Indicus Biological Consultants

Darwin International Airport Pty. Ltd.

Terrestrial and Aquatic fauna assessment

March 2004

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Contents

Introduction

This document outlines the results of a fauna survey carried out during 21-24th November 2003 and 1-5th March 2004 on Darwin International airport land by Indicus Biological Consultants. This report serves to highlight any significant habitats/ species present on Airport land and will contribute to an Airport Environmental Strategy.

The study area encompasses much of Rapid Creek catchment and is bounded to the North by McMillan's road, the West by Bagot road, the South by the Airport and to the East Department of Defence Land (see figure 4).

The terrestrial and aquatic vertebrate fauna survey methodology and findings are presented in this report and fauna species and habitats are identified.

Survey Methods

Terrestrial vertebrate survey

The fauna survey methodology complies with the requirements of the Northern Territory Parks and wildlife fauna survey standard methodology. Nine 50 x 50 metre quadrats and 1 line transect were chosen to represent each of the vegetation groups identified within the study area as well as areas to be cleared for development and set aside as part of a proposed reserve system.

Each quadrat consisted of four cage traps placed in each corner, with 20 Elliot traps spaced evenly around the perimeter. These were baited with honey, oats and peanut butter and bait for cages were mixed with tuna. Within each quadrat, four pitfall traps with 10 m drift fences were placed within different microhabitats. All traps were open for 3 nights, with cage and Elliot traps checked and closed each morning and rebaited in the late afternoon. The line transect along Rapid creek was also slowly traversed and actively searched at varying times throughout the survey period. All sites were surveyed between the 21-24 November 2003 and the 1-5 March 2004.

Bird counts

Each quadrat and transect was censored for birds three times in the morning and three times in the afternoon with an additional two nocturnal visits. Bird counts involved walking through the quadrat/ transect and all birds heard or observed utilising the quadrat/ transect recorded. Birds flying overhead were not included and raptors were only included if observed overhead.

Active Searches

Each quadrat/ transect was actively searched three times for reptiles, mammals, scats and signs. Each active search lasted for ten minutes and involved turning rocks and logs, raking through leaf litter, looking under bark, in crevices, etc. Three searches were conducted during the day (morning, midday and late afternoon) with an additional two searches at night using spotlights.

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Bat sampling

Using the Anabat detector system (Titley Electronics) ten minute recordings were undertaken in each quadrat/ transect while spotlighting during the 22nd and 23rd of November 2003.

These recordings were then analysed by Mr Damian Milne form the Biodiversity section, Natural Systems, Department of Infrastructure, Planning and Environment for the presence of bats.

Bats were not recorded during the survey carried out between the 1-5 of March 2004 due to the unavailability of the Anabat detector system.

Incidental terrestrial records

Other species seen in the general area that were not attributable to a quadrat/ transect were recorded separately on a list for the survey area.

Rapid Creek aquatic vertebrate survey

Fish species were sampled in Rapid Creek from upstream of Yankee Pools to the road bridge on Henry Wrigley Drive. Side drains with flowing water were also sampled along that section. Mr David Wilson of Aquagreen and Indicus Biological Consultants carried out the fish survey and Mr Wilson provided information and photos of each species recorded.

The methods used to sample were:

1) Cast netting: A hand cast net with fine mesh is cast over visible fish. Good for open snag free shallow water.
2) Frame netting: Fine mesh on a frame with a small drop is pushed through aquatic vegetation to capture fish hiding within.
3) Dip netting: A small mesh net on a handle is used in conjunction with a spotlight to catch fish that lie motionless when illuminated by bright light at night.
4) Angling methods are used to extract predatory species and smaller species from places where netting will not work.
5) Mask and snorkel are used to observe fishes and identify species when it is safe and the water is clear.
6) Streamside observations are made in likely places where fish occur during the day and also at night using a spot light.

Study Sites

The sites chosen for this survey represented the major habitats present on Darwin International Airport land. The following descriptions together with figures 1-3 illustrate representative examples of each habitat type and Table 1 contains location data for each site sampled.

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Pandanus Woodland

Sites 1 and 2 were situated in Pandanus woodland/ Seasonal swampland (see figure 1). These sites are inundated in the wet season and contain scattered *Melaleuca* spp. trees along with a grassy understorey comprised primarily of *Heteropogon contortus*.

Figure 1. Pandanus woodland.

