or an environmental barrier such as water temperature or quality. Barriers could be permanent or temporary. **Table 7**, **Table 9** and **Table 12** show fish distribution along the Flinders, Leichhardt and Nicholson catchments. The maximum figure is the uppermost site in a catchment and the minimum the lower site. The range indicates how widespread the particular species was throughout the catchment.

Table 6, **Table 8** and **Table 10** are correlation matrices showing the relationships between biodiversity and measured physical and chemical parameters. Note this is a first look at identifying factors that may influence fish biodiversity in these catchments. A significant correlation does not necessarily mean that one factor is causing an effect on the other. Correlation signifies that as one factor increases, the other increases (positive correlation) or decreases (negative correlation). For example, the abundance of barramundi in the Flinders catchment decreased with increasing AHD (distance upstream). This relationship was not significant in either the Leichhardt or Nicholson catchments. Factors that have significant correlations with species numbers are worthy of further study. The relationship between width and depth is also worth noting. We did not determine the relationship between individual fish species (apart from barramundi) and the factors in these matrices, as such an analysis was outside the scope of this project.

The reader is referred to the appendix for detailed lists of species at each site. General results for each catchment follow.

5.3.1 Fish distribution in the Flinders catchment

The distribution of the 41 species found was strongly correlated with prawn and barramundi abundance (**Table 6**). Species number was positively correlated with the length and surface area of the waterbody, and negatively correlated with cooler water temperatures, but not with other water quality parameters.

Table 6 Correlation table of factors associated with fish distribution in the Flinders Catchment. Significance level is indicated by * (p=0.5), ** (p=0.01), *** (p=0.001).

	Species No	*AHD (m)*	*Prawn abundance*	*Barra abundance*	*O2 % sat*	*O2*	*Conductivity*	*pH*	*Temperature*	*Secchi*	*Length*	*Width (ave)*	*Depth (max)*	*Depth (ave)*	*Surface Area*	*Volume*
Species No	1.000															
AHD	**-0.486***	1.000														
Prawn abundance	**0.727*****	-0.176	1.000													
Barra abundance	**0.723*****	**-0.491***	**0.559***	1.000												
O2 % sat	0.146	-0.339	0.090	-0.033	1.000											
O2	0.233	-0.178	0.246	-0.047	0.911***	1.000										
Cond	0.336	-0.213	0.143	0.389	-0.393	-0.347	1.000									
pH	0.095	0.147	0.076	0.106	0.279	0.325	0.221	1.000								
Temp	**-0.448***	-0.087	**-0.645****	-0.113	-0.352	**-0.685*****	0.083	-0.224	1.000							
Secchi	-0.217	0.306	-0.430	-0.023	-0.335	-0.411	**0.539***	0.434	**0.468***	1.000						
Length	**0.468***	-0.395	0.344	**0.616****	-0.026	-0.048	0.227	-0.193	-0.058	-0.272	1.000					
Width (ave)	0.040	-0.086	0.185	0.037	-0.015	-0.024	0.202	-0.022	-0.056	-0.026	0.075	1.000				
Depth (max)	0.420	-0.077	**0.569****	**0.492***	0.252	0.283	0.035	-0.040	-0.372	-0.287	**0.599****	**0.499***	1.000			
Depth (ave)	0.382	-0.052	**0.518***	**0.464***	0.168	0.259	-0.196	-0.171	-0.425	**-0.468***	**0.714*****	0.108	0.813***	1.000		
Surface area	**0.535***	-0.403	0.346	**0.586****	-0.141	-0.162	**0.536***	-0.092	-0.004	-0.029	**0.829*****	**0.445***	**0.561****	**0.445***	1.000	
Volume	0.300	-0.280	0.283	**0.505***	-0.020	-0.020	0.077	-0.215	-0.084	-0.306	**0.945*****	0.175	**0.631****	0.774***	0.761***	1.000

Rainbowfish and bony bream were the only species found throughout the catchment (**Table 7**). The bony bream occurred in the most number of sites (18 out of 20) and had the highest average abundance rating of 6.9. This rating equated to almost 5 000 individual fish seen per site. Spangled perch and banded grunter were also widespread and abundant, only avoiding the higher salinity site at the estuarine interface.

Hyrtl's tandan was restricted to the upper catchment, as was the northern trout gudgeon, which occurred only at the uppermost site. The gudgeon was in reasonable numbers at this one site.

Ten species were found only below 12 m AHD. This does not necessarily mean all these species were saltwater spawners. Other factors may explain this distribution, and this is discussed later.

Barramundi are saltwater spawners, so its distribution is indicative of barriers to upstream migration. Barramundi were stocked into the house dam at Silver Hills (220 m AHD). The upstream limit that we found this species to be naturally occurring was at Rocky Waterhole (120 m AHD), although it has reliably been reported from Tarbrax (AHD 157 m). The water temperature was 13.8 ^{o}C when we sampled Tarbrax in August (see the appendix), and no doubt, lower temperatures occur, so barramundi would rarely survive a winter here. We saw no reason why barramundi would not occur here during summer floods, however. The golden goby apparently also has a marine larval stage (Allen *et al*., 2002), and it ranges from 218 m to 5 m AHD in the Flinders catchment.

Twelve species were found at just one site, and of these, there were seven species where just one individual was found in the entire catchment. The rare species were reported in Section 5.2.1.

Table 7 Fish distribution along the Flinders River. The highest of 20 sites sampled was at 747 m AHD and the lowest site was at 5 m AHD.

Common name	Species	Number of sites	Average abundance	AHD (m)		
				Maximum	Minimum	Range
Bony bream	*Nematolosa erebi*	18	6.9	747	5	742
Eastern rainbowfish	*Melanotaenia splendida*	11	4.8	747	5	742
Spangled perch	*Leiopotherapon unicolor*	12	4.3	747	12	735
Banded grunter	*Amniataba percoides*	7	4.3	747	56	691
Hyrtl's tandan	*Neosilurus hyrtlii*	3	1.7	747	191	556
Square-blotched goby	*Glossogobius sp. C*	8	2.6	260	12	248
Barramundi	*Lates calcarifer*	10	3.2	220	5	215
Sleepy cod	*Oxyeleotris lineolata*	14	5.0	218	5	213
Golden goby	*Glossogobius aureus*	9	2.8	218	5	213
Archerfish	*Toxotes chatareus*	12	2.9	191	5	186
Gulf grunter	*Scortum ogilbyi*	12	2.7	191	5	186
Toothless catfish	*Anodontiglanis dahli*	8	2.1	191	5	186
Giant glassfish	*Parambassis gulliveri*	10	5.2	180	5	175
Northwest glassfish	*Ambassis sp.*	2	5.0	218	63	155
Carpentaria catfish	*Arius paucus*	10	3.4	157	5	152
Mouth almighty	*Glossamia aprion*	8	3.0	157	5	152
Berney's catfish	*Arius berneyi*	5	2.4	157	5	152
Striped sleepy cod	*Oxyeleotris selheimi*	3	4.3	191	63	128
Freshwater sole	*Brachirus selheimi*	2	2.0	130	5	125
Forktailed catfish	*Arius graeffei*	7	3.7	120	5	115
Papuan river sprat	*Clupeoides cf. papuensis*	3	5.3	110	5	105
Rendahl's catfish	*Porochilus rendahli*	5	3.6	157	56	101
Black catfish	*Neosilurus ater*	3	1.3	102	5	97
Freshwater anchovy	*Thryssa scratchleyi*	4	6.3	68	5	63
Reticulated glassfish	*Ambassis macleayi*	2	3.0	102	91	11
Long tom	*Strongylura krefftii*	2	1.0	12	5	7
Northern trout gudgeon	*Mogurnda mogurnda*	1	3.0	747	747	0
Saltpan sole	*Brachirus salinarum*	1	1.0	191	191	0
Tadpole goby	*Chlamydogobius ranunculus*	1	7.0	163	163	0
Salmon catfish	*Arius leptaspis*	1	3.0	91	91	0
Nurseryfish	*Kurtus gulliveri*	1	1.0	68	68	0
new catfish	*Porochilus sp.*	1	1.0	56	56	0
Freshwater stingray	*Himantura chaophrya*	1	1.0	12	12	0
Diamond mullet	*Liza alata*	2	3.0	5	5	0
Crimson-tipped flathead gudgeon	*Butis butis*	2	2.0	5	5	0
Small-eyed sleeper	*Prionobutis microps*	2	2.0	5	5	0
Small-mouthed catfish	*Cinetodus froggatti*	1	3.0	5	5	0
River gar	*Zenarchopterus spp*	1	2.0	5	5	0
new (?) goby	*Pseudogobius sp.*	1	1.0	5	5	0
Speckled goby	*Redigobius bikolanus*	1	1.0	5	5	0
Spotted scat	*Scatophagus argus*	1	1.0	5	5	0

5.3.2 Fish distribution in the Leichhardt catchment

We did not sample above the Julius and East Leichhardt dam walls, as these had been subjected to a long period of fish stocking activity (Hogan, 1995). For lists of fish species in these impoundments, see the Mt Isa Fish Stocking Group Incorporated web site at mountisafish.org.au..

During this project, thirty fish species were found in the Leichhardt catchment below the dam walls. There was a correlation between distance downstream and increasing numbers of species (**Table 8**). Six species, including the freshwater anchovy and the giant glassfish, were not found above 70 m AHD (see **Table 9**). The distribution of these species may indicate a preference for substrates with finer material rather than rock or cobbles. Water temperature also significantly increased downstream.

Table 8 Correlation table of factors associated with fish distribution in the Leichhardt catchment. Significance level is indicated by * (p=0.5), ** (p=0.01), *** (p=0.001).

	Species No	*AHD (m)*	*Prawn abundance*	*Barra abundance*	*O2 % sat*	*O2*	*Conductivity*	*pH*	*Temperature*	*Secchi*	*Length*	*Width (ave)*	*Depth (max)*	*Depth (ave)*	*Surface Area*	*Volume*
AHD	**-0.769****	1.000														
Prawn abundance	**0.641***	**-0.847****	1.000													
Barra abundance	0.309	-0.433	0.494	1.000												
O2 % sat	0.148	0.157	-0.215	-0.320	1.000											
O2	-0.262	0.593	-0.515	-0.404	0.852**	1.000										
Cond	-0.362	0.343	-0.322	-0.341	0.563	0.623	1.000									
pH	0.070	0.124	-0.491	-0.105	0.644*	0.555	0.349	1.000								
Temp	**0.761***	**-0.809****	0.547	0.160	0.275	-0.263	-0.137	0.180	1.000							
Secchi	-0.331	0.385	-0.236	-0.516	0.104	0.232	0.493	-0.259	-0.333	1.000						
Length	0.260	-0.543	0.415	0.075	-0.351	-0.437	-0.248	-0.165	0.141	0.121	1.000					
Width (ave)	0.370	**-0.672***	**0.693***	0.216	-0.406	-0.588	-0.579	-0.404	0.299	-0.109	0.748	1.000				
Depth (max)	0.129	-0.527	0.527	0.568	-0.512	**-0.673***	-0.472	-0.456	0.264	-0.062	0.501	0.654*	1.000			
Depth (ave)	0.222	-0.526	0.501	0.200	-0.406	-0.496	-0.381	-0.401	0.159	0.127	**0.898*****	**0.753***	0.738*	1.000		
Surface area	0.198	-0.475	0.340	-0.005	-0.363	-0.418	-0.249	-0.162	0.084	0.155	**0.995*****	0.726*	0.462	**0.885*****	1.000	
Volume	0.138	-0.396	0.238	-0.089	-0.343	-0.370	-0.200	-0.133	0.042	0.198	**0.974*****	**0.634***	0.403	0.868***	0.989***	1.000

The most widespread species were bony bream and archerfish, which occurred in all 10 sites. Banded grunter and long tom were also found throughout the catchment. We have found these four species in the impoundments on previous occasions, so they possibly range to the upper reaches. Spangled perch, rainbowfish and sooty grunter were also found throughout the catchment, but not below the Leichhardt falls. Hyrtl's tandan and the black catfish were confined to upper reaches.

Four species were confined to below the falls. Barramundi also were not found above the falls, except for escapees of stocked barramundi that were found immediately below the spillway at Julius dam, and at the end of the gorge at Rocky Bar. Interestingly, golden gobies, which are reputed to have a marine larval phase (Allen *et al*., 2002), were found above as well as below the falls. Its distribution was patchy, however, being found immediately above the falls at Floraville, and in Gunpowder Creek.

Bony bream was the most abundant species, with an average abundance rating of 7.0. Also noticeable was the wide distribution and numbers of sleepy cod. Another

predator, the mouth almighty, also occurred in nine of ten sites and had a relatively high average abundance rating of 5.0.

None of the species found could be classified as rare, although some species had restricted distributions. The strawman was found in just one site, where it was very abundant. The unidentified gobies could possibly have conservation significance after being examined by the Queensland museum.

Table 9 Fish distribution along the Leichhardt River. The highest of 10 sites sampled was at 353 m AHD and the lowest site was at 6 m AHD.

Common name	Species	Number of sites	Average abundance	AHD (m)		
				Maximum	Minimum	Range
Bony bream	*Nematolosa erebi*	10	7.0	353	6	347
Archerfish	*Toxotes chatareus*	10	3.6	353	6	347
Banded grunter	*Amniataba percoides*	9	5.1	353	6	347
Long tom	*Strongylura krefftii*	7	3.6	353	6	347
Eastern rainbowfish	*Melanotaenia splendida*	8	5.1	353	17	336
Spangled perch	*Leiopotherapon unicolor*	7	4.7	353	17	336
Sooty grunter	*Hephaestus fuliginosus*	7	2.3	353	24	329
Black catfish	*Neosilurus ater*	2	2.0	353	101	252
Hyrtl's tandan	*Neosilurus hyrtlii*	2	1.5	353	101	252
Sleepy cod	*Oxyeleotris lineolata*	9	5.3	209	6	203
Mouth almighty	*Glossamia aprion*	9	5.0	209	6	203
Forktailed catfish	*Arius graeffei*	8	3.9	209	6	203
Barramundi	*Lates calcarifer*	5	3.6	209	6	203
Carpentaria catfish	*Arius paucus*	4	3.0	209	6	203
Gulf grunter	*Scortum ogilbyi*	7	2.0	209	17	192
Toothless catfish	*Anodontiglanis dahli*	2	1.5	209	17	192
Reticulated glassfish	*Ambassis macleayi*	5	5.8	162	6	156
Striped sleepy cod	*Oxyeleotris selheimi*	3	2.0	209	101	108
Golden goby	*Glossogobius aureus*	4	4.5	105	6	99
Freshwater anchovy	*Thryssa scratchleyi*	5	4.0	70	6	64
Square-blotched goby	*Glossogobius sp. C*	3	4.0	70	6	64
Giant glassfish	*Parambassis gulliveri*	3	5.7	70	24	46
Berney's catfish	*Arius berneyi*	3	1.3	24	6	18
unknown goby	*Glossogobius sp.*	2	1.5	24	17	7
Elongate glassfish	*Ambassis elongatus*	2	1.5	26	24	2
Strawman	*Craterocephalus stramineus*	1	7.0	101	101	0
Silver biddy	*Gerres filamentosus*	1	5.0	6	6	0
Snub-nosed gar	*Arrhampus sclerolepis*	1	4.0	6	6	0
Ponyfish	*Leiognathus equulus*	1	3.0	6	6	0
Diamond mullet	*Liza alata*	1	3.0	6	6	0

5.3.3 Fish distribution in the Nicholson catchment

The number of fish species in the Nicholson catchment was positively correlated with the size of the waterbody, particularly its length (**Table 10**). Interestingly, species numbers did not vary with distance upstream (AHD). There was a tendency for lower barramundi abundance further upstream, but this correlation was not significant.

Barramundi abundance was very positively associated with the average depth of water, the width, and increased clarity (Secchi depth).

Table 10 Correlation table of factors associated with fish distribution in the Nicholson catchment. Significance level is indicated by * (p=0.5), ** (p=0.01), *** (p=0.001).

	Species No	*AHD (m)*	*Prawn abundance*	*Barra abundance*	*O2 % sat*	*O2*	*Conductivity*	*pH*	*Temperature*	*Secchi*	*Length*	*Width (ave)*	*Depth (max)*	*Depth (ave)*	*Surface Area*	*Volume*
AHD	-0.484	1.000														
Prawn abundance	0.527	-0.181	1.000													
Barra abundance	0.648*	-0.321	0.762**	1.000												
O2 % sat	0.260	-0.367	-0.159	0.011	1.000											
O2	0.206	-0.324	-0.161	-0.019	0.992***	1.000										
Cond	0.468	-0.342	**0.679***	0.520	0.253	0.250	1.000									
pH	0.327	-0.319	0.363	0.444	**0.763****	**0.783****	**0.655***	1.000								
Temp	0.469	-0.335	-0.050	0.233	**0.685***	0.597	0.251	0.459	1.000							
Secchi	0.588	-0.300	**0.774****	**0.683***	-0.092	-0.092	0.548	0.260	0.016	1.000						
Length	**0.736****	-0.087	0.534	0.487	-0.136	-0.218	0.367	-0.048	0.457	0.534	1.000					
Width (ave)	**0.653***	-0.334	0.478	**0.743****	-0.051	-0.130	0.028	0.029	0.416	0.507	**0.666***	1.000				
Depth (max)	0.566	-0.143	0.454	0.442	-0.123	-0.186	-0.006	-0.112	0.342	0.618	**0.776****	**0.821****	1.000			
Depth (ave)	**0.727***	-0.317	**0.840****	**0.915*****	-0.082	-0.119	0.564	0.309	0.234	**0.880*****	**0.702***	**0.768****	0.677*	1.000		
Surface area	**0.651***	-0.143	0.441	0.435	-0.113	-0.194	0.068	-0.121	0.448	0.531	**0.893*****	**0.816****	**0.962*****	**0.660***	1.000	
Volume	**0.636***	-0.158	0.445	0.452	-0.101	-0.180	0.044	-0.107	0.435	0.557	**0.860*****	**0.836****	**0.979*****	0.673*	0.997***	1.000

No species was confined to either the upper or the lower reaches of the catchment, although we did not sample below AHD 22 m as part of this project. The Nicholson River just above tidal influence was sampled by one of us (Vallance) one month previously at Escott Station. Species found at Escott are listed in **Table 11**. No additional species were found. However, the distribution of 13 species was extended further down the catchment.

Rainbowfish and bony bream were the most widespread species (**Table 12**). Sleepy cod, *Oxyeleotris lineolata*, and the striped sleepy cod, *Oxyeleotris selheimi*, were also widespread. Neither species exhibited a preference for any particular habitat.

The bony bream was the most abundant species, with an average abundance rating of 6.7, closely followed by the rainbowfish, with a rating of 5.7. Just one individual of the toothless catfish and one Rendahl's catfish were caught in this catchment, although both species were common in the Flinders catchment. We were confident of the identity of the one Neil's grunter specimen we caught, but unfortunately this fish was released, so this record of capture remains unconfirmed. Otherwise, we did not capture any rare or endangered species during this project.

Table 11 Species sampled by the LTMP at Escott Station, Nicholson River, on 7 July 04. (Unpublished data supplied by the long term monitoring program, Queensland DPI&F.)

Common name	Species
Reticulated glassfish	*Ambassis macleayi*
Northwest glassfish	*Ambassis spp*
Banded grunter	*Amniataba percoides*
Fly-specked hardyhead	*Craterocephalus stercusmuscarum*
Mouth almighty	*Glossamia aprion*
Square-blotched goby	*Glossogobius sp. C*
Barramundi	*Lates calcarifer*
Spangled perch	*Leiopotherapon unicolor*
Eastern (chequered) rainbowfish	*Melanotaenia splendida inornata*
Black catfish	*Neosilurus ater*
Sleepy cod	*Oxyeleotris lineolata*
Long tom	*Strongylura krefftii*
Archerfish	*Toxotes chatareus*

The Nicholson catchment has two different sub-catchments. The Gregory River is distinguished from the Nicholson River by having a permanent flow and much higher conductivity (602 μS/cm at the Pear Tree site compared to 76 μS/cm at Kingfisher). We did not design our sampling strategy to determine if there were any differences in fish distribution. Nevertheless, of 30 species, 28 were found in eight sites in the Gregory sub-catchment, and 20 species in two sites in the Nicholson. The two species not found in the Gregory system were the toothless catfish and the Carpentaria catfish. The LTMP survey also failed to catch these species. The toothless catfish is rare, but the Carpentaria catfish is widespread in other catchments in the region, suggesting the water chemistry in the Gregory is unsuitable for this species.

Table 12 Fish distribution along the Nicholson River. The highest of 11 sites sampled was at 267 m AHD and the lowest site was at 22 m AHD.

Common name	Species	Number of sites	Average abundance	AHD (m)		
				Maximum	Minimum	Range
Eastern rainbowfish	*Melanotaenia splendida*	11	5.7	267	22	245
Bony bream	*Nematolosa erebi*	10	6.7	267	22	245
Spangled perch	*Leiopotherapon unicolor*	10	4.8	267	28	239
Sleepy cod	*Oxyeleotris lineolata*	8	4.3	261	22	239
Striped sleepy cod	*Oxyeleotris selheimi*	8	4.1	261	22	239
Banded grunter	*Amniataba percoides*	8	3.6	228	22	206
Sooty grunter	*Hephaestus fuliginosus*	5	3.0	261	83	178
Reticulated glassfish	*Ambassis macleayi*	7	5.7	148	22	126
Mouth almighty	*Glossamia aprion*	7	5.3	148	22	126
Fly-specked hardyhead	*Craterocephalus stercusmuscarum*	6	4.3	148	22	126
Archerfish	*Toxotes chatareus*	6	3.3	148	30	118
Gulf grunter	*Scortum ogilbyi*	5	2.8	148	30	118
Long tom	*Strongylura krefftii*	5	3.2	148	31	117
Barramundi	*Lates calcarifer*	4	3.0	148	31	117
Berney's catfish	*Arius berneyi*	2	2.5	148	31	117
Square-blotched goby	*Glossogobius sp. C*	1	2.0	148	83	65
Golden goby	*Glossogobius aureus*	4	3.3	148	84	64
Strawman	*Craterocephalus stramineus*	2	8.0	148	84	64
Black catfish	*Neosilurus ater*	2	1.5	148	84	64
Hyrtl's tandan	*Neosilurus hyrtlii*	4	2.8	92	28	64
Elongate glassfish	*Ambassis elongatus*	2	4.0	92	31	61
unknown goby	*Glossogobius sp.*	2	2.0	84	30	54
Freshwater anchovy	*Thryssa scratchleyi*	2	2.0	83	31	52
Carpentaria catfish	*Arius paucus*	2	1.5	92	83	9
Northwest glassfish	*Ambassis sp.*	2	8.0	30	28	2
Giant glassfish	*Parambassis gulliveri*	2	1.0	31	30	1
Mariana's hardyhead	*Craterocephalus marianae*	1	3.0	148	148	0
Neil's grunter	*Scortum neili*	1	1.0	148	148	0
Toothless catfish	*Anodontiglanis dahli*	1	1.0	92	92	0
Rendahl's catfish	*Porochilus rendahli*	1	1.0	30	30	0

5.4 Hydrology

The Flinders catchment drains an area of 109 380 sq km and has a mean annual discharge of 3 857 000 ML (DNRM&E, 2004). The DNRM&E report also states that the Leichhardt catchment area is 32 880 sq km, with a mean annual discharge of 2 179 000 ML. The equivalent statistics for the Nicholson catchment were 36 100 sq km and 2 237 000 ML.

Rainfall is monsoonal and highly variable, with most of it falling between December and March. Annual rainfall varies from approximately 400 mm in the upper catchment to 900 mm along the coast. This highly variable rainfall produces markedly seasonal stream flows of highly variable magnitude. Most streams in the region cease to flow between April and November, the exception being the Gregory River, which is spring fed. An analysis of a subset of daily flow data (some missing and estimated values) obtained from the Department of Natural Resources and Mines for the Flinders, Leichhardt and Gregory Rivers illustrates the patterns of seasonality and variability.

The traditional statistic used to describe stream variability is the annual coefficient of variation (C_v). Higher C_v values indicate greater variability. Finlayson and McMahon, (1988) reported that the average C_v for the rivers of the world is 33%. As can be seen in Table 13, the C_v for the Flinders, Leichhardt and Gregory Rivers is very high. Note the C_v is based on mean values, which are skewed upwards by rare flow events such as those that accompany cyclones.

Table 13 Annual flow statistics for some southern Gulf of Carpentaria rivers in recent years. Flow values are in ML. (Data from DNRM. Note supplied data contained some missing and estimated values.)

