

**Report on preliminary survey of freshwater fish in the Djelk  
wetlands, November 1996**

**Internal Report 265**

by

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## **Introduction**

The Djelk wetlands are located in four coastal river catchments near the town of Maningrida in Central Arnhemland, NT. The country in these catchments is managed for the landowners by the Bawinanga Aboriginal Corporation (BAC). As part of the ongoing process of developing management strategies for the area the BAC is pursuing the possibility of deriving income from sustainable wild harvest of freshwater fish for the aquarium trade. Assistance in this process is being provided by the Environmental Research Institute of the Supervising Scientist (*eriss*). The first step in this process is to document the fish species that occur in the wetlands. This will be followed by market research on the economic potential of such a project. Once target species are determined by the market research, the size and methods of a sustainable harvest will be evaluated. This report presents results of a preliminary survey of fish undertaken in November 1996 by staff from *eriss* and BAC rangers.

## **Survey Procedures**

### **Personnel:**

The sampling team comprised Dean Yibarbuk, Charles Godjuwa and Otto Campion from BAC, Dr Bob Pidgeon, James Boyden and Ray Hall from *eriss* and men from the nearest outstation communities to sampling sites.

### **Fish capture:**

Fish were collected using both seine and gill nets. In the absence of a boat, gill nets were also set by foot in shallow water in some locations. The gill net was a 21 m long multi-panel gill net with 3m panels of the following mesh sizes: 26, 44, 58, 76, 100, 132, & 150 mm.

Two seine nets were used, one with 10 mm and one with 2 mm mesh. The seine net was set by dragging nets (by foot) in a semi-circle out from the bank and then hauled to shore from both ends. This procedure confined sampling to areas less than 1.5m deep in areas judged to have low crocodile risk. The range of habitats sampled, when accessible, were open sandy areas, coarse detrital substrates and macrophyte vegetation. Where macrophyte vegetation was very dense, only the fine mesh net was used and a scooping procedure was employed.

All sampling was undertaken during the day between 1000h and 1700h.

A cumulative list of all fish species collected was recorded after each seine haul and each clearance of the gill net. Sampling ceased when no new species were added to the list for that site.

### **Sample sites:**

Sampling was conducted at sites on the middle reaches of the Cadell and Blyth and middle and lower reaches of the Mann Rivers. At the time of sampling (5-7 November) the Cadell and Mann Rivers were not flowing and the remaining water consisted of isolated pools in the braided stream channels. The Blyth River was still flowing well and, unlike most others in the region, is known to be a permanent stream.

Sampling was carried out in 4 pools on the Cadell River and three pools on the Mann River. In the Blyth River sampling was confined to two small streams entering the main channel. The latter was judged too dangerous for the procedures being used. Gill nets were not used in

the Blyth River but some species were recorded by observation from the bank rather than capture. The location of sampling sites is shown in table 1.

Table 1. List of sampling locations, habitats and sampling methods

River	Location	Habitat sampled	Sample methods
Cadell R 5.11.96	Buluhkaduru S 12° 31.729' E 134° 26.527'	Open water + mud bottom,	Gill nets, seine nets (large and small mesh)
		Open water + coarse detritus, Dense macrophytes,	
Mann R 7.11.96	Yikarrakhal S 12° 24.695' E 134° 43.194'	Open water + sand, Rock pools	Gill net, seine nets (large and small mesh)
"	Kakodbedulbi	Dense macrophytes in small billabong	Small mesh seine
"	Mumeka	Open water + sand, Dense macrophytes	Large mesh seine
Blyth R 6.11.96	Imimbar Creek S 12° 28.803' E 134° 09.287'	Open water + sand,	Seine nets (Large and small mesh)
		Open water + dense detritus	