Eucalypt Woodland

Sites 3-5 and 7-10 were situated in Eucalypt woodland (see figure 2). These sites primarily consisted of a *Eucaluptus tetrodonta* / *E. miniata* overstorey with a mixed midstorey made up primarily of *Acacia* species and *Planchonia careya*, with some sites containing *Cycas* species. The groundstorey consisted chiefly of Gamba grass (*Andropogon gayanus*), *Heteropogon triticieus* and Annual Sorghum.

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Figure 2. An example of Eucalypt woodland.

Rapid Creek

Site 6 consisted of a thin riparian vegetation strip running along side Rapid creek from the Yankee pools area down stream until near McMillans road (see figure 3).

Figure 3. Rapid Creek during the aquatic survey.

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Table 1. Coordinates of study sites.

Site	Coordinates in UTM's (WGS 84)
1 Pandanus woodland	52704930, 8627638
2 Pandanus woodland	52704796, 8627708
3 Eucalypt woodland	52701868, 8628574
4 Eucalypt woodland	52701995, 8628470
5 Eucalypt woodland	52704383, 8627910
6 Rapid creek Bridge end	52704445, 8628088
Pandanus woodland end	52704173, 8628288
7 Eucalypt woodland	52703074, 8628634
8 Eucalypt woodland	52703208, 8628634
9 Eucalypt woodland	52703315, 8628908
10 Eucalypt woodland	52701862, 8628258

Taxonomy and Nomenclature

Common and scientific names used in this report follow Strahan (1998) for mammals, Christidis and Boles (1994) for birds, Cogger (2000) for reptiles, Tyler and Davies (1986) for frogs and Larson & Martin (1989) for fish.

Limitations

The survey is limited by its extent and the time period over which the survey was conducted. Cryptic and rare species may not have been recorded due to the relatively short sampling period, and further species may be detected if trapping were conducted over a longer period, or throughout different times of the year. However the heavily disturbed and fragmented condition of the small pockets of vegetation on the site and their close proximity to the surrounding urban and commercial development are unlikely to contain rare species.

Relevant Literature

Relevant literature includes the *Territory Parks and Wildlife Conservation Act 2001* (Parks & Wildlife Commission of the Northern Territory 2001) and the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia 1999) as well as the China-Australia Migratory Bird Agreement (CAMBA) 1987, the Japan-Australia Migratory Birds Agreement (JAMBA) 1974 and the Bonn Convention for the conservation of migratory species which came into effect in 1983. Species that are covered by these treaties and acts that were recorded on site were noted. Potential impacts were identified and management recommendations proposed, where necessary.