	Flinders	Leichhardt	Gregory
Years	1970 - 2003	1984 - 2002	1970 - 2003
Maximum	23,934,802	5,862,273	3,701,683
Minimum	63,298	27	123,139
Mean	3,906,000	1,335,000	653,000
Median	2,542,000	336,000	352,000
C_v (%)	132	134	110
S_{50}	150	627	154
$P_{.90}$	7,752,000	3,899,000	1,400,000
$P_{.75}$	4,525,000	2,173,000	777,000
$P_{.25}$	723,000	64,000	236,000
$P_{.10}$	290,000	3,000	176,000

Table 13 also lists flows at the 90^{th}, 75^{th}, 50^{th} (median), 25^{th} and 10^{th} percentiles. Values between the 75^{th} and 25^{th} percentiles are called the interquartile range, which encompasses 50 % of flows. These flow statistics are best viewed as a box plot, as shown in the following figures.

5.4.1 Monthly discharge in the Flinders catchment

Figure 2 shows that most flows occur in the Flinders River between January and March. Note March has the highest median flow, while January has the highest average flow. This average was skewed by rare large events above the 90th percentile (shown as the upper dot on the range line). The unreliable nature of the flows is illustrated by the fluctuations in and large values of the coefficient of variation. The C_v was highest in October, and reflects the irregular arrival and occurrence of storms. Very high values in April reflect the irregularity in the intensity and timing of the wet season and resultant persistence of the flow, which ceases with a high degree of certainty (very low C_v) by June. The low position of the median flow in the box representing the interquartile range shows that 50% of the flows that occur in the Flinders River are minor. Major flows are a rare event, and in fact, the "average" or mean flow is less than 25% of the number of flows to have occurred between 1970 and 2003. This has important implications for water extraction, allocation and reliability of supply, as well as the distribution and abundance of fish species and the maintenance of aquatic habitat and biodiversity.

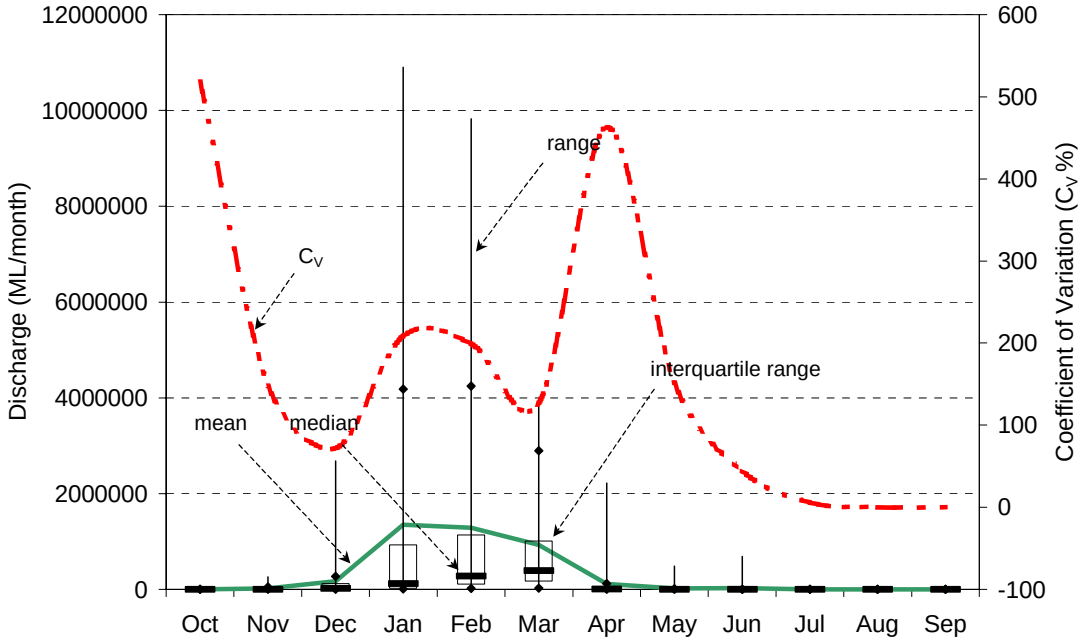

Figure 2 Monthly discharge of the Flinders River at Walker's Bend between 1970 and 2003. Note the water year is from October until September to encompass a full wet season.

The Flinders catchment is 109 380 sq km, so has a range of flow patterns. Median monthly flows recorded at upper, middle and lower reaches of the catchment are shown in **Figure 3**. Most flows in Porcupine Creek occured in January. Runoff accumulated at Canobie by February, reached Walker's Bend during March, and was discharged into the sea by April.

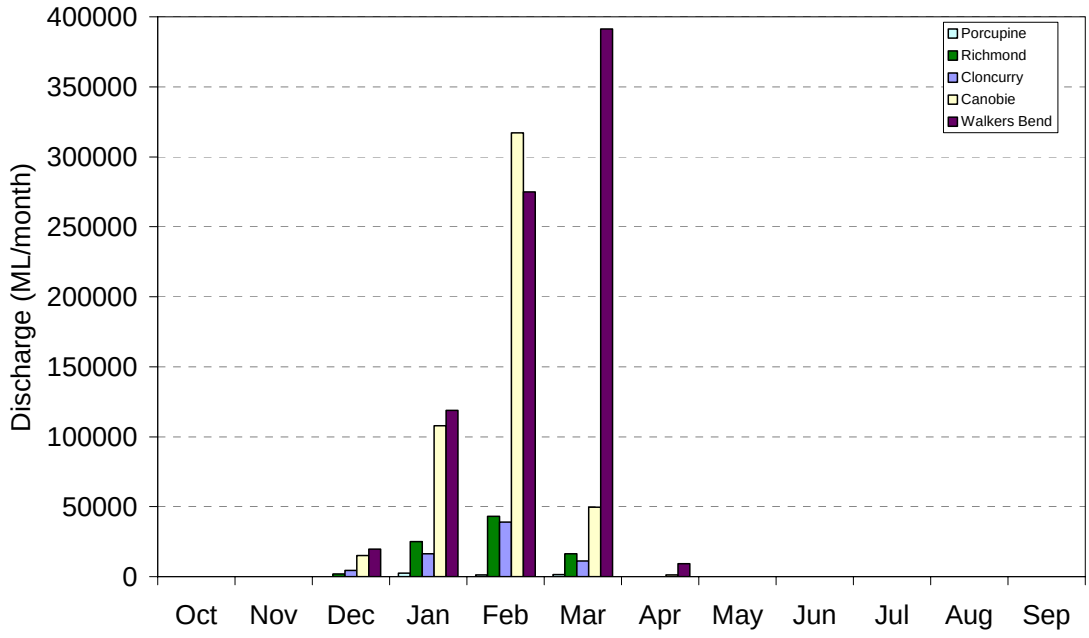

Figure 3 Median monthly flows at stream gauges in the Flinders River between 1970 and 2003. Data is in order from the uppermost gauge at Porcupine Creek to the lowest gauge at Walker's Bend.

5.4.2 Monthly discharge in the Leichhardt catchment

The Leichhardt River at Floraville has a different flow pattern to the Flinders, as illustrated in Figure 4. Extreme events have occurred earlier, although the highest average discharge occurred a month later in February. At least the February average falls within the interquartile range, although still above the median. Interestingly, the median flow in March is at the upper end of the interquartile range, indicating either that stream flows are originating from a steady release of groundwater rather than rainfall, or possibly a steady release of water from Lake Julius.

Median monthly discharge in the Leichhardt River between May and October is zero. However, in 1993, following a very large event in February, small flows persisted until August. In 1998, a small flow persisted until September. These rare events affected the C_v, which would otherwise have been zero. Overall, the flow uncertainty as described by the C_v is greater in the Leichhardt than in either the Flinders or Gregory Rivers (**Table 13**).

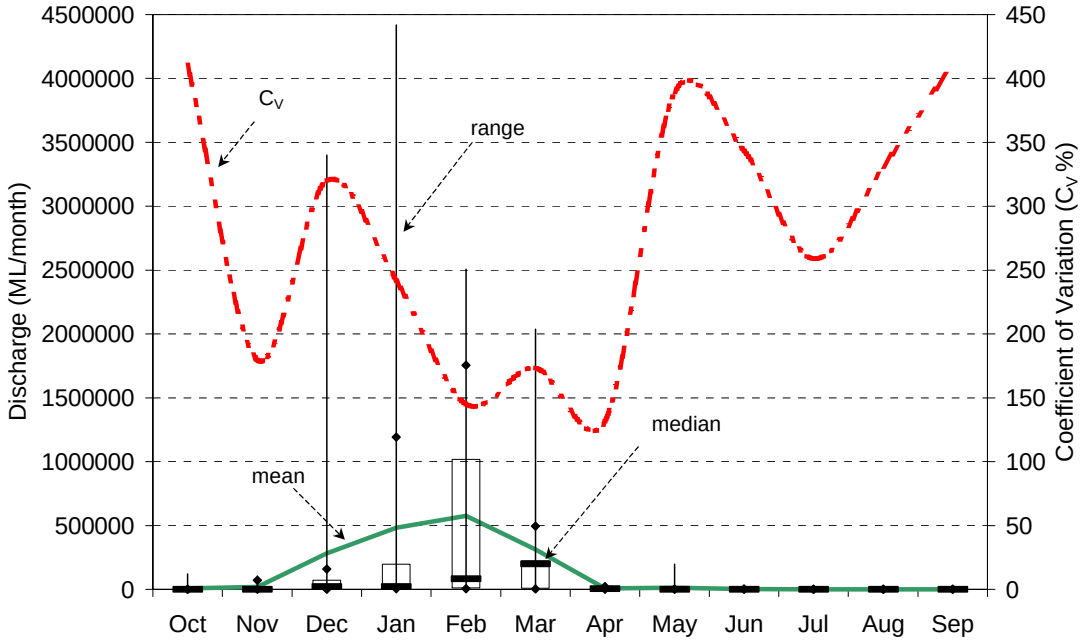

Figure 4 Monthly discharge of the Leichhardt River at Floraville between 1984 and 2002.

5.4.3 Monthly discharge in the Nicholson catchment

The stream gauge in the Nicholson River with the most reliable data was 195 km upstream. Rather than display data from this site, we have obtained and analysed data from the Gregory catchment.

Flows in the Gregory River occurred in every month, making this the only permanent stream we visited during this project. **Figure 5** was scaled to show dry season flows. As in the other two catchments, extreme flow events were restricted to the four months between December and March. **Figure 5** also shows that higher flows occurred most often in February, although the highest average discharge occurred in January and the highest monthly median in March. This median was centrally placed in the interquartile range, indicating that flow occurrence was normally distributed about the median, so was under the influence of groundwater rather than rainfall.

The average monthly flows in the wet season were again skewed by extreme rainfall events, so average monthly flows occurred less than 25% of the time in November, December, January and March. The average discharge was higher than the median in every month, by 54% when averaged over the whole year. Rare events also affected the monthly C_v values during the wet season. In the dry season, C_v values were relatively constant, although still more than twice the world average C_v of 33% (Finlayson and McMahon, 1988).

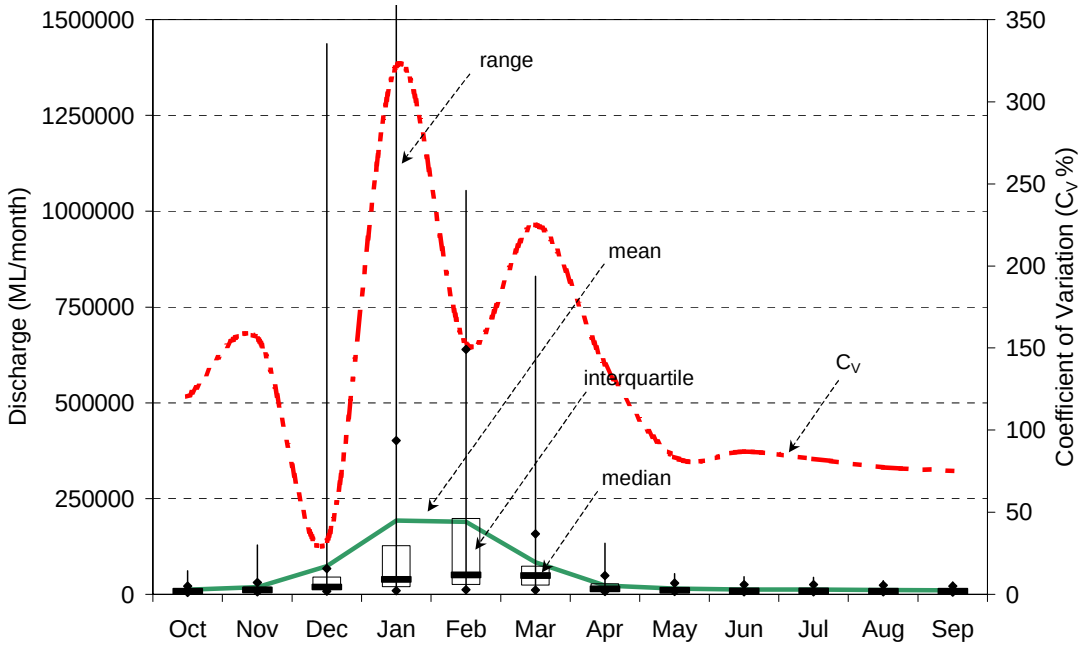

Figure 5 Monthly discharge between 1970 and 2003 in the Gregory River at Gregory Downs. The maximum discharge recorded in January is not shown, but was 2 641 655 ML.

While flows are permanent in the Gregory River, its major tributaries, the O'Shannassy and Seymour Rivers, have median flows above zero only during the wet season between December and March. These median monthly flows are shown in **Figure 6**.

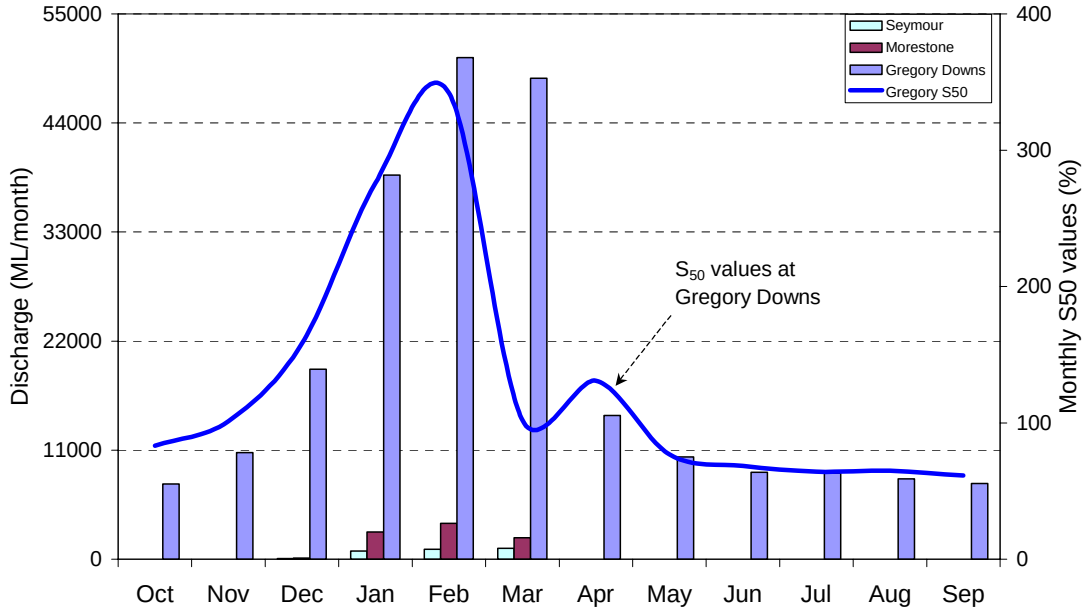

Figure 6 Median monthly flows in the Gregory River and major tributaries the O'Shannassy (1976 – 88) and Seymour Rivers (1970 – 88). Also drawn is the spread of flows about the median (S_{50}) in the Gregory River at Gregory Downs.

5.4.4 Flow duration

Another important characteristic of flows that impacts on fish biodiversity, particularly the ability to reproduce and disperse, is the length of time flows persist. While flows in these catchments occur during the wet season between December and March, flows are not necessarily continuous or high enough to allow fish to successfully complete life stages. Flows in the southern gulf region reflect the sporadic nature and intensity of rainfall events, so occur as a sequence of peaks, as shown by a graph of the mean daily discharge in the Leichhardt River (**Figure 7**). The data was supplied by DNRM.

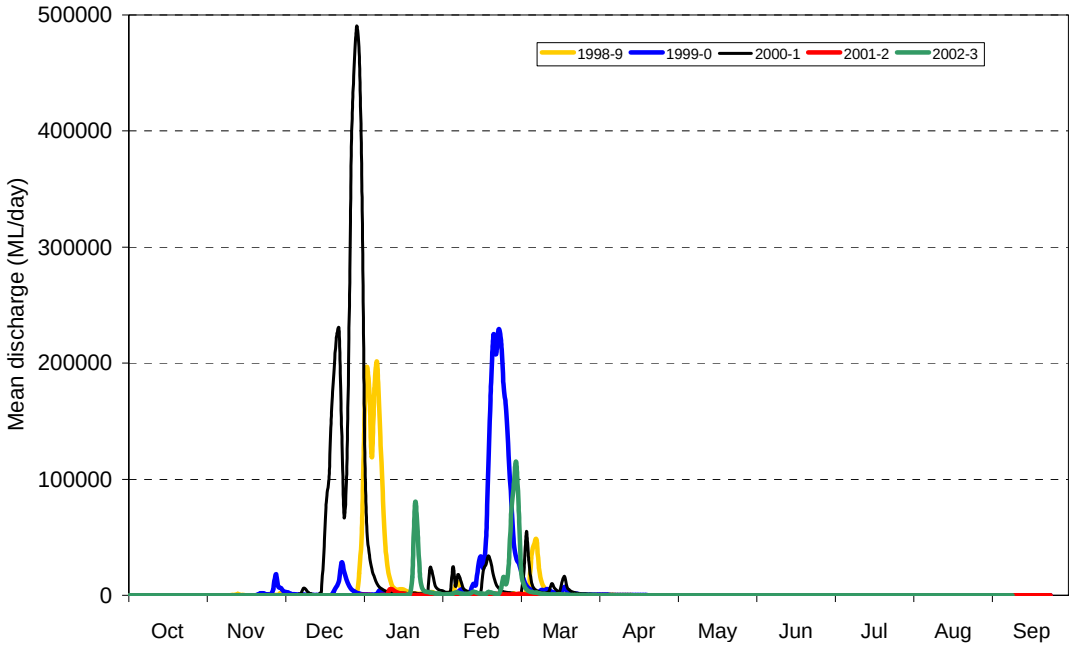

Figure 7 Mean daily discharges in the Leichhardt River at Floraville between1998 and 2003.

The 1998-9 wet season began with a very small flow in mid October, then almost ceased until a 2 500 Ml/day flow in mid-November and another in early December. These are too small to be seen in **Figure 7**. The only significant flows for that season occurred together in January 1999, with a smaller event in March. **Figure 7** shows that the 99-00 wet had a small event in December, another in January and a significant flow in March. There were insignificant wet season flows in 01-02 and two small flows in 02-03. The maximum daily flow recorded between October 1984 and December 2003 was 490 675 ML, on 30 December 2000. As shown in **Figure 7**, there was a significant prior event and seven smaller events in February and March. Between all these events, daily discharges dropped to a base flow of 1 000 ML/day or less.

A comparison of the mean daily discharges in each catchment is shown in **Figure 8**. The largest flow event for each occurred in December 2000. The pattern of the hydrograph illustrates the differences in flow regime between the catchments.

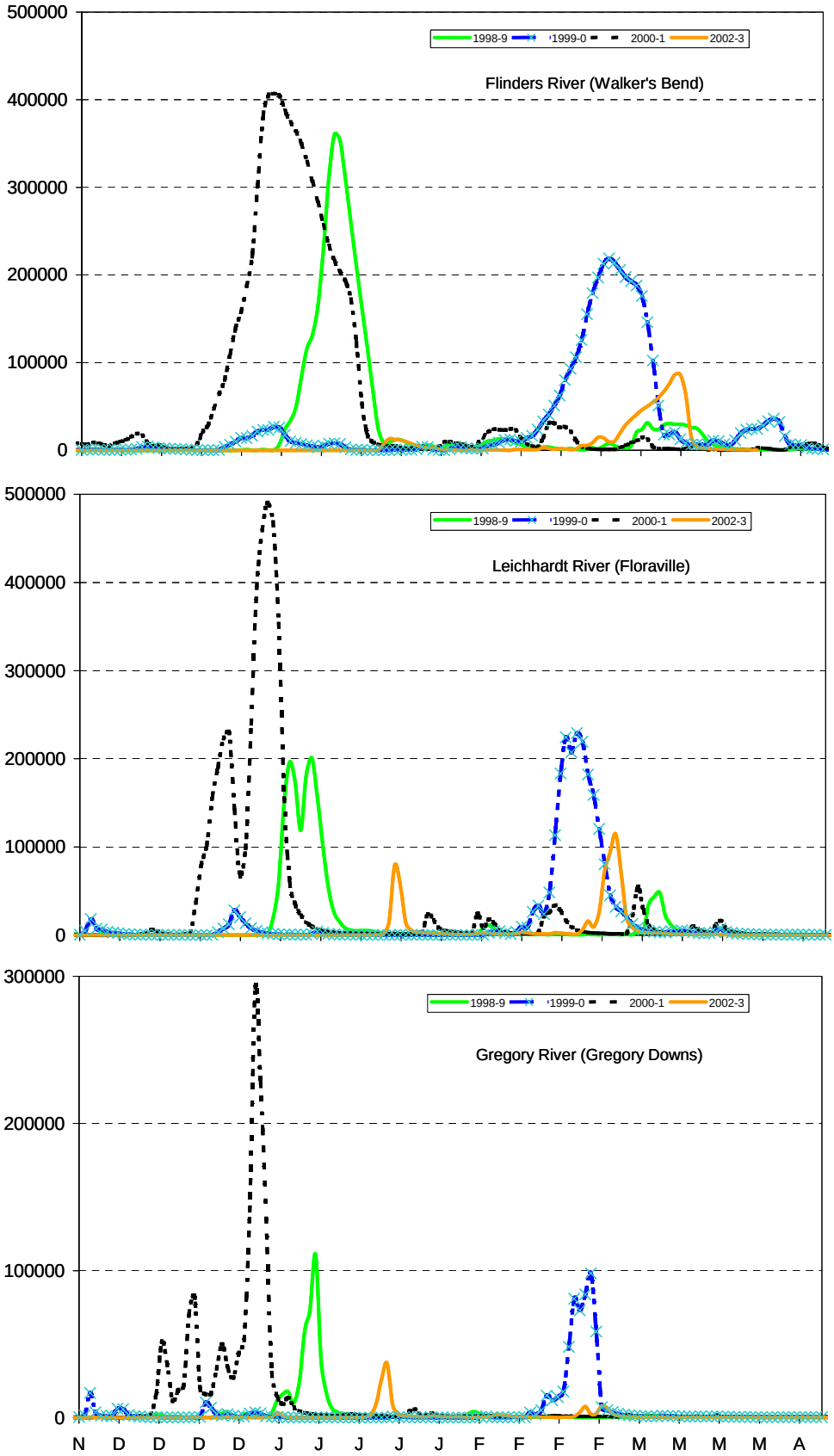

Figure 8 Mean daily wet season discharge in ML/day for southern gulf rivers. N = the last week in November; A = the first week in April.

In the Flinders River, the discharge rate rose in a relatively smooth curve to reach a peak after 15 days. Flows persisted at this peak for five days before falling back to base flows over 23 days. The Leichhardt River rose in two steps to reach peak discharge after 14 days, persisted for one day, then rapidly dropped over five days before tailing off over 16 days to base flows. The Gregory River had three minor rises and falls before rising rapidly over two days to reach a peak for one day. It then fell rapidly over three days, before tailing off over the next 19 days to base flow.

These patterns were repeated for each flow event. Generally, flow events in the Flinders River persisted for three to five weeks, in the Leichhardt for two weeks, and in the Gregory for one week.

A common analysis to determine the frequency of occurrence of a particular flow is by flow duration curves. Note discharge values on the curves are not necessarily in chronological sequence. The curves are particularly useful for determining wet and dry season base flows in perennial streams, and we have included in **Figure 9**, the average annual mean daily discharge curve for the Tully River for illustrative purposes. The slope of the curves also gives an idea of the "flashiness" of the stream, which is the rate of the rise and fall of flows.