## Survey results

The fish species found in each river (table 2) are compared with the list of species that could be expected to occur in these rivers from published descriptions of the distribution of freshwater fish in northern Australia (Allen 1989, Larson and Martin 1990). A total of 27 species were collected in the 3 streams sampled compared to a possible total of 45 species. The low proportion of possible species collected indicates the inadequacy of this initial survey rather than a low biodiversity in the region. Similarly, the differences between streams in the species collected is also most likely a reflection of the inadequate sampling. This effect of sampling effort is shown by the larger number of species (20) collected in the Mann River, in which a larger number of lowland locations (3) were sampled, than in the Cadell and Blyth Rivers in which only one location was sampled (Table 1). However, it is highly likely that there are some real differences among rivers in their fish species assemblage. For example, the Liverpool River indicated as the eastern limit of distribution of Mariana's hardyhead and Butler's grunter so these species should be absent from other streams.

Two of the species collected were not recorded in previous publications. One of these, the silverbelly (*Gerres filamentosus*) is a marine species that commonly enters freshwater reaches of rivers in some parts of the Top End, not in the Alligator Rivers Region (ARR). The other species, the threadfin rainbowfish was previously recorded for the first time in the NT only a few years ago in a small tributary of the Goyder River. It also occurs on Cape York and in Papua New Guinea. The detection of this species in the Cadell and Mann Rivers by the present study has greatly extended the known range of this species in the NT. It was found only in sites with very dense submerged macrophyte vegetation. Because of its very small size (<30mm) it has probably been overlooked in previous fish surveys.

The absence of many of the species in Table 2 is most likely a result of both inappropriate sampling methods used and not sampling appropriate habitats. For example, gill netting was only carried out during the middle of the day whereas experience in the ARR has shown that many of the larger species are only captured at dusk or night time. The survey did not include some important habitats (deep open water areas of pools, tidal freshwaters, permanent headwaters). Without a boat it was not possible to sample larger and deeper water bodies using either gill nets or seine nets. Some species are more likely to occur in, or near, tidal freshwaters (nurseryfish, striped scat, mullet) while others are more likely to occur in the permanent headwater sections (Spotted blue-eye, Mariana's hardyhead). The headwaters also have the potential to contain other unrecorded species.

The species collected can also be influenced by seasonal influences. In the ARR where large sections of rivers dry out each year there is a marked seasonal migration of fish from the permanent headwaters and floodplain billabongs to the flooded lowland stream reaches at the start of each Wet and a return movement at the end of the Wet. A similar pattern of movement may occur in the Djelk wetlands. The absence of the sooty grunter (*Hephaestus fuliginosus*) and Mariana's hardyhead (*Craterocephalus marianae*) from the survey samples may be a consequence of this seasonal movement back to the upper reaches as occurs in the ARR. Sampling during the Wet season would be needed to document any such seasonal movements in the Djelk wetlands.

Table 2. Fish species expected in Djelk wetlands from published distribution information and species collected in the November 1996 survey