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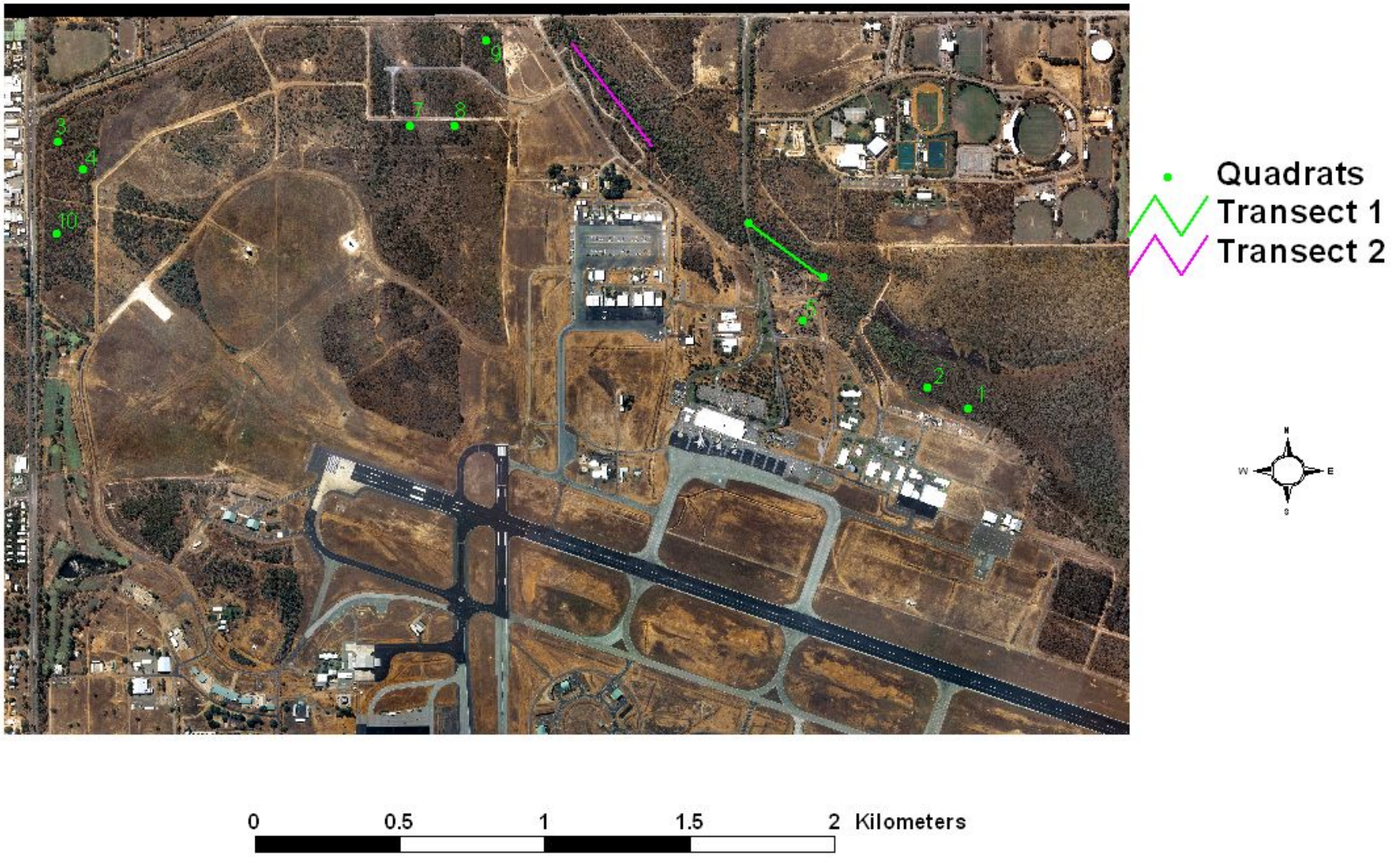
Figure 4. Map showing study area and location of quadrat/ transect sites.



Results

Study Area

A total of 12 mammal species, 50 bird species, 16 reptile species and 6 frog species were recorded from the quadrats (land & air side) and Rapid creek transect during the late dry season and wet season survey (see Tables 2 & 3 for bats).

Forty-seven bird species and 6 reptile species were recorded from airside during the late dry season and wet season survey (see table 4). A further 4 bird species and 8 frog species were recorded as incidentals during both surveys (Table 5).

Seven species of fish were also recorded during the aquatic survey of Rapid creek (Table 6). For a description of each fish species, including diet, breeding, distribution, habitat, conservation status and photo see Appendix 1.

Introduced Species

The only introduced fauna species recorded on site were the Asian house gecko *Hemidactylus frenatus* and the Black Rat *Rattus rattus*.

Significant fauna species

Mammals

Of the 12 mammal species recorded during the surveys only 2 are considered to be of any conservation significance.

Both the Black-footed tree-rat and the Pale field rat were recorded at sites 3 and 6 and sites 1,2 and 3 respectively (see table 2) and they are both listed as Near Threatened by the Department of Infrastructure, Planning and Environment, of the Northern Territory Government (DIPE). A taxon is designated Near Threatened when it has been evaluated against the IUCN selection criteria but does not qualify for Critically Endangered, Endangered or Vulnerable at present, but is close to qualifying for or is likely to qualify for a threatened category in the near future (IUCN 2001).

Birds

The majority of bird species recorded within the study area are widespread in the Top End of the Northern Territory and the majority of tropical Australia, however there were several species of birds recorded that are covered by international migratory bird agreements and Federal government and Northern Territory Government Acts.

Glossy Ibis were recorded airside (see table 3) during the late dry season of 2003, and this species is covered by the CAMBA bird agreement

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The Little Curlew was also recorded in flocks airside during the late dry season of 2003. This species is listed under several of the migratory bird agreements (CAMBA, JAMBA & Bonn) as well as the EPBC migratory wetland species act.

The Oriental Pratincole was also recorded airside during the late dry season of 2003 and it is also listed under the JAMBA, CAMBA migratory bird agreements as well as the EPBC migratory wetland species act.