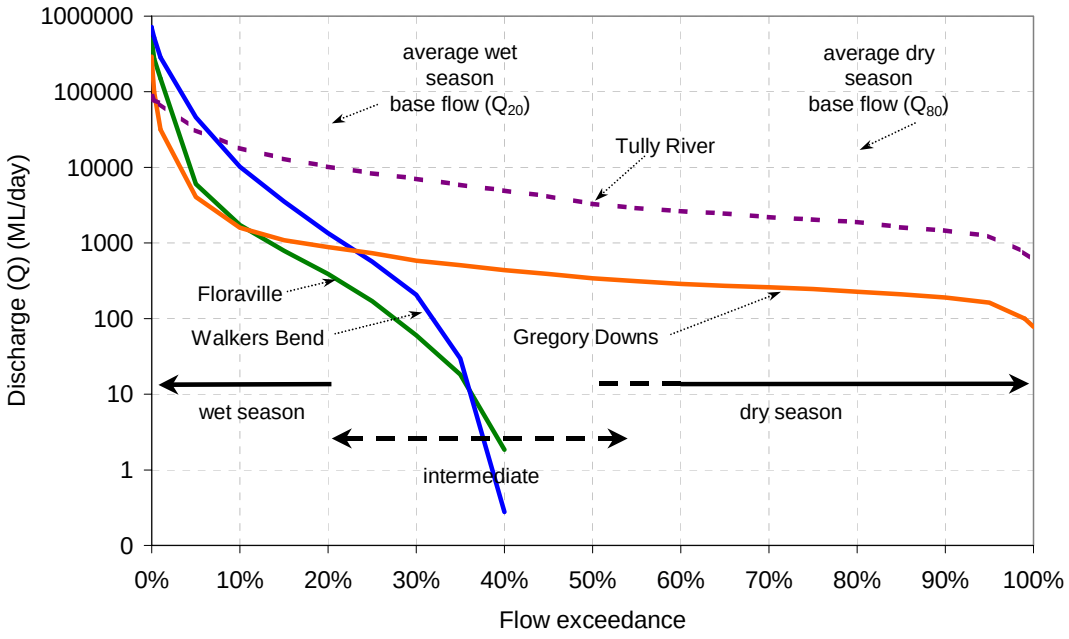

Figure 9 Annual flow duration curves for the Flinders River at Walker's Bend (1970 to 2003), the Leichhardt River at Floraville (1984 to 2002), and the Gregory River at Gregory Downs (1970 to 2003). The curve for the Tully River is included for comparison. (Data supplied by DNRM.)

From **Figure 9**, flows in the Flinders and Leichhardt exceed zero for just 40% of the year. The base wet season flow is usually defined as the flow exceeded 20% of the time. Thus the base flow in the Flinders would be 1 350 ML/day, 880 ML/day in the Gregory, 387 ML/day in the Leichhardt, and 10 300 ML/day in the Tully River. Flows greater than 10 000 ML/day occur just 10% of the time in the Flinders, and less than 5% of the time in the other two rivers. The steep slopes also confirm that high flows in southern gulf streams do not persist for very long.

5.5 Habitat

An assessment of the habitat at each site is presented in the appendix. Most sites were in reasonably good condition. The exception was Martin's Waterhole in the Saxby catchment, where the foreshores were suffering from pig damage and urban rubbish. Some riparian areas had erosion problems, which were exacerbated by cattle access and wild pigs. Exotic weeds, particularly burrs, were thick in some areas.

Water quality parameters were generally within acceptable limits (Table 14). Some sites had surprisingly low water temperatures, with the lowest recorded being 12.6 ^{o}C. We did find a few sites with very high dissolved oxygen concentrations, and several with pH values exceeding 9.0. We could not explain the high values in either parameter at any site other than behind the dam wall at Lake Julius. This site had a thick green algal bloom, which would raise both the oxygen concentration and pH during daylight hours. Oxygen levels in particular would be very low at sunrise at this site. Fish were in poor condition here, which probably had as much to do with starvation as water quality. Many fish were concentrated at this site. Fish in other waterbodies with high dissolved oxygen and pH levels appeared healthy. The high conductivity recordings in the Flinders catchment occurred at the top of the estuary.

Water transparency as determined by Secchi disc was very low in the Flinders catchment. The main effects of this included the virtual absence of submerged plants and algae, and the pale colouration of most fish species. It also made fish sampling more difficult.

Table 14 Water quality values in southern Gulf of Carpentaria catchments.

	O_2 % saturation	O_2 (mg/l)	Conductivity (µS/cm)	pH	Temperature (^{o}C)	Secchi (m)
Flinders						
Maximum	143	15.7	3370	9.91	35.0	1.00
Minimum	72	6.8	83	7.38	12.6	0.05
Median	114	11.1	468	8.44	17.3	0.59
Range	71	8.9	3287	2.53	22.4	0.95
Leichhardt						
Maximum	128	11.8	625	9.24	22.0	1.50
Minimum	93	8.4	77	7.49	14.4	0.15
Median	112	10.5	252	7.85	20.3	0.84
Range	35	3.4	548	1.75	7.6	1.35
Nicholson						
Maximum	211	17.5	753	9.33	24.4	3.10
Minimum	79	7.3	33	6.35	16.2	0.06
Median	104	9.4	90	7.81	19.9	0.78
Range	132	10.2	720	2.98	8.2	3.04

In the time available during this project, the only aquatic habitat we defined as critical to a fish species and under threat, was the bore drains. We did identify a number of issues for comment, which are listed here and discussed later.

5.5.1 Environmental issues

The following issues are worthy of further discussion and action. This is not intended to be a complete or comprehensive list.

- Several outstanding waterholes need to remain in their present condition (see **Plate 6**).
- Bore drains are possibly invaluable assets in maintaining regional biodiversity (**Plate 7**).
- The aquatic habitat containing the most species was live tree roots, particularly roots of paperbark trees (**Plate 8**).
- Bank slumping was noted in all catchments. This would be alarming in other catchments, but we could not determine from one visit whether this was a natural process (**Plate 9**).
- Exotic weeds, particularly burrs, were thick in many riparian zones.
- Algal blooms were noted in some sites. These waterbodies would be susceptible to blue-green algal blooms (**Plate 10**).
- Wild pigs were causing considerable damage in some areas (**Plate 11**).
- Rubbish is bad in many areas.
- Many road crossings have no culverts or insufficient culverts to allow fish passage. However, such crossings do increase water retention and create or enlarge pools (**Plate 12** and **Plate 13**).
- Fishways built on weirs may simply concentrate fish and make them more susceptible to harvesting. Some weirs have several features that combine to present formidable fish barriers (**Plate 14** and **Plate 15**).
- A coordinated habitat monitoring program is recommended.

Plate 6 Kingfisher Waterhole on the Nicholson River contained 21 species of fish.

Plate 7 Proa No 1 bore drain, showing the tenuous nature of the only site where the tadpole goby was found.

Plate 8 Paperbark tree roots hanging in the water, with stunned fish nearby. Insert is a close-up of dense root habitat, which was favoured by many species in all catchments.

Plate 9 Bank slumping. This whole section had slipped into the waterhole, probably during the last wet. Tree leaves were still green.

Plate 10 Algal bloom on Lyrian Waterhole, concentrated at the windward end. Note the bank slump in the background.

Plate 11 Wild pigs had uprooted bankside vegetation along the entire perimeter of Martin's Waterhole, extending below the waterline. Note the urban rubbish.

Plate 12 Rocky Bar crossing on the Leichhardt River acts as a weir. Fish would pass over once it drowned out.

Plate 13 Punchbowl crossing on the Flinders River has good-sized culverts that would not restrict fish passage.

Plate 14 The Nicholson Falls below the weir and causeway at Doomadgee.

Plate 15 The Doomadgee weir on the Nicholson River. This is a very long weir.

6 Discussion

Biodiversity

The southern Gulf of Carpentaria catchment is a huge area to survey in 20 days for fish biodiversity. Nevertheless, with suitable equipment, careful site selection and the cooperation and assistance of station owners in particular, we believe we were able to sample most species present in these catchments. The preliminary list of 50 species may increase to 53 once the Queensland museum has positively identified all the specimens we lodged.

No doubt more species occur in all catchments, particularly in the freshwaters close to the estuary, where a number of extra gudgeons and gobies are known to occur, as well as tarpon, *Megalops cyprinoides*, and other marine vagrants. Some of these, including two to four species of sawfish, *Pristis spp*., and the bull shark, *Carcharhinus leucas*, are known to move a long way upstream. We did find a dead sawfish on the bank of the Flinders River, but did not include it in our species count. As can be seen in **Plate 5**, this sawfish had been caught, its saw removed, then the body discarded up the bank. This large species is now rare in our rivers, so deserves protection. We will be recommending that the practice of catching a fish just for its saw be made illegal.

We did not target the shark or sawfish species, as gill nets would be required and we did not have the time. Sawfish are under separate study by Sterling Peverill of our organisation, so information on their distribution and abundance in southern gulf catchments will be available in the near future. The LTMP has recorded coal grunter, *Hephaestus carbo*, in the Gregory River, and O'Keefe, (1990) also lists the saratoga, *Scleropages jardini*, as occurring in this river.

Allen *et al.* (2002) stated approximately 100 species have been recorded from the Gulf of Carpentaria drainage division, which includes the rivers of Western Cape York and the east coast of the Northern Territory. At least 55 and probably 60 or more of these occur in southern gulf catchments. Nevertheless, we found four species that are possibly new, another four species still awaiting positive identification, and we have extended the range of two species only recorded previously from the Northern Territory (**Table 5**).

One species that has been tentatively identified as a tadpole goby could become a conservation issue. Allen *et al*., (2002), described the status of tadpole gobies as common, and its distribution as always near the coast, in muddy creeks draining mangrove or freshwater floodplains between Townsville (Qld) and the Adelaide River (NT). We found it at just one site, in a bore drain at Proa. This site is 400 km inland. Whether or not the Proa goby is a new species or is indeed the tadpole goby, the biology of this species requires urgent attention. It is highly likely that this goby occurs in other bore drains (Makim, *pers. comm*.). However, bore drains are not the most secure of environments, as can be seen in **Plate 7**. Until additional research proves otherwise, we believe this fish in its current location has high conservation significance. It is definitely vulnerable to local extinction.

Other species listed as newly discovered or rare in **Table 5** may become better known as more fish studies are undertaken in the region. A repeat survey during the

wet season could find many of these species are seasonally more abundant. As well, a different fish community probably exists under different climatic cycles.

Distribution

Identifying the factors that determine the distribution of species in the southern Gulf of Carpentaria catchments would require a specifically designed research project. We analysed several physical and chemical parameters for significant correlation with fish biodiversity, and the results identified several relationships worth further discussion.

In the Flinders and Leichhardt catchments, a significant correlation existed between distance upstream (as measured by AHD) and smaller numbers of species. A neat regression line can be drawn to further define this relationship. However, no such relationship existed in the Nicholson catchment. Species numbers in this catchment increased with the size of the waterhole. There were significant correlations between species numbers and the length, width, average depth, surface area and volume in the Nicholson catchment. In the Flinders, just surface area was correlated with species numbers, and in the Leichhardt catchment, no correlation existed between waterbody size and species numbers. The difference between these catchments is that the Gregory River, where most sites in the Nicholson catchment were, has a permanent flow. It would appear that, given the opportunity, species move to the largest waterbodies they can find. As very large waterholes exist upstream as well as downstream in the Gregory and Nicholson Rivers, species are not confined to any particular section of catchment. In the Flinders and Leichhardt catchments, species are more numerous downstream, even though large waterholes also exist upstream. The questions then become; do species attempt to reach these waterholes during floods; do the flows last long enough; or do species deliberately avoid upstream areas in these catchments? Once in waterholes in these intermittent streams, they are confined there until the next floods. Water quality, habitat availability and other physical and chemical characteristics would not determine species distribution in these catchments unless specific conditions became lethal. A study of fish movement during floods in these intermittent streams is required, even if just for fish passage issues.

Fish species that were found throughout the catchments tended to be freshwater breeders without specific spawning requirements that would limit them to particular conditions, or require movement between habitats. These species include rainbowfish, bony bream, spangled perch, archerfish and banded grunter. Sleepy cod were also widely distributed. This species is noted for thriving in still water conditions such as lagoons. The species that was surprisingly limited in distribution and abundance was the sooty grunter. It occurred in just 12 sites, whereas the saltwater spawning barramundi occurred in 19 sites. No sooty grunters were found in the Flinders River, despite assurances that they were present. The probability is that, large as the Flinders catchment is, no suitable spawning sites exist. Sooty grunters have a specific requirement for spawning in rocky rapids. Any sooty grunter found in the Flinders catchment may have been a vagrant from the Norman River during floods.

Another species that had limited distribution in the Flinders catchment, but was widespread in the other two, was the long tom. It was only found in clearer water in the lower reaches of the Flinders. As this species is a predator that probably feeds by sight, water turbidity would be the limiting factor in its distribution. Analysis of the distribution of other species would likewise provide insight into its biology. Such analysis is outside the scope of this project.

Fish barriers

The distribution of barramundi is a good indicator of catchment accessibility as this species spawns in the sea. Juveniles then migrate upstream until they reach maturity after 5 – 7 years, then return to the sea to spawn. Barramundi have been reliably reported from Tarbrax in the upper reaches of the southern part of the Flinders catchment. The limiting factor in the upper Flinders River would appear to be lack of permanent water. In the Cloncurry River, the limiting factor appears to be water temperature. There does not appear to be any physical barriers to fish movement in the Flinders catchment, at least not while there are sufficient flows.

The Leichhardt Falls limit the upstream distribution of barramundi in this catchment. A significant flood that drowns out the falls, timed with the arrival of juvenile barramundi, would be the only time fish would successfully navigate the falls. Ernie Camp from Floraville Station beside the falls, has seen the falls drown out on a number of occasions. Sometimes the falls have been in a backwater or even flowing backwards when flows are higher in the Alexandra River. Yet, even under these conditions, barramundi do not appear to move up the Leichhardt River. The Alexandra and Leichhardt falls are adjacent, so would be of similar heights. Yet there is a good population of barramundi in the Alexandra River. The falls may only drown out for a day, but this should be sufficient time to allow fish passage. The hydrodynamics at the falls must be unsuitable for attracting barramundi. The Alexandra is probably populated by fish moving up the Blue Bush watercourse. Further study of the hydrodynamics of these two rivers at the falls is recommended.

Barramundi are spread throughout the majority of the Nicholson catchment. The Nicholson and Gregory Rivers have weirs at Doomadgee and Escott respectively. Neither structure has prevented upstream barramundi dispersal. However, sufficient discharge would be required to drown out these weirs. There is a causeway and a set of vertical falls below the weir at Doomadgee that would also have to drown out (see **Plate 14** and **Plate 15**). The river at this site is more than 200 m wide, so a substantial flow event would be required to provide sufficient depth over the weir, causeway and falls to allow fish passage. The size, duration and frequency of this event is unknown. These statistics would be needed before any additional alteration to flows occurred.

Concerns have been raised that road crossings in southern gulf catchments present a barrier to fish migration. Our results do not indicate that fish distribution is adversely affected, so any crossings must drown out sufficiently to allow fish passage. At insufficient flows, some road crossings and weirs would obviously be fish barriers, particularly as many have insufficiently sized culverts or none at all. Upgrading or installing larger culverts may be counterproductive if the pooled water upstream of the crossing subsequently drains and dries out. Crossings would require individual assessment and careful consideration of subsequent effects before being modified. The Punchbowl crossing in **Plate 13**, for example, is built on bedrock and has culverts large enough to have minimal effects on flow or fish passage. This structure would have no effect on the permanency of the pre-existing upstream pool. The Rocky Bar causeway shown in **Plate 12**, however, would contribute to the size and permanency of the upstream pool. The amount of flood damage to the structure also indicates it drowns out regularly. This causeway should be left in its present configuration.

Well-designed fishways are very successful at providing fish passage over barriers. Most fishways concentrate fish below, in or immediately above them. This is

not a problem in inaccessible or well-policed sites. In the southern gulf region, policing is almost non-existent, so any fishway would need to be made inaccessible, or it would be counter-productive.

Commercial species

The Flinders catchment had the highest abundance and widest distribution of recreationally and commercially important fisheries species such as barramundi and prawns. Development of natural resources in this catchment is more likely to adversely affect these fisheries than development in the other two catchments. Further investigation into the movement of barramundi in this catchment, the relationship to flows, and the significance of particular waterholes to the fish population, should be instigated.

The sprat that we discovered was extremely abundant. It was obviously breeding at these sites. This fish is about the size of a sardine, so could be suitable as a sardine substitute. Its biology and aquaculture potential should be investigated.

The giant glassfish, locally known as the yellowfin perch, is also a potential aquaculture product. This attractively sized and presented fish could be the northern Australian equivalent of golden and silver perch in southern fish markets.

Hydrology

Flow has an over-riding influence on riverine ecosystems (e.g. Poff and Ward, 1989; Poff and Allen, 1995; Poff *et al*., 1997; Puckridge *et al*., 1998), particularly the extremes of flow and patterns of flow variability. Poff *et al*. (1997) labelled streamflow a “master variable” that was strongly correlated with many critical physical and chemical characteristics of rivers, such as water temperature, channel geomorphology and habitat diversity. Poff and Allen (1995) also correlated daily flow predictability and base flow stability with the functional traits of fish. Poff *et al*. (1997) identified 5 critical components of the flow regime that regulated ecological processes in rivers: timing or predictability, magnitude, frequency, duration and rate of change.

The gulf community needs to have a good understanding and knowledge of these variables to ensure development of the region’s natural resources is sustainable. In the results section on hydrology (Section 5.4), we have emphasised that average values occur less than 25% of the time, and that mean values are much higher than median flows. In these monsoonal, dry tropics rivers, management decisions on water harvesting in particular should be based on medians, which are flows that occur 50% of the time.

Any proposal that is likely to change the hydrology of these streams needs to be thoroughly assessed for potential impacts. We have assessed the most pressing need to be information on the relationships between the hydrodynamics and the geomorphology of these catchments.

Habitat

We visited 41 sites in the region, and most were in good condition. There were several outstanding waterholes that had high biodiversity values. The Kingfisher waterhole on the Nicholson had 21 fish species, which was the second highest number of species detected at the one site. The O’Shannassy River near Riversleigh had 22

species. Lake Corinda in the Gregory floodplain also had very high habitat values, as did the 10 Mile Waterhole near Canobie. No doubt there are other waterholes in the region with similar high biodiversity values. A means to maintain such sites needs to be determined.

In the Leichhardt catchment, the sites on Gunpowder Creek had high species diversity but riparian zones were infested with Noogoora Burr. The Washpool on the Alexandra River also had high species numbers and a large population of fish. However, the catchment was suffering from erosion, and there was evidence the Washpool was silting up. Water clarity was certainly poor, with a Secchi disc not being visible just 15 cm below the surface. What effect this was having on fish could not be determined or even estimated from one visit.

Interestingly, water clarity in the Flinders catchment is also very low. Despite the reduced visibility and resultant lack of submerged aquatic vegetation, species diversity and fish numbers were higher than in the other catchments. Low visibility had positive benefits on fish distribution in individual waterbodies, where fish were found throughout rather than in or beside cover. The preferred cover in all catchments was the suspended roots of paperbark trees. Determining relationships between individual species and habitat variables was outside the scope of this project, but more research into this topic needs to be undertaken.

We found that bank slumping was quite a common occurrence in all catchments. Riverbank slumping is a phenomenon usually associated with poor catchment management practices and the widening and silting of the river. Slumping in the southern gulf region may be a natural occurrence and not associated with catchment degradation. Smaller waterholes in the upper Flinders River are known by local residents to change size, depth, position and permanency after each flood, indicating that a lot of material moves down this river. Yet the larger, permanent waterholes in all catchments had steep sides and deep water. Whether the slumping is natural or not, the existing flow regimes and the geomorphology of the catchments are obviously in balance. This balancing mechanism needs to be understood before changes are made to either the river channels or the flow regimes. Until this mechanism is defined, an early warning monitoring system is suggested. A simple one would be to monitor the width and depth of strategic waterholes for signs of widening and silting.

Dissolved nutrient levels were not measured by us during this project. We did record the colour of the water, and noticed the presence of algal blooms in some waterholes. A blue-green algal bloom was noticed on Lyrian Waterhole (**Plate 10**) and a very dense green algal bloom existed behind the dam wall at Lake Julius. The source of nutrients for these blooms was not obvious. Given the hot, still conditions that would exist in the region during the dry season, the potential for algal blooms in these waterholes is high. Water treatment to remove blue green algae is very expensive, so management options to prevent nutrient input into waterbodies need to be formulated before further intensive agriculture is developed in the catchments.

One habitat type easily overlooked is that associated with bore drains. These have been in existence for long enough to be considered a natural part of the landscape. Birds, fish, redclaw and no doubt, many animal species have probably adapted to the extent that removing the bore drains would cause the local extinction of

many species. Before bores are capped in this region, the dependence of the wildlife on the bore drains needs to be determined.

7 Late results

This information was provided just as we were preparing this report for printing. We consider this information very interesting, so have included it here.

As described in the methods Section 4.2, we tagged all barramundi longer than 260 mm as part of the Suntag program which is coordinated by Infofish Services. Three of these fish were recently recaptured. Bill Sawynok, coordinator of the program, provided the following information. We also thank Bill for providing the map at very short notice.

Table 15 Recent recaptures of tagged barramundi. (Data from Bill Sawynok.)

Tag No	Date	Length	Location	Days Out	Recapture length	Recapture Location	Distance travelled
P51776	13/08/04	462mm	Burketown X-ing	199	610mm	Burketown Xing	0km
P51761	12/08/04	653mm	10 mile Cloncurry	174	710mm	Flinders R estuary	265km downstream
Z94517	27/07/04	574mm	Sedan Dip	212	101mm	Flinders Jacks Pocket	360km downstream

Tagged barramundi over the past 15 years have a 10.2 % recapture rate (Sawynok, 2004). We assume that the movements of this proportion of the population are representative of common behaviour. While just three fish have been recaptured to date, it is interesting to note that two individuals from the upper catchment have taken the opportunity during wet season flows to move up to 360 km down to the estuary. Fish of this size will be contributing to recruitment over the next few spawning seasons. Without sufficient river flows and connectivity, these fish would still be confined to waterholes 360 km and 265 km from the estuary. It will be interesting to learn if any of the smaller individuals tagged in the lower reaches are recaptured upstream in the future. A project tagging large numbers of barramundi throughout southern gulf catchments would help identify important nursery areas and highlight the value and importance of these rivers.

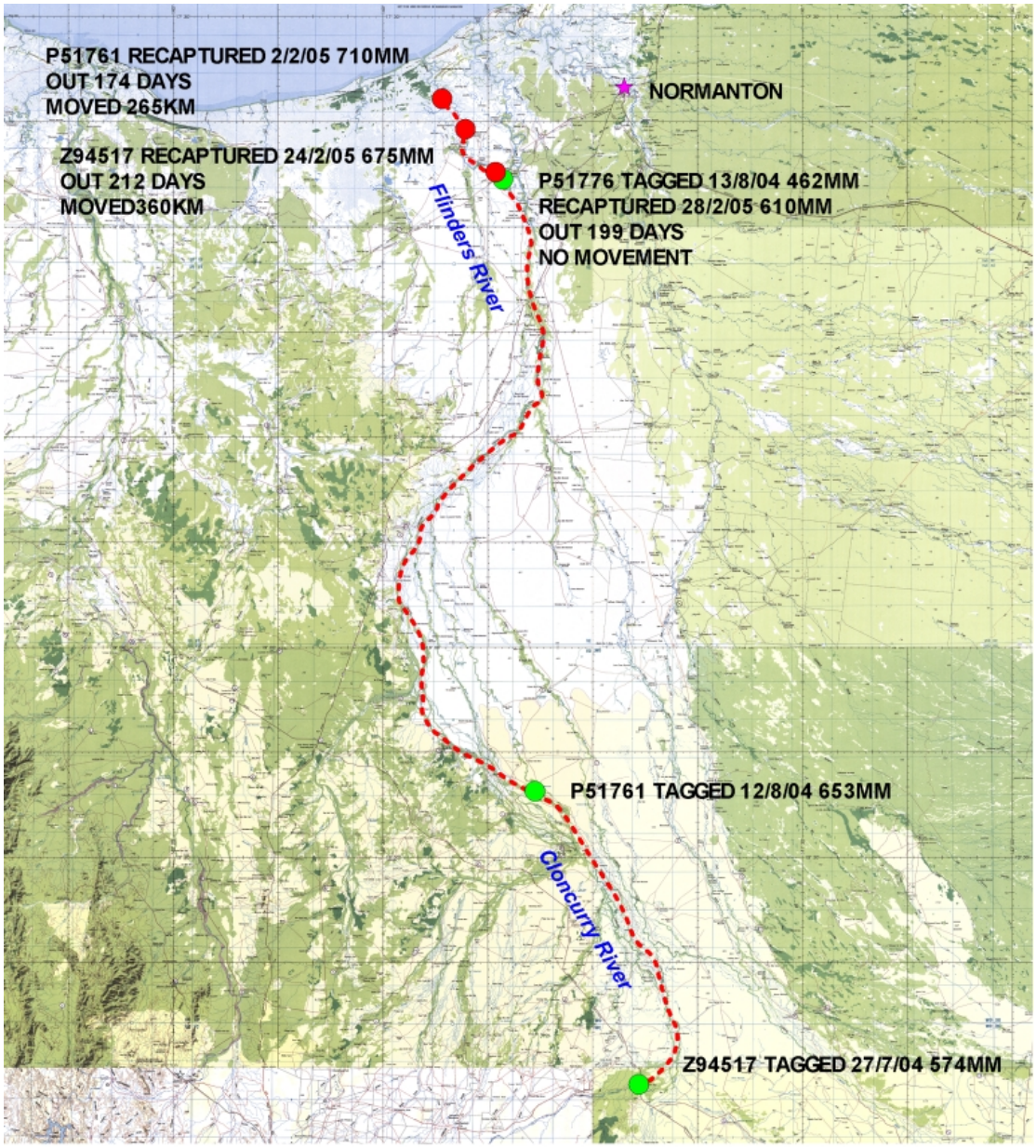

Plate 16 Map of the Flinders catchment, showing the capture and recapture points for tagged barramundi (map supplied by Bill Sawynok).