Species	Species expected	Species recorded	River species recorded in		
			Blyth R	Cadell R	Mann R
<i>Ambassis macleayi</i>	+	+	+	+	+
<i>Amniataba percooides</i>	+	+		+	+
<i>Aseraggodes klunzingeri</i>	+	+	+		
<i>Craterocephalus stercusmuscarum</i>	+	+	+	+	+
<i>Denariusa bandata</i>	+	+		+	+
<i>Glossamia aprion</i>	+	+	+	+	+
<i>Glossogobius giuris</i>	+	+		+	+
<i>Hypseleotris compressa</i>	+	+	+		+
<i>Lates calcarifer</i>	+	+	+		+
<i>Leiopotherapon unicolor</i>	+	+	+	+	+
<i>Megalops cyprinoides</i>	+	+	+	+	+
<i>Melanotaenia nigrans</i>	+	+			+
<i>Melanotaenia splendida inornata</i>	+	+	+	+	+
<i>Melanotaenia trifasciata</i>	+*	+	+		
<i>Mogurnda mogurnda</i>	+	+		+	
<i>Nematalosa erebi</i>	+	+	+	+	+
<i>Neosilurus hyrtlil</i>	+	+		+	
<i>Neosilurus ater</i>	+	+	+		
<i>Oxyeleotris nullipora</i>	+	+			+
<i>Porochilus rendahli</i>	+	+		+	
<i>Pseudomugil tenellus</i>	+	+		+	+
<i>Scatophagus argus</i>	+	+	+		
<i>Scleropages jardini</i>	+	+	+		+
<i>Syncomistes butleri</i>	+*	+			+
<i>Toxotes chatareus</i>	+	+	+	+	+
<i>Ambassis agrammus</i>	+				
<i>Anodontiglanis dahli</i>	+				
<i>Arius graeffei</i>	+				
<i>Arius leptaspis</i>	+				
<i>Arius midgleyi</i>	+				
<i>Brachirus selheimi</i>	+				
<i>Craterocephalus marianae</i>	+*				
<i>Glossogobius aureus</i>	+				
<i>Hephaestus fuliginosus</i>	+				
<i>Hephaestus carbo</i>	+				
<i>Kurtus gulliveri</i>	+				
<i>Liza alata</i>	+				
<i>Melanotaenia splendida australis</i>	+				
<i>Ophistemon gutturale</i>	+				
<i>Oxyeleotris lineolata</i>	+				
<i>Oxyeleotris selheimi</i>	+				
<i>Parambasissis gulliveri</i>	+				
<i>Pseudomugil gertrudae</i>	+				
<i>Scatophagus multifasciata</i>	+				
<i>Strongylura krefftii</i>	+				
<i>Gerres filamentosus</i>		+	+		+
<i>Iriatherina werneri</i>		+		+	+
Number of species	45	27	16	16	20

## **Conclusions**

### **Further Survey**

The data on freshwater fish gathered so far in the Djelk wetlands are clearly inadequate either as an assessment of the potential resources available for commercial exploitation or as a basis for monitoring and assessment of the health of aquatic ecosystems. Consequently, further survey of fish is required in all four major catchments. Further surveys should be systematic covering waterbodies in headwater, lowland, floodplain and any tidal freshwater sections of each river. The sampling for the survey should also be carried out in a standardised manner and data recorded in a suitable quantitative format so that the procedures can be repeated in the future if monitoring of the wetland fishes is required.

### **Harvesting implications**

Most of the fish species recorded so far are widespread in Northern Australia. From a national biodiversity perspective such species present little concern for any localised depletion of stocks that may occur if commercial exploitation ensued. However, there are some species found already in the Djelk wetlands that have either a very restricted distribution or a very patchy distribution for which there may be some national concern and these could require special attention in a harvesting management program (threadfin rainbowfish, Butler's grunter, banded rainbowfish).

Market research on Australian native freshwater fish is urgently needed so that potential target species can be identified, field evaluation of the stock available can be undertaken and harvest management strategies developed. It is likely that the less widespread species may have most commercial potential. For example, the very limited distribution of the threadfin rainbowfish makes this a highly prospective species. The banded rainbowfish is also popular with aquarists because many colour variants have evolved in its very patchy distribution across northern Australia.

## **References**

- Allen GA 1989. *Freshwater fishes of Australia*. TFH Publications, Neptune City NJ.
- Evans N 1991. *Mayali Dictionary*. ANPWS: research and consultancy program
- Larson HK and Martin KC 1990. *Freshwater fishes of the Northern Territory*. Northern Territory Museum of Arts and Sciences, Darwin NT.

**Appendix 1.** Species codes for fish used in survey data records and names for each freshwater fish species likely to occur in the Djelk Wetlands.