The Bush Stone-Curlew was recorded at site 9 and it is listed as Near Threatened under the Threatened Species List of the Northern Territory (DIPE 2002). However, there are many records of the Bush Stone-Curlew around the Top End in the NT Bird Atlas database.

Rainbow Bee-eaters were recorded at site 9 and airside (see table 2 & 3) and it is covered by the JAMBA migratory bird agreement.

It is important to note that most of the bird species covered by these migratory agreements such as the Rainbow Bee-eater occur commonly in the Top End, as does the Glossy Ibis and Oriental Pratincole and the habitats the study area provides for these species are well represented in both the local and the regional area.

The Little Curlew is less common in the Top End (Chatto 2003). Chatto (2003) recorded them most frequently in the wetlands to the east of Darwin, where they were always seen in the freshwater wetlands rather than the inter-tidal zone or adjacent saline wetlands and they often spread out in low density over dry and or burnt floodplains.

Reptiles, Amphibians & Fish
No species of reptile, amphibian or fish of conservation significance was recorded during either the late dry or wet season surveys.

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Table 2.
Terrestrial fauna species recorded in quadrats
Darwin International Airport land and the Rapid Creek transect from the 21-24/11/03 and 1-5/3/04 and their conservation significance.

Species	1	2	3	4	5	6	7	8	9	10
Mammals										
Northern Brown Bandicoot, *Isoodon macrourus*	#	#	# +	#				+	+	+
Grassland Melomys, *Melomys burtoni*	#	#	#							
Black-footed Tree-rat, *Mesembriomys gouldii* *			#			#				
Pale Field Rat, *Rattus tunneyi* *	#	#	# +							
Black Rat, *Rattus rattus*										+
Black Flying-fox, *Pteropus alecto*				#						
Birds										
Orange-footed Scrubfowl, *Megapodius reinwardt*						# +				
Radjah Shelduck, *Tadorna radjah*						#				
Little Pied Cormorant, *Phalacrocorax malanoleucos*						#				
Great Cormorant, *Phalacrocorax carbo*						#				
Straw-necked Ibis, *Threskiornis spinicollis*		#								
Whistling Kite, *Haliastur sphenurus*						# +				
Brahminy Kite, *Haliastur indus*	#					# +				
Bush Stone-curlew, *Burhinus grallarius* *									+	
Peaceful Dove, *Geopelia striata*		#	#	#	#	# +	+	+	+	
Bar-shouldered Dove, *Geopelia humeralis*	#	#	# +	#	#	# +	+	+	+	+
Pied Imperial Pigeon, *Ducula bicolor*						#				

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Birds	1	2	3	4	5	6	7	8	9	10
Red-tailed Black-cockatoo, *Calyptorhynchus banksii*			#							
Sulphur-crested Cockatoo, *Cacatua galerita*	#									
Rainbow Lorikeet, *Trichoglossus haematodus*	#	#			#	#		+		
Red-winged Parrot, *Aprosmictus erythropterus*		#	+							
Brush Cuckoo, *Cacomantis variolosus*						# +				
Little Bronze-Cuckoo, *Chrysococcyx minutillus*	#									
Common Koel, *Eudynamys scolopacea*	#									
Pheasant Coucal, *Centropus phasianinus*		#	#			#				
Tawny Frogmouth, *Podargus strigoides*	#						+			
Azure Kingfisher, *Alcedo azurea*						# +				
Blue-winged Kookaburra, *Dacelo leachii*	#									
Forest Kingfisher, *Todiramphus macleayii*		#				# +				
Dollarbird, *Eurystomus orientalis*					#					
Rainbow Bee-eater, *Merops ornatus* **(J)**									+	
Red-backed Fairy-wren, *Malurus malanocephalus*	#	#	+		#					
Spotted Pardalote, *Pardalotus punctatus*						+				
Green-backed Gerygone, *Gerygone chloronotus*						#				+
Silver-crowned Friarbird, *Philemon argenticeps*					#					
White-gaped Honeyeater, *Lichenostomus unicolor*			#	#	#	# +				+
White-throated Honeyeater, Melithreptus albogularis			#	#	#	# +	+		+	
Brown Honeyeater, *Lichmera indistincta*			# +	#	#	# +	+	+	+	+
Rufous-banded honeyeater, *Conopophila albogularis*							+	+	+	
Bar-breasted Honeyeater, *Ramsayornis fasciatus*						#				
Lemon-bellied Flycatcher, *Microeca flavigaster*			#							
Northern Fantail, *Rhipidura rufiventris*							+	+	+	