8 Recommendations

1. The relationship between river channel maintenance and flows for each catchment needs to be determined before any further alteration to flows is allowed.
2. Knowledge of fish movement on a catchment scale during floods is required. This information would be particularly useful for determining the timing and size of water allocations, and the construction of instream structures such as weirs and crossings.
3. To determine to value of individual waterholes as nursery areas, and the contribution of these catchments to recreational and commercial fisheries, a tagging project on barramundi is recommended.
4. Nutrient threshold levels for blue-green algal blooms need to be determined. Runoff management plans could then be implemented. It would be easier to implement nutrient/runoff management plans before intensive agriculture development escalates.
5. A wildlife survey of bore drains is recommended before bores are capped in the region.
6. The aquaculture potential of southern gulf species, particularly the sprat and giant glassfish, be assessed. These species could provide a new industry for the gulf.

9 Acknowledgement

We would like to thank the Southern Gulf Catchment Centre and the Natural Heritage Trust for commissioning and funding this study. We are grateful for the assistance of staff at the catchment centre, particularly Charles Currey, Ken Isaacson and Noel Sarmardin for contacts, advice on site selection and advice on culturally significant sites. Mark Van Ryt, Grant Godson and Bill Rigby of the Mt Isa Fish Stocking Group provided support, contacts, site advice and guided us on a number of field trips. Richard Stewart from the Richmond Shire Council guided us around the top of the Flinders catchment. All the shire mayors provided support and invaluable local knowledge. Geoff Pocock, Michelle Wood and Nathan March from DNRM, provided hydrological data, advice on road conditions and sites. Jeff Johnson of the Queensland Museum identified fish species, provided advice on fish distributions and the latest scientific nomenclature. Gary Weiden and Darryl Mason from Queensland Parks and Wildlife Service provided contacts and invaluable advice on sites.

We particularly thank the dozens of pastoralists that provided advice and access to sites throughout the southern Gulf of Carpentaria. Dave McGinnis from Bowthorn provided particularly stimulating conversation, historical information and ideas, as did Richard Makim from Arizona station.

We reserve a special thanks to Kylie and Ernie Camp at Floraville for providing a hot shower, a roof over our swags and a home cooked meal after 10 days of bulldust and fish slime.

Finally, we thank our families for backup support, acting as remote area contact officers, and coping with our absences during very busy times.

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Table of Appendices

List of Photographs

Fish blank data sheet front page.

Date ..... /..... / ..... Sheet No ..... of .....

Stream ..... **Site** .....

Staff ..... **Cloud Cover** .....% **Rain** (circle): Nil, Showers, Light, Heavy. **Wind Speed** .....kn **Dir** ..... **Air Temp** .....

Lat .... S **Long** 1..... .... E **AHD** ..... m **Time start** ..... **finish** ..... **Comments:**

Length ..... m **Width** ***max*** ..... m ***min*** ..... m ***ave*** ..... m **Depth** ***max*** ..... m ***ave*** ..... m **Velocity** ..... m/sec

Surface O_2 ..... ppm **Conductivity** ..... µs/cm **pH** ..... **Temp** ..... **Secchi** ..... m **Colour** .....

T'cline ..... m O_2 ..... **Cond** ..... **pH** ..... **Temp** .....; **Bottom** ..... m O_2 ..... **Cond** ..... **pH** ..... **Temp** .....

No	Tag No	Species (do 20 TL)	1 (mm) 11	2 12	3 13	4 14	5 15	6 16	7 17	8 18	9 19	10 20	Abundance	Comments (sex, cover, disease, method, etc)
		prawns (all spp)												
1														
2														
3														
4														
5														

Abundance: # fish caught/seen (**scale**) 1 (**1**); 2 - 9 (**2**); 10 - 50 (**3**); 51 - 100 (**4**); 101 - 500 (**5**); 501 - 1000 (**6**); 1001 - 5000 (**7**); > 5000 (**8**) **Time Zapping:**

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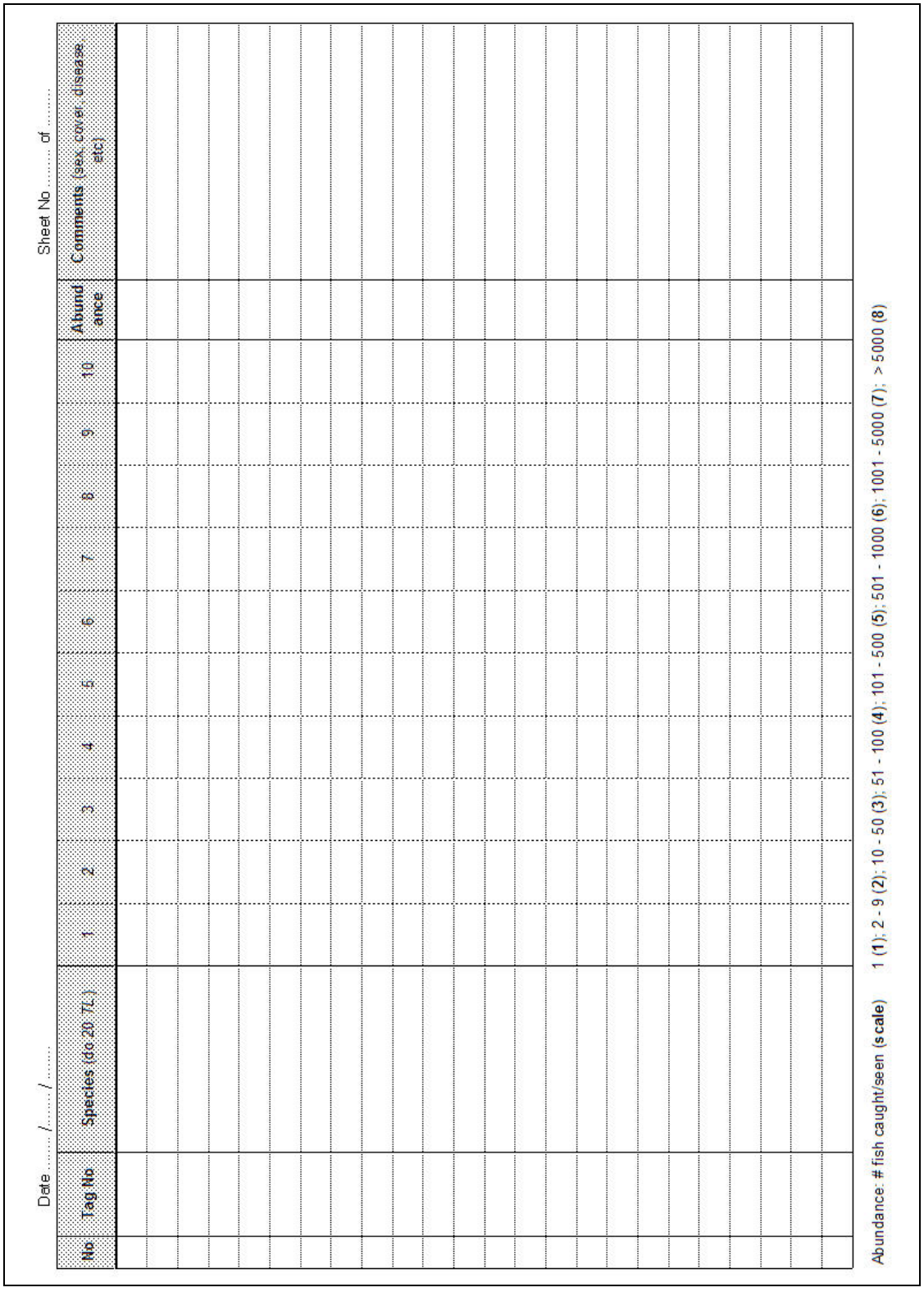

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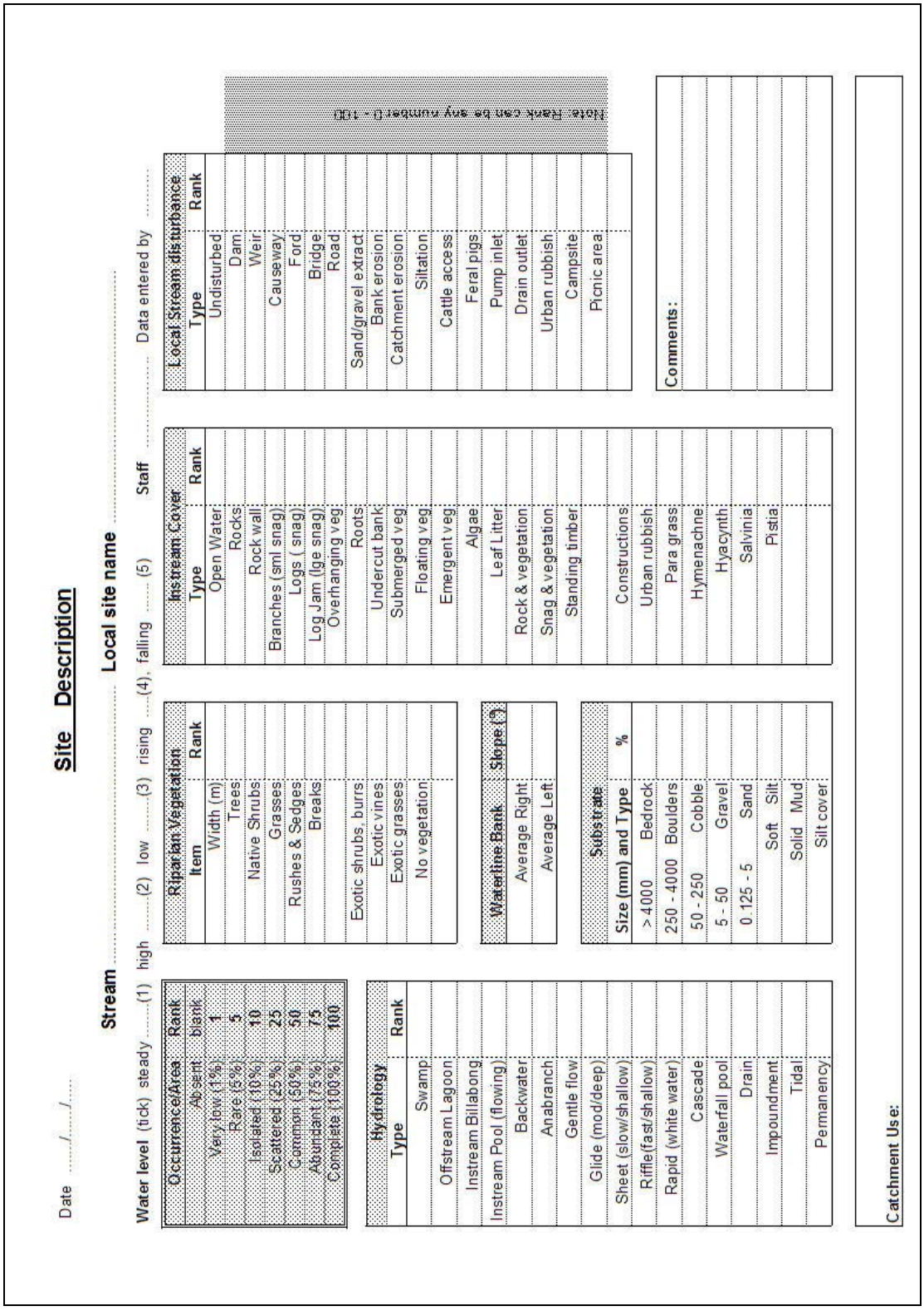

Site Description

Date ...../...../.....

Stream ..... Local site name .....

Water level (tick) steady .....(1) high .....(2) low .....(3) rising .....(4) falling ..... (5) Staff ..... Data entered by .....

Occurrence/Area	Rank
Absent	blank
Very low (1%)	1
Rare (5%)	5
Isolated (10%)	10
Scattered (25%)	25
Common (50%)	50
Abundant (75%)	75
Complete (100%)	100

Hydrology	
Type	Rank
Swamp	
Offstream Lagoon	
Instream Billabong	
Instream Pool (flowing)	
Backwater	
Anabranch	
Gentle flow	
Glide (mod/deep)	
Sheet (slow/shallow)	
Riffle(fast/shallow)	
Rapid (white water)	
Cascade	
Waterfall pool	
Drain	
Impoundment	
Tidal	
Permanency	

Riparian Vegetation	
Item	Rank
Width (m)	
Trees	
Native Shrubs	
Grasses	
Rushes & Sedges	
Breaks	
Exotic shrubs, burrs	
Exotic vines	
Exotic grasses	
No vegetation	

Waterline Bank	Slope (°)
Average Right	
Average Left	

Substrate	
Size (mm) and Type	%
> 4000 Bedrock	
250 - 4000 Boulders	
50 - 250 Cobble	
5 - 50 Gravel	
0.125 - 5 Sand	
Soft Silt	
Solid Mud	
Silt cover	

Instream Cover	
Type	Rank
Open Water	
Rocks	
Rock wall	
Branches (sml snag)	
Logs (snag)	
Log Jam (lge snag)	
Overhanging veg	
Roots	
Undercut bank	
Submerged veg	
Floating veg	
Emergent veg	
Algae	
Leaf Litter	
Rock & vegetation	
Snag & vegetation	
Standing timber	
Constructions	
Urban rubbish	
Para grass	
Hymenachne	
Hyacynth	
Salvinia	
Pistia	

Local Stream disturbance	
Type	Rank
Undisturbed	
Dam	
Weir	
Causeway	
Ford	
Bridge	
Road	
Sand/gravel extract	
Bank erosion	
Catchment erosion	
Siltation	
Cattle access	
Feral pigs	
Pump inlet	
Drain outlet	
Urban rubbish	
Campsite	
Picnic area	

Note: Rank can be any number 0 - 100

Comments:

Catchment Use:

Habitat blank data sheet back page.

Outline of site showing landmarks and key features of the waterbody. Show North, the direction of flow, and mark photo points and direction.

Access: Draw a mud map of the track to the site from the main road.

Landholder	Contact	Phone	Mobile	Address

Flinders Catchment Data

Porcupine Creek at Mt Emu Plains

Summary and habitat data

Summary	
Date	07-Aug-2004
Catchment	Flinders
Stream	Porcupine Creek
Site	Mt Emu Plains
Lat	20 10.638
Long	144 31.433
AHD (m)	747
Length (m)	200
Width (ave)	30
Depth (max)	2.90
Depth (ave)	1.50
Area (ha)	0.600
Volume (ML)	9.000
Time	13:00
Fishing Time	0:45
O_2 % sat	72.0
O_2	7.17
Cond	537.0
pH	8.73
Temp	16.5
Secchi	0.92
Colour	olive green
Weather	fine
Classification	
Prawn abundance	7
Barra abundance	**0**
Species N°	**6**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
stream gauge
Jeff Pocock (DNRM) says sooties here
must be rare, as no sign this trip

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	25
Offstream Lagoon		Rocks	
Instream Billabong	100	Rock wall	10
Instream Pool (flowing)		Branches (sml snag)	
Backwater		Logs (snag)	
Anabranch		Log Jam (lge snag)	
Gentle flow		Overhanging veg	
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	75
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)		Urban rubbish	
Trees	10	Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	90	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	40	Weir	
Geomorphology		Road	
Ave Right bank slope	80	Bridge	
Ave Left bank slope	30	Ford	
> 4000 Bedrock	10	Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble	25	Bank erosion	50
5 - 50 Gravel	30	Catchment erosion	20
0.125 - 5 Sand	10	Siltation	
Soft Silt	20	Cattle access	80
Solid Mud	10	Feral pigs	50
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	5
		Picnic area	

Fish data

Fish at Mt Emu Plains in Porcupine Creek		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	390	45	8
Eastern rainbowfish	*Melanotaenia splendida*	67	22	7
Spangled perch	*Leiopotherapon unicolor*	180	115	4
Banded grunter	*Amniataba percoides*	93	35	5
Hyrtl's tandan	*Neosilurus hyrtlii*	158	158	1
Northern trout gudgeon	*Mogurnda mogurnda*	82	37	3

Plate 1 Porcupine Creek site, looking north

Eight Mile Creek at Old dam (Silver Hills)

Summary and habitat data

Summary	
Date	08-Aug-2004
Catchment	Flinders
Stream	Eight Mile Creek
Site	Silver Hills old dam
Lat	20 36.489
Long	143 06.116
AHD (m)	218
Length (m)	1100
Width (ave)	500
Depth (max)	5.50
Depth (ave)	1.20
Area (ha)	55.000
Volume (ML)	660.000
Time	14:30
Fishing Time	1:00
O_2 % sat	109.0
O_2	10.22
Cond	661.0
pH	8.36
Temp	19.6
Secchi	0.58
Colour	light green
Weather	fine
Classification	
Prawn abundance	5
Barra abundance	**0**
Species N°	**6**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	80
Offstream Lagoon		Rocks	20
Instream Billabong		Rock wall	
Instream Pool (flowing)		Branches (sml snag)	20
Backwater		Logs (snag)	10
Anabranch		Log Jam (lge snag)	10
Gentle flow		Overhanging veg	
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment	100	Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	25
Riparian Zone		Constructions	
Width (m)	20	Urban rubbish	
Trees	10	Para grass	
Native Shrubs	80	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs	50	**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	100
No vegetation	40	Weir	
Geomorphology		Road	
Ave Right bank slope	15	Bridge	
Ave Left bank slope	15	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders	25	Sand/gravel extract	
50 - 250 Cobble		Bank erosion	
5 - 50 Gravel	10	Catchment erosion	
0.125 - 5 Sand	40	Siltation	
Soft Silt	10	Cattle access	90
Solid Mud		Feral pigs	
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	10
		Campsite	
		Picnic area	10

Fish data

Fish at Silver Hills old dam in Eight Mile Creek		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	312	32	8
Spangled perch	*Leiopotherapon unicolor*	124	32	7
Banded grunter	*Amniataba percoides*	45	36	6
Northwest glassfish	*Ambassis sp.*	36	32	3
Golden goby	*Glossogobius aureus*	232	80	2
Sleepy cod	*Oxyeleotris lineolata*	388	388	1

Plate 2 Silver Hills old dam

Eight Mile Creek at house dam (Silver Hills)

Summary and habitat data

Summary	
Date	08-Aug-2004
Catchment	Flinders
Stream	Eight Mile Creek
Site	Silver Hills house dam
Lat	20 36.103
Long	143 04.739
AHD (m)	220
Length (m)	230
Width (ave)	140
Depth (max)	4.50
Depth (ave)	1.00
Area (ha)	3.220
Volume (ML)	32.200
Time	16:20
Fishing Time	0:40
O_2 % sat	136.0
O_2	12.15
Cond	652.0
pH	9.72
Temp	21.5
Secchi	0.90
Colour	light green brown
Weather	fine
Classification	
Prawn abundance	8
Barra abundance	**2**
Species N°	**5**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
high pH origin a mystery
effect on barra, other spp not discernable
a few dead barra floating
dam was stocked with unknown # of spp

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	50
Offstream Lagoon		Rocks	
Instream Billabong		Rock wall	
Instream Pool (flowing)		Branches (sml snag)	
Backwater		Logs (snag)	
Anabranch		Log Jam (lge snag)	
Gentle flow		Overhanging veg	10
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	80
Rapid (white water)		Floating veg	15
Cascade		Emergent veg	25
Waterfall pool		Algae	20
Drain		Leaf Litter	
Impoundment	100	Rock & vegetation	
Tidal		Snag & vegetation	10
Permanency	100	Standing timber	
Riparian Zone		Constructions	10
Width (m)	10	Urban rubbish	
Trees	10	Para grass	
Native Shrubs	20	Hymenachne	
Grass	40	Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	75	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	100
No vegetation	40	Weir	
Geomorphology		Road	
Ave Right bank slope	70	Bridge	
Ave Left bank slope	70	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble		Bank erosion	20
5 - 50 Gravel	20	Catchment erosion	
0.125 - 5 Sand		Siltation	
Soft Silt	100	Cattle access	
Solid Mud		Feral pigs	
Silt cover		Pump inlet	10
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	50

Fish data

Fish at Silver Hills house dam in Eight Mile Creek		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	905	650	2
Bony bream	*Nematolosa erebi*	340	72	7
Eastern rainbowfish	*Melanotaenia splendida*	74	50	7
Spangled perch	*Leiopotherapon unicolor*	120	50	4
Banded grunter	*Amniataba percoides*	125	46	6

Plate 3 Silver Hills house dam. The cause of high pH remains a mystery. Some fish were dying.

Flinders River at Harrogate

Summary and habitat data

Summary	
Date	08-Aug-2004
Catchment	Flinders
Stream	Flinders River
Site	Harrogate
Lat	20 38.725
Long	142 43.282
AHD (m)	180
Length (m)	90
Width (ave)	40
Depth (max)	1.00
Depth (ave)	0.40
Area (ha)	0.360
Volume (ML)	1.440
Time	10:00
Fishing Time	0:15
O_2 % sat	95.0
O_2	9.25
Cond	470.0
pH	8.30
Temp	17.8
Secchi	0.23
Colour	light olive
Weather	fine
Classification	
Prawn abundance	7
Barra abundance	**0**
Species N°	**7**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
very boggy, tried to backpack

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	100
Offstream Lagoon		Rocks	
Instream Billabong	100	Rock wall	
Instream Pool (flowing)		Branches (sml snag)	5
Backwater		Logs (snag)	5
Anabranch		Log Jam (lge snag)	
Gentle flow		Overhanging veg	
Glide (mod/deep)		Roots	10
Sheet (slow/shallow)		Undercut bank	1
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	1
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	50	Standing timber	
Riparian Zone		Constructions	
Width (m)	100	Urban rubbish	
Trees	75	Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	75	Bridge	
Ave Left bank slope	75	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble		Bank erosion	20
5 - 50 Gravel		Catchment erosion	10
0.125 - 5 Sand	20	Siltation	
Soft Silt	80	Cattle access	90
Solid Mud		Feral pigs	50
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	

Fish data

Fish at Harrogate in the Flinders River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	86	46	5
Spangled perch	*Leiopotherapon unicolor*	155	140	2
Archerfish	*Toxotes chatareus*	81	81	1
Golden goby	*Glossogobius aureus*	177	177	1
Sleepy cod	*Oxyeleotris lineolata*	126	94	3
Giant glassfish	*Parambassis gulliveri*	54	50	3
Square-blotched goby	*Glossogobius sp. C*	82	35	4

Plate 4 Harrogate Waterhole, looking downstream, was drying up and very boggy. Waterhole changes size, depth, permanency and position after each flood.

Rupert Creek at Tarbrax Waterhole

Summary and habitat data

Summary	
Date	09-Aug-2004
Catchment	Flinders
Stream	Rupert Creek
Site	Tarbrax Waterhole
Lat	21 05.902
Long	142 27.901
AHD (m)	157
Length (m)	1800
Width (ave)	40
Depth (max)	2.30
Depth (ave)	1.00
Area (ha)	7.200
Volume (ML)	72.000
Time	9:45
Fishing Time	1:45
O_2 % sat	137.0
O_2	14.44
Cond	465.0
pH	9.91
Temp	13.8
Secchi	0.60
Colour	light green
Weather	fine
Classification	
Prawn abundance	6
Barra abundance	**0**
Species N°	**14**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
wind chill factor high
bore fed
a = anecdotal
b = in bore drain above

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	60
Offstream Lagoon		Rocks	10
Instream Billabong	100	Rock wall	10
Instream Pool (flowing)		Branches (sml snag)	20
Backwater		Logs (snag)	20
Anabranch		Log Jam (lge snag)	5
Gentle flow		Overhanging veg	15
Glide (mod/deep)		Roots	15
Sheet (slow/shallow)		Undercut bank	10
Riffle(fast/shallow)		Submerged veg	50
Rapid (white water)		Floating veg	
Cascade		Emergent veg	50
Waterfall pool		Algae	50
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	15	Urban rubbish	
Trees	20	Para grass	
Native Shrubs	10	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges	70	Salvinia	
Breaks	70	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	30	Bridge	
Ave Left bank slope	20	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders	10	Sand/gravel extract	
50 - 250 Cobble	10	Bank erosion	10
5 - 50 Gravel	10	Catchment erosion	20
0.125 - 5 Sand		Siltation	
Soft Silt	90	Cattle access	70
Solid Mud	10	Feral pigs	25
Silt cover		Pump inlet	
		Drain outlet	10
		Urban rubbish	20
		Campsite	
		Picnic area	

Fish data

Fish at Tarbrax Waterhole in Rupert Creek		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	333	181	6
Eastern rainbowfish	*Melanotaenia splendida*	66	40	3
Rendahl's catfish	*Porochilus rendahli*	215	110	6
Giant glassfish	*Parambassis gulliveri*	307	45	6
Spangled perch	*Leiopotherapon unicolor*	138	138	1
Golden goby	*Glossogobius aureus*	180	130	2
Toothless catfish	*Anodontiglanis dahli*	340	340	1
Gulf grunter	*Scortum ogilbyi*	332	299	3
Berney's catfish	*Arius berneyi*	440	310	3
Sleepy cod	*Oxyeleotris lineolata*	276	68	5
Carpentaria catfish	*Arius paucus*	703	600	3
Barramundi	*Lates calcarifer*			a
Mouth almighty	*Glossamia aprion*			b
Banded grunter	*Amniataba percoides*			b
Notes				
a = anecdotal				
b = in bore drain above				

Plate 5 Tarbrax Waterhole, looking upstream in the middle reaches. Note the reeds, which lined both banks at the top of the waterhole.