J - juvenile form; A - adult form

Species Code	Scientific Name	Common English Name	Gundjeihmi Name (Evans 1991)
AD	<i>Anodontiglanis dahli</i>	Toothless Catfish	Ganbaldjdja (J), Barrabarra or Na-gurl (A)
AG	<i>Arius graeffei</i>	Blue catfish	Gonjgonj (J), Almakkawarri (A)
AI	<i>Arius midgleyi</i>	Shovel-head catfish	
AL	<i>Arius leptaspis</i>	Salmon or Boof-head catfish	
AB	<i>Arius berneyi</i>	High-fin catfish	
AM	<i>Ambassis spp.</i>	Perchlets	Na-rranggi
AMA	<i>Ambassis agrammus</i>	Reticulated perchlet	Na-rranggi
AMM	<i>Ambassis macleayi</i>	Sail-fin perchlet	Na-rranggi
PAG	<i>Parambasissis gulliveri</i>	Giant perchlet	
AP	<i>Amniataba percoides</i>	Banded grunter	Mandidi
CF	<i>Cinetodus froggatti</i>	Small mouthed catfish	
CM	<i>Craterocephalus marianae</i>	Mariana's hardyhead	Dilebang or Dolbo
CS	<i>Craterocephalus stercusmuscarum</i>	Fly-Specked hardyhead	Dilebang or Dolbo
DB	<i>Denariusa bandata</i>	Penny Fish	Na -rranggi
GA	<i>Glossamia aprion</i>	Mouth-almighty	Na-rranggi or Djabelh
GG	<i>Glossogobius giuris</i>	Flathead goby	
GS	<i>Glossogobius aureus</i>	Golden goby	
HC	<i>Hypseleotris compressa</i>	Carp gudgeon	Bigodjmalemale
HF	<i>Hephaestus fuliginosus</i>	Sooty grunter	Na-gerdmi or Durnbuhmanj
HO	<i>Hephaestus carbo</i>	Coal grunter	Dubang or Dubarrabagon
LA	<i>Liza alata</i>	Diamond mullet	Madjabarra
LC	<i>Lates calcarifer</i>	Barramundi	Malarialk(J) , Na-marngorl (A)
LU	<i>Leiopotherapon unicolor</i>	Spangled grunter	Burd
MA	<i>Melanotaenia splendida australis</i>	Red-tail rainbowfish	
MC	<i>Megalops cyprinoides</i>	Ox-eye herring or Tarpon	Garlalba
ME	<i>Melanotaenia exquisita</i>	Exquisite rainbowfish	
MI	<i>Melanotaenia splendida inornata</i>	Chequered rainbowfish	Dilebang or Dolbo
MJ	Juveniles < 3cm		
MN	<i>Melanotaenia nigrans</i>	Black-Striped rainbowfish	Dilebang or Dolbo
IW	<i>Inlatherina werneri</i>	Threadfin Rainbowfish	
MG	<i>Melanotaenia gracilis</i>	Slender Rainbowfish	
MP	<i>Melanotaenia pygmaea</i>	Pygmy Rainbowfish	
MSA	<i>Melanotaenia splendida australis</i>	Red-Tailed Rainbowfish	
MO	<i>Mogurnda mogurnda</i>	Purple-spotted gudgeon	Djagolk or Gomboh
MT	<i>Melanotaenia trifasciata</i>	Banded rainbowfish	
NE	<i>Nematalosa erebi</i>	Bony bream	Na-bardebarde or Garlalba
NH	<i>Neosilurus hyrtlil</i>	Hyrtl's catfish	Binjdjarrang
NA	<i>Neosilurus argenteus</i>		
OG	<i>Ophisternon gutturale</i>	Single-gilled eel	
OL	<i>Oxyeleotris lineolata</i>	Sleepy cod	Djurludj
OLL	<i>Oxyeleotris selheimi</i>	Black banded gudgeon	
ON	<i>Oxyeleotris nullipora</i>	Dwarf gudgeon	
PG	<i>Pseudomugil gertrudae</i>	Spotted blue-eye	Dilebang or Dolbo
PI	<i>Pingalla midgleyi</i>	Black-anal-fin grunter	Durnbuhmanj ??
PR	<i>Porochilus rendahli</i>	Rendahl's catfish	
PT	<i>Pseudomugil tenellus</i>	Delicate blue-eye	Dilebang or Dolbo
SB	<i>Syncomistes butleri</i>	Sharp-nosed or Butler's grunter	Na-gerdmi or Durnbuhmanj
SJ	<i>Scleropages jardini</i>	Saratoga	Yinmamarra (j), Guluibirr (A)
SK	<i>Strongylura krefftii</i>	Longtom	Burrugulung