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Birds	1	2	3	4	5	6	7	8	9	10
Magpie lark, *Grallina cyanoleuca*						+				
Grey-crowned Babbler, *Pomatostomus temporalis*					#					
Shining Flycatcher, *Myiagra alecto*						#				
White-bellied Cuckoo-shrike, *Coracina papuensis*			# +			#	+			+
White-winged Triller, *Lalage sueurii*			#	#						
Varied Triller, *Lalage leucomela*			+			+			+	
Yellow Oriole, *Oriolus flavocinctus*						# +				
Figbird, *Sphecotheres viridis*			# +			# +				
Torresian Crow, *Corvus orru*						#				
Double-barred Finch, *Taeniopygia bichenovii*			#							
Crimson Finch, *Neochmia phaeton*		#								
Mistletoebird, *Dicaeum hirundinaceum*	#			#			+		+	
Golden-headed Cisticola, *Cisticola exilis*		#								
Yellow White-eye, *Zosterops luteus*			#							

Reptiles

Asian House Gecko, *Hemidactylus frenatus*	#			#	#	#				
Bynoes Gecko, *Heteronotia bynoei*			+					+	+	
Frilled Lizard, Chlamydosaurus kingii			#					+		
Northern Water Dragon, *Lophognathus temporalis*			#	#	#	#			+	
Mitchells Water Monitor, *Varanus mitchelli*						+				
Yellow Spot Monitor, *Varanus panoptes*								+		
Spotted Tree Monitor, *Varanus scalaris*			+					+		
Striped Rainbow Skink, *Carlia munda*		#	#	#	#					
Slender Rainbow Skink, *Carlia gracilis*	#	#				#		+		

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Reptiles	1	2	3	4	5	6	7	8	9	10
Red-sided Rainbow Skink, *Carlia rufilatus*									+	
Arboreal Snake-Eyed Skink, *Cryptoblepharus plagiocephalus*	#					#				
Darwin Skink, *Glaphyromorphus darwiniensis*			#							
Douglas' Skink, *Glaphyromorphus Douglasi*	#		# +	#				+	+	+
Top end Fire-tailed Skink, *Morethia storri*										
Brown Tree Snake, *Boiga irregularis*						+				
Macleays Water Snake, *Enhydris polylepis*						+				

Amphibians										
Northern Dwarf Tree-frog, *Litoria bicolor*	#	#				#				
Green Tree-frog, *Litoria caerulea*			#			#		+		
Rocket Frog, *Litoria nasuta*							+			
Red Tree-frog, *Litoria rubella*	#	#				#				
Marbled Frog, *Limnodynastes convexiusculus*	#	#								+
Floodplain Toadlet *Uperolia inundata*							+	+	+	+

Records from the dry season
+ Records from the wet season
***** = Near threatened by DIPE Threatened Species List for the Northern Territory.
J = Japan- Australia migratory bird agreement.

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Table 3.
Micro-bat species recorded during the late dry season survey 21-24/11/03.

Site	Common name	Species name
1	Northern Pipistrelle/ Common Bent-wing Bat	*Pipistrellus westralis / Miniopterus schreibersii*
	Little Broad-nosed Bat/ Northern Broad-nosed Bat/ Hoary Wattled Bat	*Scotorepens greyii / S. sanborni / Chalinolobus nigrogriseus*
2	Little Northern Freetail Bat	*Mormopterus "loriae"*
	Northern Pipistrelle/ Common Bent-wing Bat	*Pipistrellus westralis / Miniopterus schreibersii*
	Little Broad-nosed Bat/ Northern Broad-nosed Bat/ Hoary Wattled Bat	*Scotorepens greyii / S. sanborni / Chalinolobus nigrogriseus*
3	Little Northern Freetail Bat	*Mormopterus "loriae"*
4	Northern Pipistrelle/ Common Bent-wing Bat	*Pipistrellus westralis / Miniopterus schreibersii*
5	Northern Pipistrelle/ Common Bent-wing Bat	*Pipistrellus westralis / Miniopterus schreibersii*
	Little Northern Freetail Bat	*Mormopterus "loriae"*
6	Little Northern Freetail Bat	*Mormopterus "loriae"*
	Northern Pipistrelle/ Common Bent-wing Bat	*Pipistrellus westralis / Miniopterus schreibersii*

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Table 4.
Fauna species recorded airside at Darwin International Airport on the 24/11/03 and 4/3/04 and their conservation significance.