Flinders River at Punchbowl waterhole

Summary and habitat data

Summary	
Date	10-Aug-2004
Catchment	Flinders
Stream	Flinders River
Site	Punchbowl Waterhole
Lat	20 25.756
Long	142 02.661
AHD (m)	130
Length (m)	80
Width (ave)	9
Depth (max)	0.50
Depth (ave)	0.35
Area (ha)	0.072
Volume (ML)	0.252
Time	11:00
Fishing Time	0:30
O_2 % sat	125.0
O_2	12.40
Cond	398.0
pH	9.45
Temp	16.3
Secchi	0.48
Colour	milky green
Weather	fine
Classification	
Prawn abundance	5
Barra abundance	**0**
Species N°	**8**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
will dry out 1-2 months
bank erosion natural
salinity 200ppm
white crystals on bank

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	90
Offstream Lagoon		Rocks	10
Instream Billabong		Rock wall	
Instream Pool (flowing)		Branches (sml snag)	
Backwater		Logs (snag)	
Anabranch	100	Log Jam (lge snag)	
Gentle flow		Overhanging veg	
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	30
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	50	Standing timber	
Riparian Zone		Constructions	
Width (m)	0	Urban rubbish	
Trees	0	Para grass	
Native Shrubs	0	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	100	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	100	Weir	
Geomorphology		Road	
Ave Right bank slope	50	Bridge	50
Ave Left bank slope	20	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders	30	Sand/gravel extract	
50 - 250 Cobble	50	Bank erosion	30
5 - 50 Gravel		Catchment erosion	10
0.125 - 5 Sand	70	Siltation	10
Soft Silt	20	Cattle access	40
Solid Mud		Feral pigs	30
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	20
		Campsite	10
		Picnic area	

Fish data

Fish at Punchbowl Waterhole in the Flinders River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	41	26	5
Archerfish	*Toxotes chatareus*	45	40	2
Mouth almighty	*Glossamia aprion*	60	52	2
Square-blotched goby	*Glossogobius sp. C*	65	54	3
Freshwater sole	*Brachirus selheimi*	43	43	1
Sleepy cod	*Oxyeleotris lineolata*	70	67	2
Banded grunter	*Amniataba percoides*	86	61	2
Carpentaria catfish	*Arius paucus*	240	240	1

Plate 6 Punchbowl Waterhole, looking upstream. Note the low water level. This popular fishing hole will probably dry out. It may be permanent following large floods. Layers of an unknown salt crystal lined the banks where water had been seeping out.

Flinders River at Rocky Waterhole

Summary and habitat data

Summary	
Date	10-Aug-2004
Catchment	Flinders
Stream	Flinders River
Site	Rocky Waterhole
Lat	20 14.557
Long	141 50.894
AHD (m)	120
Length (m)	1600
Width (ave)	80
Depth (max)	4.20
Depth (ave)	2.20
Area (ha)	12.800
Volume (ML)	281.600
Time	14:30
Fishing Time	1:30
O_2 % sat	118.0
O_2	11.80
Cond	483.0
pH	8.52
Temp	15.7
Secchi	0.37
Colour	milky green
Weather	fine
Classification	
Prawn abundance	8
Barra abundance	**2**
Species N°	**14**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
Wyaldra station
Tim Marsden may have sampled 2000

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	85
Offstream Lagoon		Rocks	10
Instream Billabong		Rock wall	15
Instream Pool (flowing)		Branches (sml snag)	25
Backwater		Logs (snag)	20
Anabranch	100	Log Jam (lge snag)	10
Gentle flow		Overhanging veg	30
Glide (mod/deep)		Roots	40
Sheet (slow/shallow)		Undercut bank	10
Riffle(fast/shallow)		Submerged veg	1
Rapid (white water)		Floating veg	10
Cascade		Emergent veg	
Waterfall pool		Algae	10
Drain		Leaf Litter	1
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	40	Urban rubbish	
Trees	75	Para grass	
Native Shrubs	20	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	20	Pistia	
Exotic shrubs, burrs	5	**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	80	Bridge	
Ave Left bank slope	75	Ford	1
> 4000 Bedrock	10	Causeway	
250 - 4000 Boulders	10	Sand/gravel extract	
50 - 250 Cobble	20	Bank erosion	20
5 - 50 Gravel	20	Catchment erosion	20
0.125 - 5 Sand		Siltation	10
Soft Silt	80	Cattle access	50
Solid Mud	20	Feral pigs	
Silt cover		Pump inlet	
		Bore Drain outlet	10
		Urban rubbish	
		Campsite	
		Picnic area	

Fish data

Fish at Rocky Waterhole in the Flinders River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	650	500	2
Bony bream	*Nematolosa erebi*	305	48	8
Eastern rainbowfish	*Melanotaenia splendida*	91	81	2
Sleepy cod	*Oxyeleotris lineolata*	365	44	7
Golden goby	*Glossogobius aureus*	145	50	3
Giant glassfish	*Parambassis gulliveri*	70	31	7
Forktailed catfish	*Arius graeffei*	325	94	6
Archerfish	*Toxotes chatareus*	135	92	3
Gulf grunter	*Scortum ogilbyi*	325	220	3
Spangled perch	*Leiopotherapon unicolor*	95	75	2
Square-blotched goby	*Glossogobius sp. C*	65	55	3
Berney's catfish	*Arius berneyi*	332	280	3
Mouth almighty	*Glossamia aprion*	131	131	1
Carpentaria catfish	*Arius paucus*	600	492	3

Plate 7 Rocky Waterhole, looking downstream.

Saxby River at Lyrian Waterhole

Summary and habitat data

Summary	
Date	11-Aug-2004
Catchment	Flinders
Stream	Saxby River
Site	Lyrian Waterhole
Lat	19 27.266
Long	141 16.568
AHD (m)	68
Length (m)	14600
Width (ave)	65
Depth (max)	6.40
Depth (ave)	3.80
Area (ha)	94.900
Volume (ML)	3606.200
Time	14:15
Fishing Time	2:00
O_2 % sat	114.0
O_2	11.15
Cond	154.0
pH	7.88
Temp	16.4
Secchi	0.08
Colour	milk coffee
Weather	fine
Classification	
Prawn abundance	8
Barra abundance	**4**
Species N°	**12**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:

illegal nets bad, gets plenty of attention
algal scum on surface, wind blown
to bottom end
very deep average
lots of redclaw (8)
Thryssa dominant
Tim Marsden sampled 2000
lots small nurseryfish

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	90
Offstream Lagoon		Rocks	
Instream Billabong	100	Rock wall	
Instream Pool (flowing)		Branches (sml snag)	20
Backwater		Logs (snag)	25
Anabranch		Log Jam (lge snag)	10
Gentle flow		Overhanging veg	50
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	15
Riparian Zone		Constructions	
Width (m)	40	Urban rubbish	
Trees	80	Para grass	
Native Shrubs	20	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	10	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	75	Bridge	
Ave Left bank slope	75	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble	10	Bank erosion	15
5 - 50 Gravel	10	Catchment erosion	15
0.125 - 5 Sand		Siltation	
Soft Silt	80	Cattle access	50
Solid Mud	70	Feral pigs	25
Silt cover		Pump inlet	25
		Drain outlet	10
		Urban rubbish	10
		Campsite	20
		Picnic area	

Fish data

Fish at Lyrian Waterhole in the Saxby River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	800	430	4
Bony bream	*Nematolosa erebi*	296	260	7
Sleepy cod	*Oxyeleotris lineolata*	340	98	6
Freshwater anchovy	*Thryssa scratchleyi*	66	20	8
Giant glassfish	*Parambassis gulliveri*	134	53	6
Archerfish	*Toxotes chatareus*	152	76	3
Gulf grunter	*Scortum ogilbyi*	398	276	2
Toothless catfish	*Anodontiglanis dahli*	325	325	1
Forktailed catfish	*Arius graeffei*	287	100	4
Nurseryfish	*Kurtus gulliveri*	383	383	1
Square-blotched goby	*Glossogobius sp. C*	56	44	2
Carpentaria catfish	*Arius paucus*	770	600	4

Plate 8 Lyrian Waterhole on the Saxby River. The only site where nurseryfish were found. Surface algae were blown to the windward end, forming a thick scum.

Gidya Creek (Saxby/Norman) at Martins Waterhole

Summary and habitat data

Summary	
Date	11-Aug-2004
Catchment	Flinders
Stream	Gidya Creek (Norman R.)
Site	Martin's Waterhole
Lat	19 18.784
Long	141 17.635
AHD (m)	63
Length (m)	600
Width (ave)	175
Depth (max)	1.40
Depth (ave)	0.90
Area (ha)	10.500
Volume (ML)	94.500
Time	11:30
Fishing Time	0:45
O_2 % sat	110.0
O_2	10.70
Cond	82.6
pH	7.76
Temp	16.7
Secchi	0.09
Colour	milk coffee
Weather	fine
Classification	
Prawn abundance	8
Barra abundance	**0**
Species N°	**7**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
Saxby Roundup site
aquatic veg 4m wide entire shoreline
diseased sleepy and scortum
dirty, windy, shallow
pigs were seen, damage bad
lot of rubbish

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	95
Offstream Lagoon	100	Rocks	
Instream Billabong		Rock wall	
Instream Pool (flowing)		Branches (sml snag)	5
Backwater		Logs (snag)	5
Anabranch		Log Jam (lge snag)	
Gentle flow		Overhanging veg	
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	50
Rapid (white water)		Floating veg	50
Cascade		Emergent veg	50
Waterfall pool		Algae	50
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	75	Standing timber	
Riparian Zone		Constructions	
Width (m)	30	Urban rubbish	30
Trees	30	Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges	10	Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs	20	**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	20	Weir	
Geomorphology		Road	
Ave Right bank slope	7	Bridge	
Ave Left bank slope	10	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble		Bank erosion	20
5 - 50 Gravel	10	Catchment erosion	30
0.125 - 5 Sand	10	Siltation	30
Soft Silt	95	Cattle access	100
Solid Mud	20	Feral pigs	100
Silt cover		Pump inlet	10
		Drain outlet	
		Urban rubbish	40
		Campsite	50
		Picnic area	50

Fish data

Fish at Martin's Waterhole in Gidya Creek (Norman R.)		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	266	266	1
Eastern rainbowfish	*Melanotaenia splendida*	91	4	8
Striped sleepy cod	*Oxyeleotris selheimi*	358	175	6
Spangled perch	*Leiopotherapon unicolor*	172	133	7
Gulf grunter	*Scortum ogilbyi*	240	240	1
Rendahl's catfish	*Porochilus rendahli*	121	105	5
Northwest glassfish	*Ambassis sp.*	59	24	7
Notes:				
millions of rainbows				
a number of fish had sores				

Plate 9 Martin's Waterhole, near Saxby Roundup. Note the pig damage along the banks. This site had lots of rubbish in the water and along the banks.

Cloncurry River at Malbon crossing

Summary and habitat data

Summary	
Date	25-Jul-2004
Catchment	Flinders
Stream	Cloncurry River
Site	Malbon Crossing
Lat	21 05.462
Long	140 19.159
AHD (m)	260
Length (m)	170
Width (ave)	40
Depth (max)	2.90
Depth (ave)	1.10
Area (ha)	0.680
Volume (ML)	7.480
Time	12:30
Fishing Time	0:45
O_2 % sat	143.0
O_2	15.65
Cond	354.0
pH	8.78
Temp	12.6
Secchi	0.63
Colour	Olive green
Weather	Fine
Classification	
Prawn abundance	3
Barra abundance	**0**
Species N°	**5**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
Uppermost permanent water
may dry out if crossing removed
or culverts upgraded

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	95
Offstream Lagoon		Rocks	1
Instream Billabong	100	Rock wall	
Instream Pool (flowing)		Branches (sml snag)	1
Backwater		Logs (snag)	1
Anabranch		Log Jam (lge snag)	1
Gentle flow		Overhanging veg	10
Glide (mod/deep)		Roots	15
Sheet (slow/shallow)		Undercut bank	15
Riffle(fast/shallow)		Submerged veg	5
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	15
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	50	Urban rubbish	
Trees	90	Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	30	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	80	Bridge	
Ave Left bank slope	75	Ford	
> 4000 Bedrock		Causeway	25
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble	10	Bank erosion	
5 - 50 Gravel	10	Catchment erosion	
0.125 - 5 Sand	90	Siltation	
Soft Silt	15	Cattle access	50
Solid Mud		Feral pigs	
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	25
		Picnic area	25

Fish data

Fish at Malbon Crossing in the Cloncurry River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	211	24	8
Eastern rainbowfish	*Melanotaenia splendida*	61	28	3
Spangled perch	*Leiopotherapon unicolor*	218	51	6
Square-blotched goby	*Glossogobius sp. C*	64	46	2
Hyrtl's tandan	*Neosilurus hyrtlii*	100	100	1

Plate 10 Malbon crossing, the uppermost permanent water in the Cloncurry River. The causeway may have a role in maintaining permanent water.

Cloncurry River at 2 Mile waterhole (Cloncurry)

Summary and habitat data

Summary	
Date	25-Jul-2004
Catchment	Flinders
Stream	Cloncurry River
Site	2 Mile Waterhole
Lat	20 40.516
Long	140 29.673
AHD (m)	191
Length (m)	200
Width (ave)	35
Depth (max)	2.40
Depth (ave)	0.90
Area (ha)	0.700
Volume (ML)	6.300
Time	15:20
Fishing Time	1:25
O_2 % sat	120.0
O_2	12.05
Cond	511.0
pH	8.06
Temp	16.1
Secchi	0.60
Colour	khaki
Weather	Fine
Classification	
Prawn abundance	7
Barra abundance	**0**
Species N°	**13**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
stream gauge

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	
Offstream Lagoon		Rocks	5
Instream Billabong	100	Rock wall	
Instream Pool (flowing)		Branches (sml snag)	
Backwater		Logs (snag)	25
Anabranch		Log Jam (lge snag)	1
Gentle flow		Overhanging veg	50
Glide (mod/deep)		Roots	75
Sheet (slow/shallow)		Undercut bank	25
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	5
Riparian Zone		Constructions	
Width (m)	40	Urban rubbish	25
Trees	40	Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	40	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	10
Ave Right bank slope	80	Bridge	
Ave Left bank slope	80	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	20
50 - 250 Cobble	5	Bank erosion	
5 - 50 Gravel	10	Catchment erosion	10
0.125 - 5 Sand	75	Siltation	
Soft Silt	10	Cattle access	45
Solid Mud		Feral pigs	
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	25
		Campsite	
		Picnic area	

Fish data

Fish at 2 Mile Waterhole in the Cloncurry River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	230	30	8
Eastern rainbowfish	*Melanotaenia splendida*	68	23	5
Striped sleepy cod	*Oxyeleotris selheimi*	405	194	6
Sleepy cod	*Oxyeleotris lineolata*	240	53	6
Hyrtl's tandan	*Neosilurus hyrtlii*	172	110	3
Spangled perch	*Leiopotherapon unicolor*	187	51	7
Gulf grunter	*Scortum ogilbyi*	309	118	5
Toothless catfish	*Anodontiglanis dahli*	476	476	1
Saltpan sole	*Brachirus salinarum*	90	90	1
Golden goby	*Glossogobius aureus*	171	165	2
Square-blotched goby	*Glossogobius sp. C*	65	65	1
Banded grunter	*Amniataba percoides*	95	52	5
Archerfish	*Toxotes chatareus*	130	125	2

Plate 11 Two Mile Waterhole in the Cloncurry River, beside Cloncurry.

Alick Creek at Proa bore No 2 drain

Summary and habitat data

Summary	
Date	09-Aug-2004
Catchment	Flinders
Stream	Alick Creek
Site	Proa bore No 2 drain
Lat	20 52.854
Long	142 08.279
AHD (m)	163
Length (m)	1000
Width (ave)	0.7
Depth (max)	0.02
Depth (ave)	0.01
Area (ha)	0.070
Volume (ML)	0.007
Time	14:00
Fishing Time	0:10
O_2 % sat	92.0
O_2	6.93
Cond	557.0
pH	8.32
Temp	30.6
Secchi	1.00
Colour	clear
Weather	fine
Classification	
Prawn abundance	0
Barra abundance	**0**
Species N°	**1**

At bore head	
O_2	0.23
Cond	568.0
pH	7.89
Temp	48.1
1 km downstream	
O_2	13.14
Cond	607.0
pH	9.27
Temp	17.6

Comments:
may be in more bore drains, Saxby catchment (Richard Makim, *pers. comm.)*

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	90
Offstream Lagoon		Rocks	
Instream Billabong		Rock wall	
Instream Pool (flowing)		Branches (sml snag)	25
Backwater		Logs (snag)	
Anabranch		Log Jam (lge snag)	
Gentle flow		Overhanging veg	10
Glide (mod/deep)		Roots	10
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	20
Bore Drain	100	Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	5	Urban rubbish	
Trees		Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs	25	**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	75	Weir	
Geomorphology		Road	20
Ave Right bank slope	10	Bridge	10
Ave Left bank slope	5	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble		Bank erosion	
5 - 50 Gravel		Catchment erosion	
0.125 - 5 Sand		Siltation	
Soft Silt	95	Cattle access	90
Solid Mud	50	Feral pigs	
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	

Fish data

Fish at Proa bore No 2 drain near Alick Creek		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Tadpole goby	*Chlamydogobius ranunculus*	46	17	7
Notes:				
sample F5, sent to Qld museum, may be new species				
30-50/sq m within 80 m of bore head				
obviously breeding				
colours match book (Allen *et. al.,* 2002) description				
1 km downstream, very few				

Plate 12 Proa Bore Drain No. 2. The one fish species at this site is potentially "new".

Julia Creek at 1950 (new) Proa bore drain

Summary and habitat data

Summary	
Date	09-Aug-2004
Catchment	Flinders
Stream	Julia Creek
Site	Proa 1950 bore drain
Lat	20 52.589
Long	142 07.518
AHD (m)	163
Length (m)	80
Width (ave)	0.5
Depth (max)	0.02
Depth (ave)	0.01
Area (ha)	0.004
Volume (ML)	0.000
Time	14:00
Fishing Time	0:10
O_2 % sat	99.0
O_2	6.80
Cond	610.0
pH	8.00
Temp	35.0
Secchi	1.00
Colour	clear
Weather	fine
Classification	
Prawn abundance	0
Barra abundance	**0**
Species N°	**0**

Bore head	
O_2	1.04
Cond	591.0
pH	7.41
Temp	48.5

Comments:
no fish, no invertebrates
barren, no habitat
very clear water, width <1 m
water qual measured 30 m downstream
new in 1950

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	100
Offstream Lagoon		Rocks	
Instream Billabong		Rock wall	
Instream Pool (flowing)		Branches (sml snag)	
Backwater		Logs (snag)	
Anabranch		Log Jam (lge snag)	
Gentle flow		Overhanging veg	
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Bore Drain	100	Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	5	Urban rubbish	
Trees		Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs	25	**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	75	Weir	
Geomorphology		Road	
Ave Right bank slope	75	Bridge	
Ave Left bank slope	70	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble		Bank erosion	
5 - 50 Gravel		Catchment erosion	
0.125 - 5 Sand		Siltation	
Soft Silt	95	Cattle access	95
Solid Mud	50	Feral pigs	
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	

Fish data

Fish at Proa 1950 bore drain near Julia Creek		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
no fish - completely barren	*(blank)*			
Note:				
"new" bore, dug 1950!				

Plate 13 Proa Bore “new”, constructed in 1950. There were no fish at this site. Other wildlife may depend on these bore drains for survival.

Eastern Creek at Eddington Waterhole

Summary and habitat data

Summary	
Date	26-Jul-2004
Catchment	Flinders
Stream	Eastern Creek
Site	Eddington Waterhole
Lat	20 39.509
Long	141 32.709
AHD (m)	110
Length (m)	1600
Width (ave)	50
Depth (max)	3.20
Depth (ave)	1.50
Area (ha)	8.000
Volume (ML)	120.000
Time	10:30
Fishing Time	1:30
O_2 % sat	120.0
O_2	11.30
Cond	194.3
pH	7.38
Temp	18.4
Secchi	0.35
Colour	light khaki
Weather	fine
Classification	
Prawn abundance	6
Barra abundance	**0**
Species N°	**10**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comment:
most fish and spp up top end

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	80
Offstream Lagoon		Rocks	
Instream Billabong	100	Rock wall	
Instream Pool (flowing)		Branches (sml snag)	1
Backwater		Logs (snag)	
Anabranch		Log Jam (lge snag)	
Gentle flow		Overhanging veg	
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	5
Rapid (white water)		Floating veg	10
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	20	Urban rubbish	
Trees	80	Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	20	Pistia	
Exotic shrubs, burrs	20	**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	40	Weir	
Geomorphology		Road	
Ave Right bank slope	30	Bridge	
Ave Left bank slope	45	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble		Bank erosion	15
5 - 50 Gravel		Catchment erosion	5
0.125 - 5 Sand		Siltation	25
Soft Silt	100	Cattle access	100
Solid Mud		Feral pigs	
Silt cover		Pump inlet	5
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	1

Fish data

Fish at Eddington Waterhole in Eastern Creek		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	333	54	7
Sleepy cod	*Oxyeleotris lineolata*	350	83	5
Archerfish	*Toxotes chatareus*	63	63	2
Gulf grunter	*Scortum ogilbyi*	372	256	3
Forktailed catfish	*Arius graeffei*	130	81	5
Giant glassfish	*Parambassis gulliveri*	266	35	4
Toothless catfish	*Anodontiglanis dahli*	370	270	4
Rendahl's catfish	*Porochilus rendahli*	183	150	4
Papuan river sprat	*Clupeoides cf. papuensis*	53	53	1
Carpentaria catfish	*Arius paucus*	660	347	2

Plate 14 Eddington Waterhole in Eastern Creek

Julia Creek at Dalgonally Waterhole

Summary and habitat data

Summary	
Date	26-Jul-2004
Catchment	Flinders
Stream	Julia Creek
Site	Dalgonally Waterhole
Lat	20 08.071
Long	141 20.882
AHD (m)	91
Length (m)	5700
Width (ave)	80
Depth (max)	4.40
Depth (ave)	1.30
Area (ha)	45.600
Volume (ML)	592.800
Time	15:15
Fishing Time	1:15
O_2 % sat	126.0
O_2	11.11
Cond	149.9
pH	7.72
Temp	21.6
Secchi	0.05
Colour	pale yellow
Weather	fine
Classification	
Prawn abundance	7
Barra abundance	**1**
Species N°	**13**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
skiing shed, big waterhole

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	90
Offstream Lagoon		Rocks	
Instream Billabong	90	Rock wall	
Instream Pool (flowing)		Branches (sml snag)	5
Backwater	10	Logs (snag)	10
Anabranch	5	Log Jam (lge snag)	1
Gentle flow		Overhanging veg	25
Glide (mod/deep)		Roots	10
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	25
Waterfall pool		Algae	10
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	1
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	20	Urban rubbish	
Trees	40	Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	70	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	10	Weir	
Geomorphology		Road	
Ave Right bank slope	20	Bridge	
Ave Left bank slope	15	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble		Bank erosion	
5 - 50 Gravel		Catchment erosion	5
0.125 - 5 Sand		Siltation	
Soft Silt	100	Cattle access	50
Solid Mud		Feral pigs	25
Silt cover		Pump inlet	1
		Drain outlet	
		Urban rubbish	
		Campsite	1
		Picnic area	1

Fish data

Fish at Dalgonally Waterhole in Julia Creek		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	589	589	1
Bony bream	*Nematolosa erebi*	191	94	7
Sleepy cod	*Oxyeleotris lineolata*	385	69	5
Berney's catfish	*Arius berneyi*	370	360	3
Salmon catfish	*Arius leptaspis*	85	83	3
Toothless catfish	*Anodontiglanis dahli*	436	280	4
Giant glassfish	*Parambassis gulliveri*	275	104	6
Archerfish	*Toxotes chatareus*	99	60	2
Reticulated glassfish	*Ambassis macleayi*	41	24	2
Rendahl's catfish	*Porochilus rendahli*	110	104	2
Gulf grunter	*Scortum ogilbyi*	328	328	1
Carpentaria catfish	*Arius paucus*	700	605	5
Papuan river sprat	*Clupeoides cf. papuensis*	38	23	8
Notes:				
sprat identified by Qld museum				
may be new species				
very abundant, possible aquaculture potential				
millions of small ones, obviously breeding here				

Plate 15 Dalgonally Waterhole. A very large waterhole with a high density of fodder fish.