## Appendix 1. cont.

Species Code	Scientific Name	Common English Name	Gundjeihmi Name
TA	<i>Neosilurus ater</i>	Black catfish	Binjdjarrang or Ganbaldjdja
TC	<i>Toxotes chatareus</i>	Common archerfish	Njarlgan
TL	<i>Toxotes lorentzi</i>	Primitive archerfish	Bodjdjalk
SA	<i>Scatophagus argus</i>	Spotted Scat	
SM	<i>Scatophagus multifasciata</i>	Striped Scat	
KG	<i>Kurtus gulliveri</i>	Nursery Fish	
AK	<i>Aseraggodes klunzingeri</i>	Tailed Sole	
BS	<i>Brachirus selheimi</i>	Selheim's Sole	
BA	<i>Brachirus salinarum</i>	Saltpan Sole	



**Appendix 2.** Trip report for survey conducted from 4/11/96 - 8/11/96. Personnel Bob Pidgeon, James Boyden, & Ray Hall

*Purpose:*

In collaboration with the Bawinanga Aboriginal Corporation (BAC) document the inventory and distributions of freshwater fish species present in the Liverpool-Mann and Cadell-Blyth river systems. This knowledge, as part of the BACs plan to manage wetlands in the region, will provide a benchmark to further assess the economic viability for the sustainable harvesting of native fish species.

1. Over the week we visited outstations in the middle and upper sections of the Cadell, Blyth, and Mann Rivers and were introduced by Dean Yibarbuk (Chairman) and Charles Godjwa, to TOs in these areas. A group from the outstation would accompany us to show potential sampling areas, and assist in fish collecting. Fishing appeared to be a form of 'work' which integrated well into the daily life-style of our hosts. They were eager to assist, and at the end of the day when the gill-net was set or a stray lure was thrown, the most interesting catch were those fish large enough to throw on the fire. Barramundi, Saratoga, and (patience, patience) Bony Bream were enthusiastically eaten.
2. Five sites were surveyed using visual and netting techniques. The ecological character of sites varied substantially. For example, the Blyth is a permanently flowing river, allowing saltwater species to migrate some distance into lowland freshwater. The Cadell was not flowing and sites consisted of a series of 'billabong' pools. The Mann River, which was not flowing, was sampled at three locations; the upper region at the periphery of the stone country; a small backflow swamp in the lowlands; and a brackish area at the tidal zone.
3. Distance, limited time, and access, prevented a full inventory of species known to inhabit these waters being acquired. Nevertheless, a number of interesting species were discovered. In particular, the Threadfin rainbowfish, which had not been recorded before in the Cadell and Mann rivers. This species and the Spotted Scat, found in the Blyth river, are attractive aquarium fish.
4. The marketing potential of native fish from the Arnhemland region has still to be determined. This topic was discussed in fairly nebulous terms with Dean Yibarbuk and Ian Munroe (Bawinanga's project officer). Ian Munroe mentioned that fish popular in the Asia region, such as Saratoga which are know as a 'lucky' fish, may offer some potential. Bob Pidgeon expressed cautionary scepticism to the economic benefits of marketing native fish from Arnhemland. Options for infrastucture, initial costs, and training will require further investigation. If a marketing exercise is undertaken guidelines for sustainable harvesting and monitoring may also need to be established.
5. A number of issues arose which may be significant for the planning of future field operations in this region. A substantial period was necessary to discuss possible sites to sample before actually visiting there. Travel over rough roads to sites also took a lot of time. This aspect will need more thought if live fish are to be delivered safely the market-place from remote areas. Access to the escarpment region was restricted by road therefore these areas were not sampled. Finally damage sustained to the boat and trailer during the trip highlighted a need to devise

a more appropriate means of carrying this equipment over long distances on unsealed roads. Because the boat was put out of action, sampling was limited to areas deemed to be Crocodile 'safe'. Open water fish species were therefore rarer in our sampling.