Species	Late dry	Wet
Birds		
Brown Quail, *Coturnix ypsilohora*	#	+
Glossy Ibis, *Plegadis falcinellus* **(C)**	#	
Staw-necked Ibis, *Threskiornis spinicollis*	#	
Black Kite, *Milvus migrans*	#	
Whistling Kite, *Haliastur sphenurus*	#	+
Brahminy Kite, *Haliastur indus*	#	
Nankeen Kestrel, *Falco cenchroides*		+
Little Curlew, *Numenius minutes* **(C, J, Bonn & EPBC)**	#	
Masked Lapwing, *Vanellus miles*	#	+
Oriental Pratincole, *Glareola maldivarum* **(C, J & EPBC)**	#	
Australian Pratincole, *Stiltia isabella*	#	
Peaceful Dove, *Geopelia striata*	#	+
Bar-shouldered Dove, *Geopelia humeralis*	#	+
Pied Imperial Pigeon, *Ducula bicolor*	#	
Red-tailed Black-cockatoo, *Calyptorhynchus banksii*	#	+
Sulphur-crested Cockatoo, *Cacatua galerita*	#	
Rainbow Lorikeet, *Trichoglossus haematodus*	#	
Red-winged Parrot, *Aprosmictus erythropterus*	#	
Brush Cuckoo, *Cacomantis variolosus*	#	+
Little Bronze-Cuckoo, *Chrysococcyx minutillus*	#	
Pheasant Coucal, *Centropus phasianinus*	#	
Forest Kingfisher, *Todiramphus macleayii*	#	+
Rainbow Bee-eater, *Merops ornatus* **(J)**	#	+
Red-backed Fairy-wren, *Malurus malanocephalus*	#	
Silver-crowned Friarbird, *Philemon argenticeps*	#	
Little Friarbird, *Philemon citreogularis*	#	
White-gaped Honeyeater, *Lichenostomus unicolor*	#	+
White-throated Honeyeater, Melithreptus albogularis	#	

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Birds	Late dry	Wet
Brown Honeyeater, *Lichmera indistincta*	#	+
Lemon-bellied Flycatcher, *Microeca flavigaster*	#	
Magpie lark, *Grallina cyanoleuca*	#	
Northern Fantail, *Rhipidura rufiventris*	#	+
Black-faced Cuckoo-shrike, *Coracina novaehollandia*	#	
White-bellied Cuckoo-shrike, *Coracina papuensis*	#	+
White-winged Triller, *Lalage sueurii*	#	+
Varied Triller, *Lalage leucomela*		+
Yellow Oriole, *Oriolus flavocinctus*	#	
Figbird, *Sphecotheres viridis*	#	
Singing Bushlark, *Mirafra javanica*	#	
Richard's Pipit, *Anthus novaeseelandiae*	#	+
Double-barred Finch, *Taeniopygia bichenovii*	#	+
Long-tailed Finch, *Poephila acuticauda*	#	+
Crimson Finch, *Neochmia phaeton*	#	
Chestnut-breasted Mannikin, *Lonchura castaneothorax*	#	
Mistletoebird, *Dicaeum hirundinaceum*	#	
Golden-headed Cisticola, *Cisticola exilis*	#	
Yellow White-eye, *Zosterops luteus*	#	

Reptiles		
Asian House Gecko, *Hemidactylus frenatus*	#	
Frilled Lizard, Chlamydosaurus kingii	#	
Northern Water Dragon, *Lophognathus temporalis*	#	
Floodplain Monitor, *Varanus panoptes*	#	
Striped Rainbow Skink, *Carlia munda*	#	
Arboreal Snake-Eyed Skink, *Cryptoblepharus plagiocephalus*	#	

C = China- Australia migratory bird agreement (CAMBA).
J = Japan- Australia migratory bird agreement (JAMBA).
EPBC = Commonwealth Environment Protection and Biodiversity Conservation Act 1999 for migratory wetland species.
Bonn = Bonn Convention for the conservation of migratory species.

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Table 5.
Incidental list of species recorded at the Darwin International Airport but not on airside or on the quadrats from the 21-24/11/03 and 1-5/3/04 surveys.