Cloncurry River at Sedan Dip

Summary and habitat data

Summary	
Date	27-Jul-2004
Catchment	Flinders
Stream	Cloncurry River
Site	Sedan Dip
Lat	20 02.736
Long	141 05.306
AHD (m)	102
Length (m)	400
Width (ave)	35
Depth (max)	2.50
Depth (ave)	0.70
Area (ha)	1.400
Volume (ML)	9.800
Time	10:00
Fishing Time	1:00
O_2 % sat	113.0
O_2	11.30
Cond	445.0
pH	8.21
Temp	15.9
Secchi	0.48
Colour	Olive
Weather	fine
Classification	
Prawn abundance	8
Barra abundance	**3**
Species N°	**16**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
crumbling rocks
fishing comp site, still plenty of fish

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	80
Offstream Lagoon		Rocks	1
Instream Billabong	100	Rock wall	
Instream Pool (flowing)		Branches (sml snag)	20
Backwater		Logs (snag)	20
Anabranch		Log Jam (lge snag)	10
Gentle flow		Overhanging veg	25
Glide (mod/deep)		Roots	50
Sheet (slow/shallow)		Undercut bank	5
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	10
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	10	Urban rubbish	
Trees	60	Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	25	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	80	Bridge	
Ave Left bank slope	75	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders	1	Sand/gravel extract	
50 - 250 Cobble	5	Bank erosion	
5 - 50 Gravel	10	Catchment erosion	10
0.125 - 5 Sand	80	Siltation	
Soft Silt	10	Cattle access	25
Solid Mud		Feral pigs	
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	10
		Campsite	20
		Picnic area	

Fish data

Fish at Sedan Dip in the Cloncurry River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	690	525	3
Bony bream	*Nematolosa erebi*	211	24	8
Eastern rainbowfish	*Melanotaenia splendida*	93	43	7
Gulf grunter	*Scortum ogilbyi*	302	62	5
Sleepy cod	*Oxyeleotris lineolata*	330	44	5
Toothless catfish	*Anodontiglanis dahli*	436	196	3
Striped sleepy cod	*Oxyeleotris selheimi*	390	390	1
Spangled perch	*Leiopotherapon unicolor*	86	56	5
Reticulated glassfish	*Ambassis macleayi*	50	40	4
Mouth almighty	*Glossamia aprion*	160	146	2
Archerfish	*Toxotes chatareus*	175	54	4
Black catfish	*Neosilurus ater*	352	352	1
Giant glassfish	*Parambassis gulliveri*	230	66	6
Forktailed catfish	*Arius graeffei*	189	187	3
Carpentaria catfish	*Arius paucus*	623	520	5
Golden goby	*Glossogobius aureus*	64	64	3

Plate 16 Sedan Dip Waterhole in the Cloncurry River. Popular camping and fishing competition site.

Cloncurry River at 10 Mile Waterhole

Summary and habitat data

Summary	
Date	12-Aug-2004
Catchment	Flinders
Stream	Cloncurry River
Site	10 Mile Waterhole
Lat	19 19.940
Long	140 51.018
AHD (m)	56
Length (m)	2200
Width (ave)	50
Depth (max)	3.40
Depth (ave)	1.50
Area (ha)	11.000
Volume (ML)	165.000
Time	9:00
Fishing Time	2:00
O_2 % sat	114.0
O_2	11.11
Cond	284.0
pH	8.74
Temp	16.5
Secchi	0.35
Colour	light green
Weather	fine
Classification	
Prawn abundance	8
Barra abundance	**5**
Species N°	**16**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
excellent waterhole
worth protecting

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	90
Offstream Lagoon		Rocks	
Instream Billabong	100	Rock wall	
Instream Pool (flowing)		Branches (sml snag)	30
Backwater		Logs (snag)	30
Anabranch		Log Jam (lge snag)	30
Gentle flow		Overhanging veg	50
Glide (mod/deep)		Roots	40
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	60	Urban rubbish	
Trees	70	Para grass	
Native Shrubs	10	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	15	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	80	Bridge	
Ave Left bank slope	80	Ford	10
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble		Bank erosion	10
5 - 50 Gravel	20	Catchment erosion	10
0.125 - 5 Sand	80	Siltation	
Soft Silt	60	Cattle access	50
Solid Mud		Feral pigs	50
Silt cover		Pump inlet	10
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	

Fish data

Fish at 10 Mile Waterhole in the Cloncurry River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	653	457	5
Bony bream	*Nematolosa erebi*	286	26	8
Eastern rainbowfish	*Melanotaenia splendida*	66	44	5
Giant glassfish	*Parambassis gulliveri*	256	40	8
Sleepy cod	*Oxyeleotris lineolata*	261	53	7
Gulf grunter	*Scortum ogilbyi*	364	191	3
Archerfish	*Toxotes chatareus*	256	45	4
Banded grunter	*Amniataba percoides*	86	35	2
Spangled perch	*Leiopotherapon unicolor*	83	83	1
Freshwater anchovy	*Thryssa scratchleyi*	262	206	4
Rendahl's catfish	*Porochilus rendahli*	45	45	1
Forktailed catfish	*Arius graeffei*	345	298	4
Mouth almighty	*Glossamia aprion*	132	95	3
new catfish	*Porochilus sp.*	435	435	1
Square-blotched goby	*Glossogobius sp. C*	90	62	3
Carpentaria catfish	*Arius paucus*	870	450	6

Plate 17 Ten Mile Waterhole in the Cloncurry River. Great species diversity and barramundi abundance. Note steep sides.

Flinders River at Walkers Bend

Summary and habitat data

Summary	
Date	12-Aug-2004
Catchment	Flinders
Stream	Flinders River
Site	Walker's Bend
Lat	18 09.736
Long	140 51.473
AHD (m)	12
Length (m)	4500
Width (ave)	90
Depth (max)	3.90
Depth (ave)	1.80
Area (ha)	40.500
Volume (ML)	729.000
Time	15:00
Fishing Time	2:00
O_2 % sat	122.0
O_2	10.88
Cond	241.0
pH	8.72
Temp	20.8
Secchi	0.61
Colour	light green
Weather	fine
Classification	
Prawn abundance	8
Barra abundance	**4**
Species N°	**19**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
stream gauge
lots of big crocs

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	90
Offstream Lagoon		Rocks	15
Instream Billabong	10	Rock wall	15
Instream Pool (flowing)		Branches (sml snag)	20
Backwater		Logs (snag)	20
Anabranch		Log Jam (lge snag)	15
Gentle flow		Overhanging veg	50
Glide (mod/deep)		Roots	45
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	10
Riparian Zone		Constructions	
Width (m)	80	Urban rubbish	
Trees	80	Para grass	
Native Shrubs	20	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	10	Pistia	
Exotic shrubs, burrs	20	**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	10
Ave Right bank slope	70	Bridge	
Ave Left bank slope	65	Ford	
> 4000 Bedrock	15	Causeway	10
250 - 4000 Boulders	15	Sand/gravel extract	
50 - 250 Cobble	15	Bank erosion	10
5 - 50 Gravel	15	Catchment erosion	10
0.125 - 5 Sand	60	Siltation	
Soft Silt	80	Cattle access	80
Solid Mud		Feral pigs	20
Silt cover		Pump inlet	20
		Drain outlet	
		Urban rubbish	
		Campsite	25
		Picnic area	10

Fish data

Fish at Walker's Bend in the Flinders River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	703	405	4
Bony bream	*Nematolosa erebi*	195	26	8
Eastern rainbowfish	*Melanotaenia splendida*	78	47	5
Giant glassfish	*Parambassis gulliveri*	84	36	4
Freshwater anchovy	*Thryssa scratchleyi*	340	295	6
Archerfish	*Toxotes chatareus*	220	23	5
Spangled perch	*Leiopotherapon unicolor*	105	81	5
Toothless catfish	*Anodontiglanis dahli*	355	287	2
Mouth almighty	*Glossamia aprion*	145	122	4
Sleepy cod	*Oxyeleotris lineolata*	400	84	2
Berney's catfish	*Arius berneyi*	335	306	6
Square-blotched goby	*Glossogobius sp. C*	95	28	2
Long tom	*Strongylura krefftii*	555	555	4
Gulf grunter	*Scortum ogilbyi*	330	185	1
Black catfish	*Neosilurus ater*	438	404	2
Freshwater stingray	*Himantura chaophrya*	1000	1000	2
Forktailed catfish	*Arius graeffei*	212	190	3
Carpentaria catfish	*Arius paucus*	610	505	1
Golden goby	*Glossogobius aureus*	110	50	2

Plate 18 Walkers Bend in the Flinders River. This is the lower end. Note the rock bar and causeway. Popular camp site for travellers.

Bynoe River at Burke and Wills Monument

Summary and habitat data

Summary	
Date	13-Aug-2004
Catchment	Flinders
Stream	Bynoe River
Site	Burke & Wills monument
Lat	17 52.710
Long	140 49.479
AHD (m)	5
Length (m)	7000
Width (ave)	180
Depth (max)	3.20
Depth (ave)	0.90
Area (ha)	126.000
Volume (ML)	1134.000
Time	14:15
Fishing Time	2:35
O_2 % sat	102.0
O_2	9.09
Cond	2360.0
pH	8.81
Temp	20.7
Secchi	0.90
Colour	light olive green
Weather	fine
Classification	
Prawn abundance	8
Barra abundance	**4**
Species N°	**20**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
salinity 1.218ppt
lot more fish than Flinders arm
a few dead crocs

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	80
Offstream Lagoon		Rocks	20
Instream Billabong	70	Rock wall	10
Instream Pool (flowing)		Branches (sml snag)	20
Backwater		Logs (snag)	20
Anabranch	30	Log Jam (lge snag)	20
Gentle flow		Overhanging veg	25
Glide (mod/deep)		Roots	35
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	45
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency		Standing timber	10
Riparian Zone		Constructions	
Width (m)	30	Urban rubbish	
Trees	80	Para grass	
Native Shrubs	10	Hymenachne	
Grass	10	Hyacynth	
Rushes & Sedges		Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs	45	**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	25	Bridge	
Ave Left bank slope	15	Ford	
> 4000 Bedrock	10	Causeway	10
250 - 4000 Boulders	10	Sand/gravel extract	
50 - 250 Cobble	20	Bank erosion	30
5 - 50 Gravel	15	Catchment erosion	20
0.125 - 5 Sand	95	Siltation	
Soft Silt	10	Cattle access	80
Solid Mud		Feral pigs	
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	20
		Picnic area	10

Fish data

Fish at Burke & Wills monument in the Bynoe River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	805	289	4
Bony bream	*Nematolosa erebi*	408	88	8
Eastern rainbowfish	*Melanotaenia splendida*	60	60	1
Sleepy cod	*Oxyeleotris lineolata*	150	78	5
Freshwater anchovy	*Thryssa scratchleyi*	290	87	7
Mouth almighty	*Glossamia aprion*	141	40	5
Archerfish	*Toxotes chatareus*	96	51	3
Long tom	*Strongylura krefftii*	462	462	1
River gar	*Zenarchopterus spp*	120	100	2
Gulf grunter	*Scortum ogilbyi*	390	280	2
Berney's catfish	*Arius berneyi*	360	360	1
Small-eyed sleeper	*Prionobutis microps*	64	62	2
Golden goby	*Glossogobius aureus*	161	92	4
Giant glassfish	*Parambassis gulliveri*	110	92	2
Crimson-tipped flathead gudgeon	*Butis butis*	202	65	3
Diamond mullet	*Liza alata*	240	192	4
Spotted scat	*Scatophagus argus*	70	70	1
Small-mouthed catfish	*Cinetodus froggatti*	435	105	3
Forktailed catfish	*Arius graeffei*	132	111	2
Carpentaria catfish	*Arius paucus*	515	515	1

Plate 19 Bynoe River upstream of the Burke and Wills monument. Some bank erosion, but possibly a natural phenomenon.

Flinders River at Burketown Crossing

Summary and habitat data

Summary	
Date	13-Aug-2004
Catchment	Flinders
Stream	Flinders River
Site	Burketown Crossing
Lat	17 52.564
Long	140 46.869
AHD (m)	5
Length (m)	5500
Width (ave)	120
Depth (max)	3.40
Depth (ave)	0.90
Area (ha)	66.000
Volume (ML)	594.000
Time	9:20
Fishing Time	2:40
O_2 % sat	89.0
O_2	8.34
Cond	3370.0
pH	8.73
Temp	18.3
Secchi	0.95
Colour	light green
Weather	fine
Classification	
Prawn abundance	8
Barra abundance	**4**
Species N°	**16**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
Salinity 1.78ppt
1st place seen rubber vine
plenty of crocs
very shallow
millions of prawns
a few redclaw as well

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	85
Offstream Lagoon		Rocks	10
Instream Billabong	100	Rock wall	10
Instream Pool (flowing)		Branches (sml snag)	20
Backwater		Logs (snag)	25
Anabranch		Log Jam (lge snag)	20
Gentle flow		Overhanging veg	20
Glide (mod/deep)		Roots	20
Sheet (slow/shallow)		Undercut bank	10
Riffle(fast/shallow)		Submerged veg	25
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	10
Width (m)	50	Urban rubbish	
Trees	75	Para grass	
Native Shrubs	15	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs	50	**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	10	Weir	
Geomorphology		Road	
Ave Right bank slope	45	Bridge	
Ave Left bank slope	20	Ford	
> 4000 Bedrock	25	Causeway	10
250 - 4000 Boulders	20	Sand/gravel extract	
50 - 250 Cobble	10	Bank erosion	
5 - 50 Gravel	10	Catchment erosion	
0.125 - 5 Sand	85	Siltation	
Soft Silt	10	Cattle access	80
Solid Mud		Feral pigs	20
Silt cover		Pump inlet	10
		Drain outlet	
		Urban rubbish	20
		Campsite	10
		Picnic area	

Fish data

Fish at Burketown Crossing in the Flinders River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	518	250	4
Bony bream	*Nematolosa erebi*	397	25	7
Gulf grunter	*Scortum ogilbyi*	330	283	2
Sleepy cod	*Oxyeleotris lineolata*	366	63	7
Mouth almighty	*Glossamia aprion*	130	40	6
Papuan river sprat	*Clupeoides cf. papuensis*	25	19	6
Freshwater sole	*Brachirus selheimi*	90	77	7
Small-eyed sleeper	*Prionobutis microps*	116	77	3
Archerfish	*Toxotes chatareus*	110	50	1
Speckled goby	*Redigobius bikolanus*	50	50	2
Toothless catfish	*Anodontiglanis dahli*	450	450	4
Black catfish	*Neosilurus ater*	440	440	1
Diamond mullet	*Liza alata*	265	260	1
Crimson-tipped flathead gudgeon	*Butis butis*	75	75	1
Golden goby	*Glossogobius aureus*	132	98	2
new (?) goby	*Pseudogobius sp.*	60	60	1

Plate 20 Flinders River impounded by the Burketown crossing causeway.

Leichhardt Catchment Data

East Leichhardt River below dam

Summary and habitat data

Summary	
Date	25-Jul-2004
Catchment	Leichhardt
Stream	East Leichhardt River
Site	1st hole below dam wall
Lat	20 47.119
Long	139 47.622
AHD (m)	353
Length (m)	80
Width (ave)	30
Depth (max)	4.00
Depth (ave)	1.20
Area (ha)	0.240
Volume (ML)	2.880
Time	9:00
Fishing Time	0:40
O_2 % sat	103.0
O_2	10.97
Cond	419.0
pH	7.49
Temp	14.4
Secchi	1.50
Colour	Olive
Weather	Fine
Classification	
Prawn abundance	3
Barra abundance	**0**
Species N°	**9**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
rubbish bad
possible sooty spawning area during flows

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	80
Offstream Lagoon		Rocks	30
Instream Billabong		Rock wall	75
Instream Pool (flowing)	100	Branches (sml snag)	
Backwater		Logs (snag)	
Anabranch		Log Jam (lge snag)	
Gentle flow		Overhanging veg	
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	100
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	0	Urban rubbish	
Trees		Para grass	
Native Shrubs		Hymenachne	
Grass	1	Hyacynth	
Rushes & Sedges		Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	100
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	88	Bridge	
Ave Left bank slope	88	Ford	
> 4000 Bedrock	98	Causeway	
250 - 4000 Boulders	40	Sand/gravel extract	
50 - 250 Cobble	10	Bank erosion	
5 - 50 Gravel		Catchment erosion	20
0.125 - 5 Sand		Siltation	
Soft Silt		Cattle access	
Solid Mud		Feral pigs	
Silt cover	95	Pump inlet	
		Drain outlet	
		Urban rubbish	30
		Campsite	
		Picnic area	

Fish data

Fish at 1st hole below dam wall in the East Leichhardt River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	157	94	4
Eastern rainbowfish	*Melanotaenia splendida*	81	68	5
Sooty grunter	*Hephaestus fuliginosus*	349	349	2
Black catfish	*Neosilurus ater*	456	428	2
Hyrtl's tandan	*Neosilurus hyrtlii*	215	112	2
Banded grunter	*Amniataba percoides*	136	39	7
Spangled perch	*Leiopotherapon unicolor*	193	61	5
Long tom	*Strongylura krefftii*	400	400	2
Archerfish	*Toxotes chatareus*	220	80	2

Plate 21 First waterhole below the dam on the East Leichhardt River. Basically a rock pool.

Leichhardt River behind the Julius Dam wall

Summary and habitat data

Summary	
Date	28-Jul-2004
Catchment	Leichhardt
Stream	Leichhardt River
Site	behind Julius Dam wall
Lat	20 07.798
Long	139 43.366
AHD (m)	209
Length (m)	300
Width (ave)	30
Depth (max)	1.50
Depth (ave)	0.50
Area (ha)	0.900
Volume (ML)	4.500
Time	9:00
Fishing Time	1:00
O_2 % sat	125.0
O_2	11.70
Cond	320.0
pH	9.24
Temp	19.6
Secchi	0.30
Colour	dark green
Weather	fine
Classification	
Prawn abundance	2
Barra abundance	**1**
Species N°	**13**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
catfish skin and bone, starving
all small fish eaten out
no rainbows etc

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	50
Offstream Lagoon		Rocks	50
Instream Billabong		Rock wall	
Instream Pool (flowing)		Branches (sml snag)	
Backwater		Logs (snag)	
Anabranch		Log Jam (lge snag)	
Gentle flow		Overhanging veg	
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool	100	Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	75	Standing timber	
Riparian Zone		Constructions	
Width (m)	0	Urban rubbish	
Trees		Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	100
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	10	Bridge	
Ave Left bank slope	10	Ford	
> 4000 Bedrock	95	Causeway	
250 - 4000 Boulders	10	Sand/gravel extract	
50 - 250 Cobble	1	Bank erosion	
5 - 50 Gravel		Catchment erosion	
0.125 - 5 Sand		Siltation	
Soft Silt		Cattle access	
Solid Mud		Feral pigs	
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	

Fish data

Fish behind Julius Dam wall in the Leichhardt River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	1120	1120	1
Bony bream	*Nematolosa erebi*	260	175	5
Banded grunter	*Amniataba percoides*	111	72	5
Forktailed catfish	*Arius graeffei*	215	154	8
Long tom	*Strongylura krefftii*	750	200	7
Mouth almighty	*Glossamia aprion*	221	171	4
Striped sleepy cod	*Oxyeleotris selheimi*	450	430	3
Sleepy cod	*Oxyeleotris lineolata*	445	445	1
Sooty grunter	*Hephaestus fuliginosus*	462	242	2
Gulf grunter	*Scortum ogilbyi*	241	196	2
Toothless catfish	*Anodontiglanis dahli*	268	245	2
Archerfish	*Toxotes chatareus*	196	146	2
Carpentaria catfish	*Arius paucus*	765	475	5

Plate 22 Waterhole below Lake Julius dam wall. Note the algal bloom (green water).

Leichhardt River at Rocky Bar

Summary and habitat data

Summary	
Date	27-Jul-2004
Catchment	Leichhardt
Stream	Leichhardt River
Site	Rocky Bar
Lat	20 04.334
Long	139 56.588
AHD (m)	162
Length (m)	2400
Width (ave)	70
Depth (max)	4.40
Depth (ave)	1.60
Area (ha)	16.800
Volume (ML)	268.800
Time	16:45
Fishing Time	1:00
O_2 % sat	119.0
O_2	11.80
Cond	280.0
pH	8.09
Temp	17.0
Secchi	0.50
Colour	brown
Weather	fine
Classification	
Prawn abundance	7
Barra abundance	**3**
Species N°	**13**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
big barra eating out sooties, catfish
interesting no barra downstream of this site
likely sooty grunter spawning area
between here and Julius dam wall

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	90
Offstream Lagoon		Rocks	20
Instream Billabong	100	Rock wall	10
Instream Pool (flowing)		Branches (sml snag)	30
Backwater		Logs (snag)	10
Anabranch		Log Jam (lge snag)	60
Gentle flow		Overhanging veg	
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	150	Urban rubbish	
Trees	80	Para grass	
Native Shrubs	50	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	15	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	10	Weir	
Geomorphology		Road	
Ave Right bank slope	20	Bridge	
Ave Left bank slope	30	Ford	
> 4000 Bedrock		Causeway	20
250 - 4000 Boulders	10	Sand/gravel extract	
50 - 250 Cobble	80	Bank erosion	10
5 - 50 Gravel	40	Catchment erosion	25
0.125 - 5 Sand	10	Siltation	
Soft Silt		Cattle access	20
Solid Mud		Feral pigs	
Silt cover		Pump inlet	1
		Drain outlet	
		Urban rubbish	1
		Campsite	
		Picnic area	

Fish data

Fish at Rocky Bar in the Leichhardt River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	1100	1090	3
Bony bream	*Nematolosa erebi*	261	32	8
Eastern rainbowfish	*Melanotaenia splendida*	105	66	7
Sleepy cod	*Oxyeleotris lineolata*	265	139	6
Mouth almighty	*Glossamia aprion*	186	70	5
Spangled perch	*Leiopotherapon unicolor*	128	55	4
Striped sleepy cod	*Oxyeleotris selheimi*	315	315	1
Archerfish	*Toxotes chatareus*	104	76	3
Reticulated glassfish	*Ambassis macleayi*	88	47	8
Gulf grunter	*Scortum ogilbyi*	265	265	1
Long tom	*Strongylura krefftii*	275	200	4
Banded grunter	*Amniataba percoides*	89	50	3
Sooty grunter	*Hephaestus fuliginosus*	87	87	1
Notes:				
lots of big barra up top end, possibly eating out catfish				

Plate 23 Rocky Bar Waterhole in the Leichhardt River. Escaped Lake Julius barra present. This waterhole is at the end of a steeper, rocky section of river channel, so is the first “resting” pool.

Gunpowder Creek at Alsace Waterhole

Summary and habitat data

Summary	
Date	29-Jul-2004
Catchment	Leichhardt
Stream	Gunpowder Creek
Site	Alsace Waterhole
Lat	19 23.837
Long	139 38.037
AHD (m)	105
Length (m)	1800
Width (ave)	80
Depth (max)	9.50
Depth (ave)	1.50
Area (ha)	14.400
Volume (ML)	216.000
Time	12:00
Fishing Time	1:00
O_2 % sat	105.0
O_2	9.21
Cond	151.9
pH	7.79
Temp	20.5
Secchi	0.88
Colour	olive
Weather	fine
Classification	
Prawn abundance	6
Barra abundance	**0**
Species N°	**13**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
steep gorge, fish at top end

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	90
Offstream Lagoon		Rocks	30
Instream Billabong	100	Rock wall	30
Instream Pool (flowing)		Branches (sml snag)	20
Backwater		Logs (snag)	30
Anabranch		Log Jam (lge snag)	30
Gentle flow		Overhanging veg	30
Glide (mod/deep)		Roots	50
Sheet (slow/shallow)		Undercut bank	20
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	10
Impoundment		Rock & vegetation	10
Tidal		Snag & vegetation	
Permanency		Standing timber	
Riparian Zone		Constructions	
Width (m)	15	Urban rubbish	
Trees	70	Para grass	
Native Shrubs	15	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs	35	**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	75	Bridge	
Ave Left bank slope	80	Ford	
> 4000 Bedrock	50	Causeway	
250 - 4000 Boulders	20	Sand/gravel extract	
50 - 250 Cobble	20	Bank erosion	
5 - 50 Gravel	10	Catchment erosion	20
0.125 - 5 Sand		Siltation	
Soft Silt		Cattle access	50
Solid Mud		Feral pigs	20
Silt cover		Pump inlet	10
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	

Fish data

Fish at Alsace Waterhole in Gunpowder Creek		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	180	28	8
Eastern rainbowfish	*Melanotaenia splendida*	106	46	7
Spangled perch	*Leiopotherapon unicolor*	161	62	6
Sleepy cod	*Oxyeleotris lineolata*	295	52	7
Reticulated glassfish	*Ambassis macleayi*	92	37	7
Long tom	*Strongylura krefftii*	620	224	4
Archerfish	*Toxotes chatareus*	195	69	5
Sooty grunter	*Hephaestus fuliginosus*	320	220	3
Gulf grunter	*Scortum ogilbyi*	263	263	1
Mouth almighty	*Glossamia aprion*	216	40	7
Golden goby	*Glossogobius aureus*	84	49	6
Banded grunter	*Amniataba percoides*	111	43	7
Forktailed catfish	*Arius graeffei*	284	140	5

Plate 24 Alsace Waterhole in Gunpowder Creek. Note the rocky gorge upstream. Up to 9.5 metres deep, with good water quality throughout the water column.