Species	Late dry	Wet
Birds		
Brown Goshawk, *Accipiter fasciatus*	#	
Australian Hobby, *Falco longipennis* *	#	
Galah, *Cacatua roseicapilla*	#	
Golden Headed *Cisticolla exilis*		+
Amphibians		
Northern Dwarf Tree-frog, *Litoria bicolor*		+
Green Tree-frog, *Litoria caerulea*		+
Javelin Frog *Litoria microbelos*		+
Wotjulum *Litoria wotjulumensis*		+
Rocket Frog *Litoria nasuta*		+
Marbled Frog, Limnodynastes convexiusculus		+
Bilingual Froglet *Crinia bilingua*		+
Floodplain Toadlet *Uperolia inundata*		+

* Not confirmed

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Table 6.
Fish species recorded from the Rapid Creek survey on the 5/3/04.

Species name	Common Name
Hypseleotris compressa	Carp Gudgeon
Leiopotherapon unicolor	Spangled Grunter
Megalops cyprinoides	Ox-eye Herring
Melanotaenia splendida inornata	Chequered rainbowfish
Melanotaenia nigrans	Black-banded rainbowfish
Mogurnda mogurnda	Purple Spotted Gudgeon
Neosilurus hyrtlii	Hyrtl's Catfish

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Significance of habitats to terrestrial wildlife

The sites and the associated vegetation surveyed at the airport are well represented in the Top End and although the study area has weeds present, is modified and situated close to developed Urban, Commercial and Air force land, it is relatively typical of those found in the Top-End coast.

The Eucalypt woodlands on the sites generally contain trees that are relatively young (probably post Cyclone Tracy 1975) and hence small in diameter and height, with relatively little hollow development, an essential for much of the Top End fauna.

One Black-footed Tree-rat was recorded in site 3 (Eucalypt woodland) and on the edge of the riparian zone of Rapid Creek, suggesting that these woodlands posses trees of significant size to support the denning of these animals. Griffiths *et al.*(2002) radio-tracked 3 Black-footed tree-rats in Charles Darwin National Park and found that most denned in *E. tetrodonta* trees with an average diameter at breast height (DBH) of 36 cm (range 12-63 cm) and with an average height of 14m (range 4-26 m). Black-footed Tree-rats are listed as Near threatened under the *Territory Parks and Wildlife Conservation Act 2001* and therefore require consideration when environmental management plans for the area are being developed and implemented**.**

The little Curlew was also recorded in flocks on the grassy strips adjacent to the runways airside during the late dry season of 2003. This species is listed under several of the migratory bird agreements (CAMBA, JAMBA & Bonn) as well as the EPBC migratory wetland species act and is considered to be less common in the Top End (Chatto 2003). Therefore environmental management plans developed and implemented for the area should consider the ecology of the Little Curlew.

Potential and Anticipated Impacts

Although the study area is degraded and modified, the fauna of the area is typical of those found in the Top-End coast. However, some areas such as the Eucalypt woodland and the Rapid Creek riparian strip provide habitat for many bird species throughout different times of the year, as well as several mammal species such as the Black-footed Tree-rat, Northern Brown Bandicoot and the Pale Field rat. With this in mind, the clearing of vegetation should be kept to a minimum, and weed populations should be controlled.

Major Impacts

The primary impact will be the loss of habitat as a direct result of vegetation clearance that is proposed to take place along Bagot Road and McMillans road as part of the Airport redevelopment. However the planned reserve that is to be set aside by the Airport may provide a refuge for some of the above mentioned species if some form of wildlife corridor is to be set aside or constructed from the reserve to Rapid Creek. Also the relatively small size of the trees in the reserve may pose a problem to species such as the Black-footed Tree-rat, which require trees with a relatively large DBH (diameter at breast height) as den sites.

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Management Recommendations

General management issues

Particular attention should be paid to developing ways of retaining vegetation that are consistent with the known requirements of many fauna species such as the Black-footed Tree-rat. Spread of introduced weed species can be facilitated by disturbances such as land clearance, and construction works (particularly by using machinery that are carrying weeds from other areas). The retention of native fauna species requires an integrated management approach focusing both on fauna and flora.

Fauna

Recommendations

- The installation of natural tree hollows to any future reserves, both on trees and on the ground to provide refuge for many of the hollow using fauna.
- Avoid widespread burning during the dry season and annually to prevent the loss of further trees and hence hollows or potential hollows.

Weeds

Recommendations

- Monitoring of management actions, notably weed control, and changes in vegetation condition should be used to guide future management decisions. Establishment of permanent photo points is a simple method of monitoring such changes.
- Any new reserves that are developed should be planted with additional native flora species to enhance the habitat values of the site. This will also provide for further attractants to native species.