Gunpowder Creek at Flying Fox Hole

Summary and habitat data

Summary	
Date	28-Jul-2004
Catchment	Leichhardt
Stream	Gunpowder Creek
Site	Flying Fox Hole
Lat	19 20.946
Long	139 46.491
AHD (m)	101
Length (m)	1200
Width (ave)	60
Depth (max)	6.10
Depth (ave)	2.20
Area (ha)	7.200
Volume (ML)	158.400
Time	16:15
Fishing Time	1:00
O_2 % sat	128.0
O_2	11.30
Cond	150.8
pH	7.79
Temp	21.8
Secchi	0.80
Colour	Olive
Weather	fine
Classification	
Prawn abundance	7
Barra abundance	**0**
Species N°	**17**

At 3.0m	
O_2	
Cond	
pH	
Temp	
At 6.1m	
O_2	5.92
Cond	152.0
pH	7.41
Temp	

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	100
Offstream Lagoon		Rocks	
Instream Billabong	100	Rock wall	
Instream Pool (flowing)		Branches (sml snag)	25
Backwater		Logs (snag)	25
Anabranch		Log Jam (lge snag)	10
Gentle flow		Overhanging veg	
Glide (mod/deep)		Roots	40
Sheet (slow/shallow)		Undercut bank	20
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	10
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency		Standing timber	
Riparian Zone		Constructions	
Width (m)	80	Urban rubbish	
Trees	80	Para grass	
Native Shrubs	10	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs	20	**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	75	Bridge	
Ave Left bank slope	75	Ford	10
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble	50	Bank erosion	10
5 - 50 Gravel	20	Catchment erosion	20
0.125 - 5 Sand		Siltation	
Soft Silt	20	Cattle access	20
Solid Mud		Feral pigs	
Silt cover		Pump inlet	5
		Drain outlet	
		Urban rubbish	
		Campsite	5
		Picnic area	

Fish data

Fish at Flying Fox Hole in Gunpowder Creek		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	134	96	8
Eastern rainbowfish	*Melanotaenia splendida*	80	38	7
Reticulated glassfish	*Ambassis macleayi*	121	31	7
Sleepy cod	*Oxyeleotris lineolata*	415	91	6
Striped sleepy cod	*Oxyeleotris selheimi*	96	93	2
Sooty grunter	*Hephaestus fuliginosus*	358	96	3
Gulf grunter	*Scortum ogilbyi*	364	364	1
Long tom	*Strongylura krefftii*	453	320	4
Mouth almighty	*Glossamia aprion*	76	24	5
Archerfish	*Toxotes chatareus*	152	33	4
Golden goby	*Glossogobius aureus*	160	91	3
Banded grunter	*Amniataba percoides*	130	43	7
Spangled perch	*Leiopotherapon unicolor*	123	46	6
Hyrtl's tandan	*Neosilurus hyrtlii*	225	225	1
Black catfish	*Neosilurus ater*	400	400	2
Forktailed catfish	*Arius graeffei*	275	220	6
Strawman	*Craterocephalus stramineus*	25	12	7
Notes:				
plenty of crocs				

Plate 25 Flying Fox Waterhole in Gunpowder Creek. Lots of crocodiles in this waterhole.

Leichhardt River at Bluey's Waterhole

Summary and habitat data

Summary	
Date	29-Jul-2004
Catchment	Leichhardt
Stream	Leichhardt River
Site	Bluey's Waterhole
Lat	19 14.054
Long	139 59.045
AHD (m)	70
Length (m)	1200
Width (ave)	45
Depth (max)	3.80
Depth (ave)	1.20
Area (ha)	5.400
Volume (ML)	64.800
Time	16:15
Fishing Time	1:00
O_2 % sat	127.0
O_2	11.20
Cond	625.0
pH	8.12
Temp	21.7
Secchi	0.88
Colour	olive green
Weather	fine
Classification	
Prawn abundance	7
Barra abundance	**0**
Species N°	**13**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
lots of crocs from 45cm

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	90
Offstream Lagoon		Rocks	20
Instream Billabong	100	Rock wall	
Instream Pool (flowing)		Branches (sml snag)	30
Backwater		Logs (snag)	40
Anabranch		Log Jam (lge snag)	40
Gentle flow		Overhanging veg	40
Glide (mod/deep)		Roots	40
Sheet (slow/shallow)		Undercut bank	10
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	95	Standing timber	
Riparian Zone		Constructions	
Width (m)	50	Urban rubbish	
Trees	80	Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	5	Pistia	
Exotic shrubs, burrs	70	**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	70	Bridge	
Ave Left bank slope	60	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble	20	Bank erosion	25
5 - 50 Gravel	30	Catchment erosion	25
0.125 - 5 Sand	20	Siltation	
Soft Silt	20	Cattle access	50
Solid Mud	10	Feral pigs	20
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	

Fish data

Fish at Bluey's Waterhole in the Leichhardt River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	292	40	8
Eastern rainbowfish	*Melanotaenia splendida*	76	61	6
Reticulated glassfish	*Ambassis macleayi*	72	40	6
Sleepy cod	*Oxyeleotris lineolata*	315	66	7
Banded grunter	*Amniataba percoides*	111	54	7
Sooty grunter	*Hephaestus fuliginosus*	337	75	4
Freshwater anchovy	*Thryssa scratchleyi*	227	165	4
Mouth almighty	*Glossamia aprion*	205	134	6
Spangled perch	*Leiopotherapon unicolor*	121	73	6
Archerfish	*Toxotes chatareus*	149	56	4
Forktailed catfish	*Arius graeffei*	231	231	1
Giant glassfish	*Parambassis gulliveri*	261	261	1
Square-blotched goby	*Glossogobius sp. C*	117	32	4

Plate 26 Bluey's Waterhole In the Leichhardt River. Great riparian vegetation and stable banks.

Alexandra River at Abdy's Waterhole

Summary and habitat data

Summary	
Date	30-Jul-2004
Catchment	Leichhardt
Stream	Alexandra River
Site	Abdy's Waterhole
Lat	18 14.993
Long	139 56.226
AHD (m)	26
Length (m)	3800
Width (ave)	75
Depth (max)	18.20
Depth (ave)	3.50
Area (ha)	28.500
Volume (ML)	997.500
Time	15:00
Fishing Time	2:00
O_2 % sat	93.0
O_2	8.40
Cond	76.6
pH	7.49
Temp	20.2
Secchi	0.28
Colour	cream coffee
Weather	fine
Classification	
Prawn abundance	8
Barra abundance	**6**
Species N°	**13**

At 5.5m	
O_2	6.83
Cond	76.7
pH	7.42
Temp	18.0

Comments:
plenty of big crocs
several rock bars

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	80
Offstream Lagoon		Rocks	25
Instream Billabong	95	Rock wall	10
Instream Pool (flowing)		Branches (sml snag)	25
Backwater	5	Logs (snag)	25
Anabranch		Log Jam (lge snag)	25
Gentle flow		Overhanging veg	70
Glide (mod/deep)		Roots	60
Sheet (slow/shallow)		Undercut bank	20
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	1
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	25	Urban rubbish	
Trees	90	Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	5	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	75	Bridge	
Ave Left bank slope	80	Ford	
> 4000 Bedrock	10	Causeway	
250 - 4000 Boulders	10	Sand/gravel extract	
50 - 250 Cobble	10	Bank erosion	20
5 - 50 Gravel	10	Catchment erosion	30
0.125 - 5 Sand	10	Siltation	
Soft Silt	80	Cattle access	30
Solid Mud		Feral pigs	
Silt cover		Pump inlet	10
		Drain outlet	
		Urban rubbish	
		Campsite	10
		Picnic area	

Fish data

Fish at Abdy's Waterhole in the Alexandra River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	945	475	6
Bony bream	*Nematolosa erebi*	334	58	6
Eastern rainbowfish	*Melanotaenia splendida*	66	42	4
Giant glassfish	*Parambassis gulliveri*	300	44	8
Elongate glassfish	*Ambassis elongatus*	44	28	2
Sleepy cod	*Oxyeleotris lineolata*	364	48	5
Mouth almighty	*Glossamia aprion*	159	132	5
Freshwater anchovy	*Thryssa scratchleyi*	256	45	8
Archerfish	*Toxotes chatareus*	105	37	5
Gulf grunter	*Scortum ogilbyi*	395	360	4
Forktailed catfish	*Arius graeffei*	268	245	5
Square-blotched goby	*Glossogobius sp. C*	56	56	1
Carpentaria catfish	*Arius paucus*	850	450	3

Plate 27 Abdy's Waterhole in the Alexandra River. Barramundi and large crocodiles were plentiful.

Alexandra River at the Washpool

Summary and habitat data

Summary	
Date	31-Jul-2004
Catchment	Leichhardt
Stream	Alexandra River
Site	Washpool
Lat	18 15.020
Long	139 53.851
AHD (m)	24
Length (m)	1600
Width (ave)	60
Depth (max)	3.90
Depth (ave)	1.20
Area (ha)	9.600
Volume (ML)	115.200
Time	12:30
Fishing Time	1:00
O_2 % sat	94.0
O_2	8.47
Cond	81.5
pH	7.61
Temp	20.4
Secchi	0.15
Colour	light chocolate
Weather	fine
Classification	
Prawn abundance	8
Barra abundance	**3**
Species N°	**17**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
plenty of crocs, probably salties
emergent veg musn't need light!

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	80
Offstream Lagoon		Rocks	20
Instream Billabong	100	Rock wall	20
Instream Pool (flowing)		Branches (sml snag)	
Backwater		Logs (snag)	10
Anabranch		Log Jam (lge snag)	
Gentle flow		Overhanging veg	
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	10
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	20
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency		Standing timber	
Riparian Zone		Constructions	
Width (m)	5	Urban rubbish	
Trees	25	Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	60	Weir	
Geomorphology		Road	
Ave Right bank slope	25	Bridge	
Ave Left bank slope	40	Ford	
> 4000 Bedrock	10	Causeway	
250 - 4000 Boulders	10	Sand/gravel extract	
50 - 250 Cobble	20	Bank erosion	50
5 - 50 Gravel	20	Catchment erosion	30
0.125 - 5 Sand	20	Siltation	20
Soft Silt	70	Cattle access	100
Solid Mud		Feral pigs	20
Silt cover		Pump inlet	5
		Drain outlet	
		Urban rubbish	
		Campsite	5
		Picnic area	

Fish data

Fish at the Washpool in the Alexandra River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	610	560	3
Bony bream	*Nematolosa erebi*	219	86	8
Eastern rainbowfish	*Melanotaenia splendida*	66	61	2
Sleepy cod	*Oxyeleotris lineolata*	335	38	6
Mouth almighty	*Glossamia aprion*	138	78	3
Giant glassfish	*Parambassis gulliveri*	337	60	8
Spangled perch	*Leiopotherapon unicolor*	66	66	1
Gulf grunter	*Scortum ogilbyi*	312	71	2
Archerfish	*Toxotes chatareus*	210	130	2
Freshwater anchovy	*Thryssa scratchleyi*	263	190	3
Banded grunter	*Amniataba percoides*	102	92	2
Sooty grunter	*Hephaestus fuliginosus*	137	137	1
Forktailed catfish	*Arius graeffei*	191	165	3
Berney's catfish	*Arius berneyi*	342	106	2
Elongate glassfish	*Ambassis elongatus*	44	44	1
unknown goby	*Glossogobius sp.*	63	63	2
Carpentaria catfish	*Arius paucus*	710	690	2

Plate 28 Washpool in the Alexandra River.

Leichhardt River at Floraville

Summary and habitat data

Summary	
Date	31-Jul-2004
Catchment	Leichhardt
Stream	Leichhardt River
Site	Floraville
Lat	18 14.044
Long	139 52.763
AHD (m)	17
Length (m)	10000
Width (ave)	90
Depth (max)	9.80
Depth (ave)	4.50
Area (ha)	90.000
Volume (ML)	4050.000
Time	9:00
Fishing Time	1:20
O_2 % sat	102.0
O_2	9.32
Cond	223.2
pH	7.90
Temp	19.7
Secchi	1.07
Colour	clear green
Weather	fine
Classification	
Prawn abundance	7
Barra abundance	**0**
Species N°	**15**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
erosion natural?
biggish flood this year took bark off some trees
all species low in density

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	80
Offstream Lagoon		Rocks	10
Instream Billabong	100	Rock wall	
Instream Pool (flowing)		Branches (sml snag)	20
Backwater		Logs (snag)	30
Anabranch		Log Jam (lge snag)	30
Gentle flow		Overhanging veg	30
Glide (mod/deep)		Roots	40
Sheet (slow/shallow)		Undercut bank	10
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	10
Riparian Zone		Constructions	
Width (m)	20	Urban rubbish	
Trees	75	Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	10	Pistia	
Exotic shrubs, burrs	30	**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	10
Ave Right bank slope	75	Bridge	1
Ave Left bank slope	75	Ford	
> 4000 Bedrock	5	Causeway	
250 - 4000 Boulders	5	Sand/gravel extract	
50 - 250 Cobble	2	Bank erosion	30
5 - 50 Gravel	2	Catchment erosion	30
0.125 - 5 Sand	10	Siltation	
Soft Silt	50	Cattle access	40
Solid Mud	30	Feral pigs	
Silt cover		Pump inlet	25
		Drain outlet	
		Urban rubbish	
		Campsite	20
		Picnic area	

Fish data

Fish at Floraville in the Leichhardt River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	402	105	7
Eastern rainbowfish	*Melanotaenia splendida*	85	71	3
Banded grunter	*Amniataba percoides*	56	48	2
Sleepy cod	*Oxyeleotris lineolata*	316	56	4
Mouth almighty	*Glossamia aprion*	150	121	4
Spangled perch	*Leiopotherapon unicolor*	132	61	5
unknown goby	*Glossogobius sp.*	45	45	1
Long tom	*Strongylura krefftii*	550	218	3
Archerfish	*Toxotes chatareus*	83	50	3
Gulf grunter	*Scortum ogilbyi*	397	285	3
Golden goby	*Glossogobius aureus*	123	91	4
Toothless catfish	*Anodontiglanis dahli*	425	425	1
Freshwater anchovy	*Thryssa scratchleyi*	212	212	1
Berney's catfish	*Arius berneyi*	288	288	1
Forktailed catfish	*Arius graeffei*	323	228	2

Plate 29 Leichhardt River at Floraville. This very long pool had a disappointing number of fish. We sampled just the lower 10 km. Bank slumping was evidenced by the dead trees, but the water was still very deep.

Leichhardt River below Leichhardt Falls

Summary and habitat data

Summary	
Date	31-Jul-2004
Catchment	Leichhardt
Stream	Leichhardt River
Site	Leichhardt Falls
Lat	18 12.931
Long	139 53.433
AHD (m)	6
Length (m)	3000
Width (ave)	60
Depth (max)	10.00
Depth (ave)	2.00
Area (ha)	18.000
Volume (ML)	360.000
Time	15:10
Fishing Time	2:00
O_2 % sat	119.0
O_2	10.11
Cond	352.0
pH	8.23
Temp	22.0
Secchi	0.95
Colour	lemon green
Weather	fine
Classification	
Prawn abundance	8
Barra abundance	**5**
Species N°	**18**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
would be lots more species here
if we looked further downstream
falls drown out, but interesting flow patterns
according to Ernie Camp. Water can be still,
so may be a choke downstream.
Main current often in Alexander arm.

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	80
Offstream Lagoon		Rocks	25
Instream Billabong	90	Rock wall	15
Instream Pool (flowing)		Branches (sml snag)	35
Backwater		Logs (snag)	35
Anabranch		Log Jam (lge snag)	25
Gentle flow		Overhanging veg	30
Glide (mod/deep)		Roots	30
Sheet (slow/shallow)		Undercut bank	25
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool	10	Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	25	Urban rubbish	
Trees	80	Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	20	Weir	
Geomorphology		Road	
Ave Right bank slope	80	Bridge	
Ave Left bank slope	80	Ford	
> 4000 Bedrock	10	Causeway	
250 - 4000 Boulders	20	Sand/gravel extract	
50 - 250 Cobble	20	Bank erosion	50
5 - 50 Gravel	10	Catchment erosion	
0.125 - 5 Sand	80	Siltation	50
Soft Silt	20	Cattle access	
Solid Mud		Feral pigs	
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	20
		Campsite	10
		Picnic area	10

Fish data

Fish below Leichhardt Falls in the Leichhardt River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	598	211	5
Bony bream	*Nematolosa erebi*	389	37	8
Freshwater anchovy	*Thryssa scratchleyi*	304	29	4
Sleepy cod	*Oxyeleotris lineolata*	256	36	6
Forktailed catfish	*Arius graeffei*	220	220	1
Reticulated glassfish	*Ambassis macleayi*	74	70	1
Silver biddy	*Gerres filamentosus*	125	116	5
Banded grunter	*Amniataba percoides*	105	24	6
Mouth almighty	*Glossamia aprion*	165	42	6
Archerfish	*Toxotes chatareus*	150	26	6
Square-blotched goby	*Glossogobius sp. C*	98	64	7
Golden goby	*Glossogobius aureus*	184	90	5
Berney's catfish	*Arius berneyi*	287	287	1
Snub-nosed gar	*Arrhampus sclerolepis*	150	89	4
Long tom	*Strongylura krefftii*	408	408	1
Ponyfish	*Leiognathus equulus*	87	82	3
Diamond mullet	*Liza alata*	165	150	3
Carpentaria catfish	*Arius paucus*	800	800	2

Plate 30 Leichhardt River Falls. This site also included the Alexandra River below the Alexandra Falls.

Gregory-Nicholson Catchment Data

O'Shanassy River at 10 Mile Waterhole

Summary and habitat data

Summary	
Date	19-Aug-2004
Catchment	Gregory
Stream	O'Shannassy
Site	10 Mile Waterhole
Lat	19 41.650
Long	138 27.214
AHD (m)	267
Length (m)	130
Width (ave)	25
Depth (max)	1.00
Depth (ave)	0.65
Area (ha)	0.325
Volume (ML)	2.113
Time	14:00
Fishing Time	0:15
O_2 % sat	98.0
O_2	9.19
Cond	83.2
pH	7.55
Temp	19.9
Secchi	0.35
Colour	dark tea
Weather	fine
Classification	
Prawn abundance	0
Barra abundance	**0**
Species N°	**3**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	85
Offstream Lagoon		Rocks	20
Instream Billabong	100	Rock wall	
Instream Pool (flowing)		Branches (sml snag)	65
Backwater		Logs (snag)	20
Anabranch		Log Jam (lge snag)	10
Gentle flow		Overhanging veg	40
Glide (mod/deep)		Roots	40
Sheet (slow/shallow)		Undercut bank	10
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	50
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	50	Standing timber	
Riparian Zone		Constructions	
Width (m)	50	Urban rubbish	
Trees	30	Para grass	
Native Shrubs	15	Hymenachne	
Grass	30	Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	40	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	75	Bridge	
Ave Left bank slope	40	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble	25	Bank erosion	
5 - 50 Gravel	20	Catchment erosion	
0.125 - 5 Sand		Siltation	
Soft Silt	75	Cattle access	98
Solid Mud		Feral pigs	25
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	

Fish data

Fish at 10 Mile Waterhole in the O'Shannassy		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	275	37	8
Eastern rainbowfish	*Melanotaenia splendida*	66	31	7
Spangled perch	*Leiopotherapon unicolor*	110	49	6

Plate 31 Ten Mile Waterhole in the upper reaches of the O'Shannassy. Note this water was soft, unlike the hard water further downstream.

Seymour River at the Rock Pool

Summary and habitat data

Summary	
Date	20-Aug-2004
Catchment	Gregory
Stream	Seymour
Site	Rock Pool
Lat	19 21.660
Long	139 02.866
AHD (m)	261
Length (m)	100
Width (ave)	30
Depth (max)	2.50
Depth (ave)	0.90
Area (ha)	0.300
Volume (ML)	2.700
Time	9:30
Fishing Time	0:25
O_2 % sat	83.0
O_2	8.40
Cond	90.0
pH	7.22
Temp	16.2
Secchi	0.65
Colour	tan
Weather	fine
Classification	
Prawn abundance	4
Barra abundance	**0**
Species N°	**6**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
plenty of water lillies sprouting
rainbows nearly outnumber bonies

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	80
Offstream Lagoon		Rocks	20
Instream Billabong	100	Rock wall	40
Instream Pool (flowing)		Branches (sml snag)	10
Backwater		Logs (snag)	10
Anabranch		Log Jam (lge snag)	
Gentle flow		Overhanging veg	10
Glide (mod/deep)		Roots	10
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	20
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	10
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	25	Urban rubbish	
Trees	30	Para grass	
Native Shrubs	15	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	40	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	25	Weir	
Geomorphology		Road	
Ave Right bank slope	85	Bridge	
Ave Left bank slope	60	Ford	
> 4000 Bedrock	70	Causeway	
250 - 4000 Boulders	50	Sand/gravel extract	
50 - 250 Cobble	40	Bank erosion	10
5 - 50 Gravel	40	Catchment erosion	30
0.125 - 5 Sand	25	Siltation	
Soft Silt	10	Cattle access	75
Solid Mud		Feral pigs	75
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	10
		Picnic area	

Fish data

Fish at Rock Pool in the Seymour		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	254	73	8
Eastern rainbowfish	*Melanotaenia splendida*	90	28	8
Striped sleepy cod	*Oxyeleotris selheimi*	331	126	4
Sooty grunter	*Hephaestus fuliginosus*	308	50	3
Spangled perch	*Leiopotherapon unicolor*	180	44	6
Sleepy cod	*Oxyeleotris lineolata*	401	122	4

Plate 32 Rock pool in the upper Seymour River, a tributary of the O'Shannassy River, looking upstream. Sooty grunters probably spawn during flows in the gorge above this pool.

Seymour River at the Middle Pool

Summary and habitat data

Summary	
Date	19-Aug-2004
Catchment	Gregory
Stream	Seymour River
Site	Middle Pool
Lat	19 20.572
Long	139 01.498
AHD (m)	228
Length (m)	100
Width (ave)	35
Depth (max)	3.40
Depth (ave)	0.80
Area (ha)	0.350
Volume (ML)	2.800
Time	17:30
Fishing Time	0:20
O_2 % sat	117.0
O_2	10.75
Cond	76.2
pH	7.81
Temp	20.5
Secchi	0.38
Colour	dark tan
Weather	fine
Classification	
Prawn abundance	0
Barra abundance	**0**
Species N°	**4**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	85
Offstream Lagoon		Rocks	40
Instream Billabong	100	Rock wall	30
Instream Pool (flowing)		Branches (sml snag)	15
Backwater		Logs (snag)	20
Anabranch		Log Jam (lge snag)	10
Gentle flow		Overhanging veg	10
Glide (mod/deep)		Roots	15
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	30	Urban rubbish	
Trees	20	Para grass	
Native Shrubs	10	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	70	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	75	Bridge	
Ave Left bank slope	65	Ford	
> 4000 Bedrock	20	Causeway	
250 - 4000 Boulders	20	Sand/gravel extract	
50 - 250 Cobble	20	Bank erosion	
5 - 50 Gravel	10	Catchment erosion	10
0.125 - 5 Sand	60	Siltation	
Soft Silt	40	Cattle access	70
Solid Mud		Feral pigs	10
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	

Fish data

Fish at Middle Pool in the Seymour River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	250	19	8
Eastern rainbowfish	*Melanotaenia splendida*	92	66	8
Banded grunter	*Amniataba percoides*	155	134	2
Spangled perch	*Leiopotherapon unicolor*	159	64	4
Notes:				
millions of bony bream larvae				

Plate 33 Middle Pool in the Seymour River.

O'Shanassy River at Riversleigh

Summary and habitat data

Summary	
Date	20-Aug-2004
Catchment	Gregory
Stream	O'Shannassy
Site	Riversleigh
Lat	19 04.432
Long	138 46.117
AHD (m)	148
Length (m)	4900
Width (ave)	60
Depth (max)	5.00
Depth (ave)	2.80
Area (ha)	29.400
Volume (ML)	823.200
Time	13:15
Fishing Time	2:15
O_2 % sat	103.0
O_2	9.08
Cond	753.0
pH	8.06
Temp	22.2
Secchi	1.20
Colour	light green
Weather	fine
Classification	
Prawn abundance	5
Barra abundance	**2**
Species N°	**22**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
unsure of *neili* id only one caught
hardyheads look different, sent to museum

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	90
Offstream Lagoon		Rocks	30
Instream Billabong		Rock wall	
Instream Pool (flowing)	100	Branches (sml snag)	30
Backwater		Logs (snag)	30
Anabranch		Log Jam (lge snag)	20
Gentle flow		Overhanging veg	70
Glide (mod/deep)		Roots	70
Sheet (slow/shallow)		Undercut bank	70
Riffle(fast/shallow)		Submerged veg	20
Rapid (white water)		Floating veg	
Cascade		Emergent veg	30
Waterfall pool		Algae	10
Drain		Leaf Litter	10
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	60	Urban rubbish	
Trees	80	Para grass	
Native Shrubs	30	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	10	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology	20	Road	
Ave Right bank slope	30	Bridge	
Ave Left bank slope	25	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders	30	Sand/gravel extract	
50 - 250 Cobble	35	Bank erosion	10
5 - 50 Gravel	40	Catchment erosion	30
0.125 - 5 Sand	40	Siltation	
Soft Silt		Cattle access	70
Solid Mud		Feral pigs	50
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	20
		Campsite	20
		Picnic area	

Fish data

Fish at Riversleigh in the O'Shannassy		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	920	800	2
Bony bream	*Nematolosa erebi*	310	150	8
Eastern rainbowfish	*Melanotaenia splendida*	85	45	6
Fly-specked hardyhead	*Craterocephalus stercusmuscarum*	46	46	1
Mouth almighty	*Glossamia aprion*	160	30	7
Reticulated glassfish	*Ambassis macleayi*	95	30	7
Banded grunter	*Amniataba percoides*	135	96	6
Sleepy cod	*Oxyeleotris lineolata*	361	65	6
Mariana's hardyhead	*Craterocephalus marianae*	50	40	3
Sooty grunter	*Hephaestus fuliginosus*	291	129	4
Archerfish	*Toxotes chatareus*	192	33	6
Berney's catfish	*Arius berneyi*	640	407	3
Long tom	*Strongylura krefftii*	621	373	3
Black catfish	*Neosilurus ater*	396	396	1
Gulf grunter	*Scortum ogilbyi*	330	327	2
Spangled perch	*Leiopotherapon unicolor*	150	90	2
Golden goby	*Glossogobius aureus*	113	111	2
Square-blotched goby	*Glossogobius sp. C*	50	40	2
Neil's grunter	*Scortum neili*	305	305	1
Strawman	*Craterocephalus stramineus*	42	20	8
Coal grunter	*Hephaestus carbo*			O'K, LTMP
Saratoga	*Scleropages jardinii*			O'K
Notes:				
O'K = recorded previously by Cheryl O'Keefe, 1990				
LTMP = recorded by the Long Term Monitoring Program, 2002				

Plate 34 O'Shannassy River near Riversleigh Station.

Plate 35 O'Shannassy River with good bankside cover and interesting rock formations.

Gregory River at the Pear Tree (reach 3)

Summary and habitat data

Summary	
Date	21-Aug-2004
Catchment	Gregory
Stream	Gregory River
Site	Pear Tree (reach 3)
Lat	18 51.260
Long	139 06.037
AHD (m)	84
Length (m)	2000
Width (ave)	70
Depth (max)	6.50
Depth (ave)	3.80
Area (ha)	14.000
Volume (ML)	532.000
Time	9:15
Fishing Time	2:15
O_2 % sat	118.0
O_2	10.75
Cond	602.0
pH	8.33
Temp	19.8
Secchi	3.10
Colour	clear green
Weather	fine
Classification	
Prawn abundance	5
Barra abundance	**3**
Species N°	**17**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
slumping natural

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	90
Offstream Lagoon		Rocks	30
Instream Billabong		Rock wall	10
Instream Pool (flowing)	90	Branches (sml snag)	75
Backwater		Logs (snag)	40
Anabranch		Log Jam (lge snag)	40
Gentle flow	20	Overhanging veg	90
Glide (mod/deep)	10	Roots	70
Sheet (slow/shallow)		Undercut bank	80
Riffle(fast/shallow)	15	Submerged veg	80
Rapid (white water)		Floating veg	
Cascade		Emergent veg	20
Waterfall pool		Algae	70
Drain		Leaf Litter	70
Impoundment		Rock & vegetation	20
Tidal		Snag & vegetation	20
Permanency	100	Standing timber	30
Riparian Zone		Constructions	
Width (m)	50	Urban rubbish	
Trees	80	Para grass	
Native Shrubs	30	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	10	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology	20	Road	
Ave Right bank slope	20	Bridge	
Ave Left bank slope	25	Ford	
> 4000 Bedrock	15	Causeway	
250 - 4000 Boulders	20	Sand/gravel extract	
50 - 250 Cobble	30	Bank erosion	20
5 - 50 Gravel	40	Catchment erosion	40
0.125 - 5 Sand	40	Siltation	
Soft Silt	10	Cattle access	40
Solid Mud		Feral pigs	10
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	30
		Campsite	30
		Picnic area	

Fish data

Fish at Pear Tree (reach 3) in the Gregory River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	743	726	3
Bony bream	*Nematolosa erebi*	320	275	6
Eastern rainbowfish	*Melanotaenia splendida*	86	24	6
Fly-specked hardyhead	*Craterocephalus stercusmuscarum*	54	44	5
Sleepy cod	*Oxyeleotris lineolata*	470	71	7
Mouth almighty	*Glossamia aprion*	133	30	7
Spangled perch	*Leiopotherapon unicolor*	88	85	2
Sooty grunter	*Hephaestus fuliginosus*	365	78	3
Golden goby	*Glossogobius aureus*	148	61	5
Banded grunter	*Amniataba percoides*	118	35	6
Reticulated glassfish	*Ambassis macleayi*	66	53	3
Archerfish	*Toxotes chatareus*	120	85	2
Striped sleepy cod	*Oxyeleotris selheimi*	393	393	1
Long tom	*Strongylura krefftii*	460	460	1
unknown goby	*Glossogobius sp.*	40	31	3
Black catfish	*Neosilurus ater*	440	372	2
Strawman	*Craterocephalus stramineus*	41	20	8

Plate 36 Riffle inflow at the top of Pear Tree Waterhole in the Gregory River. This site was also sampled by the LTMP.

Gregory River at Lake Corinda

Summary and habitat data

Summary	
Date	24-Aug-2004
Catchment	Gregory
Stream	Gregory River
Site	Lake Corinda
Lat	18 06.267
Long	139 04.769
AHD (m)	31
Length (m)	1100
Width (ave)	120
Depth (max)	5.20
Depth (ave)	3.80
Area (ha)	13.200
Volume (ML)	501.600
Time	8:45
Fishing Time	1:45
O_2 % sat	120.0
O_2	10.78
Cond	461.0
pH	9.20
Temp	20.5
Secchi	1.70
Colour	clear green
Weather	fine
Classification	
Prawn abundance	6
Barra abundance	**5**
Species N°	**18**

At 3.0m	
O_2	8.27
Cond	469.0
pH	8.43
Temp	20.1

Comments:
very slow flowing
extensive broad leaf valisneria beds
3 size classes barra: 500 700 850
invaluable lagoon
needs some form of protection

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	70
Offstream Lagoon		Rocks	
Instream Billabong		Rock wall	
Instream Pool (flowing)	100	Branches (sml snag)	20
Backwater		Logs (snag)	15
Anabranch		Log Jam (lge snag)	
Gentle flow		Overhanging veg	20
Glide (mod/deep)		Roots	15
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	40
Rapid (white water)		Floating veg	10
Cascade		Emergent veg	40
Waterfall pool		Algae	40
Drain		Leaf Litter	15
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	10
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	15	Urban rubbish	
Trees	50	Para grass	
Native Shrubs	20	Hymenachne	
Grass	15	Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	20	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	20	Bridge	
Ave Left bank slope	25	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble		Bank erosion	10
5 - 50 Gravel		Catchment erosion	10
0.125 - 5 Sand	10	Siltation	
Soft Silt	90	Cattle access	75
Solid Mud	10	Feral pigs	20
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	15
		Campsite	15
		Picnic area	

Fish data

Fish at Lake Corinda in the Gregory River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	852	395	5
Bony bream	*Nematolosa erebi*	351	310	5
Eastern rainbowfish	*Melanotaenia splendida*	68	50	2
Fly-specked hardyhead	*Craterocephalus stercusmuscarum*	96	15	8
Reticulated glassfish	*Ambassis macleayi*	85	52	7
Striped sleepy cod	*Oxyeleotris selheimi*	485	215	7
Banded grunter	*Amniataba percoides*	151	72	4
Spangled perch	*Leiopotherapon unicolor*	125	90	4
Berney's catfish	*Arius berneyi*	525	485	2
Long tom	*Strongylura krefftii*	470	302	4
Gulf grunter	*Scortum ogilbyi*	345	210	4
Sleepy cod	*Oxyeleotris lineolata*	390	161	5
Mouth almighty	*Glossamia aprion*	150	95	6
unknown goby	*Glossogobius sp.*	36	36	1
Elongate glassfish	*Ambassis elongatus*	50	46	2
Freshwater anchovy	*Thryssa scratchleyi*	313	295	2
Giant glassfish	*Parambassis gulliveri*	325	325	1
Archerfish	*Toxotes chatareus*	125	51	3

Plate 37 Lake Corinda in the Gregory River. Very large areas of weed beds have created a major fish habitat in this region of the floodplain.

Gregory floodway at Pandanus Waterhole

Summary and habitat data

Summary	
Date	23-Aug-2004
Catchment	Nicholson
Stream	Gregory floodway
Site	Pandanus Waterhole
Lat	18 01.545
Long	139 02.970
AHD (m)	28
Length (m)	150
Width (ave)	60
Depth (max)	1.40
Depth (ave)	0.70
Area (ha)	0.900
Volume (ML)	6.300
Time	13:00
Fishing Time	0:20
O_2 % sat	79.0
O_2	7.25
Cond	33.0
pH	6.35
Temp	19.5
Secchi	0.06
Colour	light chocolate
Weather	fine
Classification	
Prawn abundance	0
Barra abundance	**0**
Species N°	**5**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
no one fishes here
very soft water (mainly rainwater?)
may not connect often
no bony bream
very dirty water
may be dozing it out in dry season?

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	85
Offstream Lagoon	100	Rocks	
Instream Billabong		Rock wall	
Instream Pool (flowing)		Branches (sml snag)	10
Backwater		Logs (snag)	15
Anabranch		Log Jam (lge snag)	
Gentle flow		Overhanging veg	10
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	25
Waterfall pool		Algae	10
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	95	Standing timber	
Riparian Zone		Constructions	
Width (m)	20	Urban rubbish	
Trees	45	Para grass	
Native Shrubs	15	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	10	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	15	Bridge	
Ave Left bank slope	0.15	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble		Bank erosion	
5 - 50 Gravel		Catchment erosion	
0.125 - 5 Sand		Siltation	
Soft Silt	100	Cattle access	100
Solid Mud		Feral pigs	25
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	

Fish data

Fish at Pandanus Waterhole in the Gregory floodway		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Eastern rainbowfish	*Melanotaenia splendida*	64	20	8
Striped sleepy cod	*Oxyeleotris selheimi*	395	36	6
Spangled perch	*Leiopotherapon unicolor*	185	65	6
Northwest glassfish	*Ambassis sp.*	46	30	8
Hyrtl's tandan	*Neosilurus hyrtlii*	120	105	4
Notes:				
millions of very small ambassids				

Plate 38 Pandanus Waterhole. Very turbid, soft water which is uncommon in the Gregory River catchment. Possibly filled by rainfall, with rare connection to streams.

Beames Brook at Brookdale

Summary and habitat data

Summary	
Date	24-Aug-2004
Catchment	Gregory
Stream	Beames Brook
Site	Brookdale
Lat	18 03.641
Long	139 15.876
AHD (m)	22
Length (m)	50
Width (ave)	8
Depth (max)	2.70
Depth (ave)	1.50
Area (ha)	0.040
Volume (ML)	0.600
Time	15:15
Fishing Time	0:20
O_2 % sat	116.0
O_2	10.82
Cond	573.0
pH	8.53
Temp	18.7
Secchi	1.70
Colour	green
Weather	fine
Classification	
Prawn abundance	4
Barra abundance	**0**
Species N°	**9**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
close to main road
heavily fished
very difficult navigation
plenty of redclaw
not a lot else fishwise
lots of palm fronds on ground
lots of rubbish

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	60
Offstream Lagoon		Rocks	
Instream Billabong		Rock wall	
Instream Pool (flowing)		Branches (sml snag)	50
Backwater		Logs (snag)	35
Anabranch		Log Jam (lge snag)	10
Gentle flow	100	Overhanging veg	85
Glide (mod/deep)	80	Roots	20
Sheet (slow/shallow)		Undercut bank	20
Riffle(fast/shallow)		Submerged veg	85
Rapid (white water)		Floating veg	35
Cascade		Emergent veg	70
Waterfall pool		Algae	50
Drain		Leaf Litter	50
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	25
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	20	Urban rubbish	
Trees	90	Para grass	
Native Shrubs	15	Hymenachne	
Grass	15	Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	10	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	25
Ave Right bank slope	30	Bridge	
Ave Left bank slope	30	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble		Bank erosion	20
5 - 50 Gravel		Catchment erosion	25
0.125 - 5 Sand		Siltation	10
Soft Silt	90	Cattle access	90
Solid Mud	60	Feral pigs	50
Silt cover		Pump inlet	20
		Drain outlet	
		Urban rubbish	25
		Campsite	50
		Picnic area	

Fish data

Fish at Brookdale in Beames Brook		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	330	330	1
Eastern rainbowfish	*Melanotaenia splendida*	84	26	5
Fly-specked hardyhead	*Craterocephalus stercusmuscarum*	62	45	3
Sleepy cod	*Oxyeleotris lineolata*	380	112	2
Striped sleepy cod	*Oxyeleotris selheimi*	340	255	2
Mouth almighty	*Glossamia aprion*	165	53	3
Reticulated glassfish	*Ambassis macleayi*	62	62	1
Banded grunter	*Amniataba percoides*	79	79	1
Saratoga	*Scleropages jardini*			a
Notes:				
a = anecdotal evidence. Reputedly abundant in this area during floods				

Plate 39 Brookdale Waterhole in Beames Brook. Heavily used and abused by fishers and campers.

Accident Creek at Bowthorn

Summary and habitat data

Summary	
Date	22-Aug-2004
Catchment	Nicholson
Stream	Accident Creek
Site	Bowthorn
Lat	18 05.732
Long	138 18.583
AHD (m)	92
Length (m)	600
Width (ave)	35
Depth (max)	1.70
Depth (ave)	0.90
Area (ha)	2.100
Volume (ML)	18.900
Time	12:10
Fishing Time	1:00
O_2 % sat	99.0
O_2	9.43
Cond	56.6
pH	7.05
Temp	18.0
Secchi	0.78
Colour	tannin
Weather	fine
Classification	
Prawn abundance	0
Barra abundance	**0**
Species N°	**17**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
1 large freshie
a few redclaw
may go dry in very driest years
not fished

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	98
Offstream Lagoon		Rocks	20
Instream Billabong	100	Rock wall	20
Instream Pool (flowing)		Branches (sml snag)	20
Backwater		Logs (snag)	20
Anabranch		Log Jam (lge snag)	40
Gentle flow		Overhanging veg	30
Glide (mod/deep)		Roots	10
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	20
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	40
Impoundment		Rock & vegetation	10
Tidal		Snag & vegetation	10
Permanency	98	Standing timber	
Riparian Zone		Constructions	
Width (m)	30	Urban rubbish	
Trees	70	Para grass	
Native Shrubs	10	Hymenachne	
Grass	10	Hyacynth	
Rushes & Sedges		Salvinia	
Breaks		Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation		Weir	
Geomorphology		Road	
Ave Right bank slope	45	Bridge	
Ave Left bank slope	80	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders	20	Sand/gravel extract	
50 - 250 Cobble	25	Bank erosion	10
5 - 50 Gravel	20	Catchment erosion	10
0.125 - 5 Sand	70	Siltation	
Soft Silt	30	Cattle access	50
Solid Mud		Feral pigs	10
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	

Fish data

Fish at Bowthorn in Accident Creek		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	185	70	8
Eastern rainbowfish	*Melanotaenia splendida*	91	23	8
Fly-specked hardyhead	*Craterocephalus stercusmuscarum*	50	26	5
Mouth almighty	*Glossamia aprion*	220	57	6
Striped sleepy cod	*Oxyeleotris selheimi*	348	119	5
Spangled perch	*Leiopotherapon unicolor*	173	40	6
Sooty grunter	*Hephaestus fuliginosus*	282	243	2
Archerfish	*Toxotes chatareus*	110	98	2
Sleepy cod	*Oxyeleotris lineolata*	470	92	4
Reticulated glassfish	*Ambassis macleayi*	90	40	7
Gulf grunter	*Scortum ogilbyi*	115	82	3
Hyrtl's tandan	*Neosilurus hyrtlii*	178	101	4
Banded grunter	*Amniataba percoides*	50	46	2
Elongate glassfish	*Ambassis elongatus*	57	30	6
Carpentaria catfish	*Arius paucus*	660	660	1
Long tom	*Strongylura krefftii*	195	195	2
Toothless catfish	*Anodontiglanis dahli*	177	177	1

Plate 40 Accident Creek behind Bowthorn Station residence.

Nicholson River at Kingfisher

Summary and habitat data

Summary	
Date	22-Aug-2004
Catchment	Nicholson
Stream	Nicholson River
Site	Kingfisher
Lat	17 53.848
Long	138 14.631
AHD (m)	83
Length (m)	5000
Width (ave)	150
Depth (max)	19.80
Depth (ave)	3.50
Area (ha)	75.000
Volume (ML)	2625.000
Time	16:00
Fishing Time	2:00
O_2 % sat	104.0
O_2	9.02
Cond	76.4
pH	7.18
Temp	22.6
Secchi	2.20
Colour	olive green
Weather	fine
Classification	
Prawn abundance	4
Barra abundance	**2**
Species N°	**21**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
resort
few cattle
beautiful place
not many gobies for sand area (suitable habitat)
lot of large fish on sounder down deep
probably *Arius paucus*

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	80
Offstream Lagoon		Rocks	20
Instream Billabong	100	Rock wall	20
Instream Pool (flowing)		Branches (sml snag)	60
Backwater		Logs (snag)	20
Anabranch		Log Jam (lge snag)	20
Gentle flow		Overhanging veg	80
Glide (mod/deep)		Roots	50
Sheet (slow/shallow)		Undercut bank	40
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	20
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	100	Standing timber	
Riparian Zone		Constructions	
Width (m)	50	Urban rubbish	
Trees	80	Para grass	
Native Shrubs	10	Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	10	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	15	Weir	
Geomorphology		Road	
Ave Right bank slope	75	Bridge	
Ave Left bank slope	75	Ford	
> 4000 Bedrock	20	Causeway	
250 - 4000 Boulders	20	Sand/gravel extract	
50 - 250 Cobble	20	Bank erosion	
5 - 50 Gravel	20	Catchment erosion	10
0.125 - 5 Sand	70	Siltation	10
Soft Silt		Cattle access	
Solid Mud		Feral pigs	20
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	30
		Picnic area	

Fish data

Fish at Kingfisher in the Nicholson River		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Barramundi	*Lates calcarifer*	625	603	2
Bony bream	*Nematolosa erebi*	238	66	8
Eastern rainbowfish	*Melanotaenia splendida*	94	50	4
Fly-specked hardyhead	*Craterocephalus stercusmuscarum*	46	38	4
Reticulated glassfish	*Ambassis macleayi*	90	60	8
Sleepy cod	*Oxyeleotris lineolata*	330	96	5
Sooty grunter	*Hephaestus fuliginosus*	295	95	3
Spangled perch	*Leiopotherapon unicolor*	138	78	5
Banded grunter	*Amniataba percoides*	114	33	6
Long tom	*Strongylura krefftii*	432	275	6
Hyrtl's tandan	*Neosilurus hyrtlii*	225	225	1
Mouth almighty	*Glossamia aprion*	180	132	4
Archerfish	*Toxotes chatareus*	125	95	6
Gulf grunter	*Scortum ogilbyi*	350	285	2
Striped sleepy cod	*Oxyeleotris selheimi*	420	238	2
Freshwater anchovy	*Thryssa scratchleyi*	325	310	2
Carpentaria catfish	*Arius paucus*	625	545	3
Golden goby	*Glossogobius aureus*	80	63	3
Tarpon	*Megalops cyprinoides*			a
Saratoga	*Scleropages jardinii*			a
Snub-nosed gar	*Arrhampus sclerolepis*			a
Notes:				
a = anecdotal evidence, recorded in resort records, photos.				

Plate 41 The Nicholson River from the boat ramp at Kingfisher Camp. This is a very large, very deep waterhole.

Plate 42 The Nicholson River at Kingfisher cuts through steep-sided rocky bluffs.

Bull Creek at Pelican Waterhole

Summary and habitat data

Summary	
Date	23-Aug-2004
Catchment	Gregory
Stream	Bull Creek
Site	Pelican Waterhole
Lat	18 07.289
Long	139 01.401
AHD (m)	30
Length (m)	100
Width (ave)	40
Depth (max)	0.90
Depth (ave)	0.50
Area (ha)	0.400
Volume (ML)	2.000
Time	15:20
Fishing Time	0:20
O_2 % sat	211.0
O_2	17.45
Cond	317.0
pH	9.33
Temp	24.4
Secchi	0.10
Colour	green khaki
Weather	fine
Classification	
Prawn abundance	0
Barra abundance	**0**
Species N°	**15**

At 3.0m	
O_2	
Cond	
pH	
Temp	

Comments:
NO cover
algal bloom
O_2 really high
should be no fish
plenty of ducks

Habitat			
Item	**Rank**	**Item**	**Rank**
Hydrology		**Instream habitat**	
Swamp		Open Water	100
Offstream Lagoon	100	Rocks	
Instream Billabong		Rock wall	
Instream Pool (flowing)		Branches (sml snag)	10
Backwater		Logs (snag)	
Anabranch	100	Log Jam (lge snag)	
Gentle flow		Overhanging veg	
Glide (mod/deep)		Roots	
Sheet (slow/shallow)		Undercut bank	
Riffle(fast/shallow)		Submerged veg	
Rapid (white water)		Floating veg	
Cascade		Emergent veg	
Waterfall pool		Algae	
Drain		Leaf Litter	
Impoundment		Rock & vegetation	
Tidal		Snag & vegetation	
Permanency	50	Standing timber	
Riparian Zone		Constructions	
Width (m)	0	Urban rubbish	
Trees		Para grass	
Native Shrubs		Hymenachne	
Grass		Hyacynth	
Rushes & Sedges		Salvinia	
Breaks	100	Pistia	
Exotic shrubs, burrs		**Disturbance**	
Exotic vines		Undisturbed	
Exotic grasses		Dam	
No vegetation	100	Weir	
Geomorphology		Road	
Ave Right bank slope	20	Bridge	
Ave Left bank slope	20	Ford	
> 4000 Bedrock		Causeway	
250 - 4000 Boulders		Sand/gravel extract	
50 - 250 Cobble		Bank erosion	
5 - 50 Gravel	10	Catchment erosion	
0.125 - 5 Sand		Siltation	
Soft Silt	100	Cattle access	100
Solid Mud		Feral pigs	50
Silt cover		Pump inlet	
		Drain outlet	
		Urban rubbish	
		Campsite	
		Picnic area	

Fish data

Fish at Pelican Waterhole in Bull Creek		Total Length (mm)		
Common name	**Species**	**Max**	**Min**	**Abundance**
Bony bream	*Nematolosa erebi*	135	45	7
Eastern rainbowfish	*Melanotaenia splendida*	55	29	2
Mouth almighty	*Glossamia aprion*	180	135	4
Striped sleepy cod	*Oxyeleotris selheimi*	227	60	6
Spangled perch	*Leiopotherapon unicolor*	130	82	7
Reticulated glassfish	*Ambassis macleayi*	77	41	7
Hyrtl's tandan	*Neosilurus hyrtlii*	170	170	2
Northwest glassfish	*Ambassis sp.*	55	27	3
Sleepy cod	*Oxyeleotris lineolata*	108	108	8
Gulf grunter	*Scortum ogilbyi*	140	100	1
Archerfish	*Toxotes chatareus*	56	56	3
Giant glassfish	*Parambassis gulliveri*	100	100	1
Banded grunter	*Amniataba percoides*	75	62	1
Rendahl's catfish	*Porochilus rendahli*	165	165	2
Golden goby	*Glossogobius aureus*	117	71	1

Plate 43 Pelican Waterhole, and a friendly bull and cow.