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Appendix 1. Descriptions of fish species recorded in Rapid Creek survey.

Common name:	**Carp Gudgeon or Empire Gudgeon**
Scientific name*:*	*Hypseleotris compressa* (Krefft, 1864)
Order:	Perciformes
Class:	Osteichthes
Family:	Eleotridae
Status:	Common, not listed under Commonwealth or Territory legislation as threatened.
Size:	grows to 120 mm

Aboriginal information
Nothing known.

Breeding
The male of this species selects a site then displays to the females enticing them to lay rows of very tiny eggs stuck to the area selected, a rock, plant leaf or log. The male guards the eggs for approx 36 hours when they hatch. This species lives near estuaries and can tolerate the marine environment. It is most likely that the very small larvae fish enter the estuary where they have access to very small food such as plankton. After the wet season large schools of this species move upstream into fresh waters where they develop into larger fish.

Description

Photograph Neil Armstrong - Male in breeding colours

Diet
This species eats small aquatic and terrestrial insects, aquatic crustaceans such as moina, daphnia and copepods.

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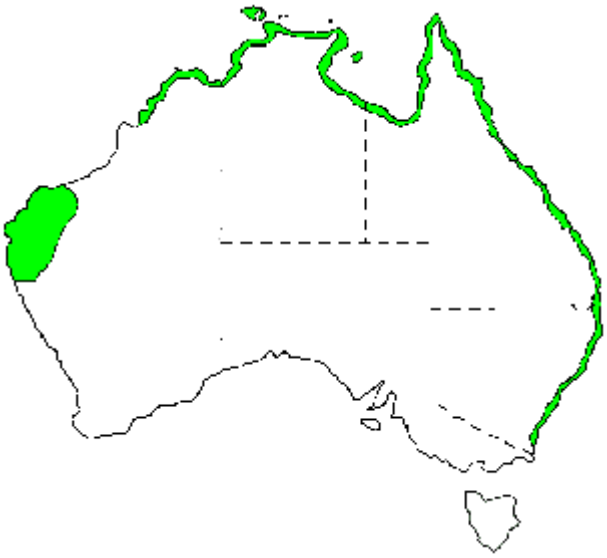
Distribution



Habitat
Creeks, Rivers, Billabongs and swamps close to the sea. Found among aquatic vegetation. Juveniles form large schools after the wet season and move upstream near the edges and accumulate below barriers such as rapids and waterfalls. This migration can be observed in the Howard and Daly Rivers during April and May.

Parks
Kakadu National Park, Litchfield National Park, Djukbinge, Mary River, Shady Camp

Habits
Found in shallow areas among aquatic plants, schools when a juvenile and sub adult.

Notes/ Observations/ Aquarium notes
An excellent aquarium subject especially when mature males display their breeding colours. Will breed in an aquarium but fry are extremely difficult to see or raise to adults. Best fed a prepared diet of 30% prawns, 30% fish fillet and 40% vegetables such as zucchini, green peas, cooked carrot, all blended together with 100 gm of calcium ascorbate per 3kg of finished product. The food can be frozen into flat slabs then pieces broken off each day for feeding.

Contributors: Dave Wilson
Photographer: Neil Armstrong
Photograph details: male specimen in breeding colours
Distribution map: drawn by Dave Wilson from Allen, Midgley & Allen (2002).

References
Larson & Martin (1989) "Freshwater Fishes of the Northern Territory"
Allen, Midgley & Allen (2002) "Freshwater Fishes of Australia"
http://www.fishbase.org (2002)

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Merrick & Schmida (1984) "Australian Freshwater Fishes, Biology and Management"

Common name:	**Spangled Grunter, Spangled Perch**
Scientific name*:*	*Leiopotherapon unicolor*
Order:	Perciformes
Class:	Osteichthyes
Family:	Terapontidae
Status:	Common, secure, not listed IUCN red list
Size:	up to 310 mm but usually about 150 mm

Aboriginal information
Tor Tor (Wagiman language)
Bud/Burd (Mayali)

Kevin Forbes the son of the traditional owner from the Goyder River said this species was special to him and that we were to let it go when caught. Then they sang a special song, which was demonstrated by Sambo Barra Barra a very senior Aboriginal man that was also present at the time.

Breeding
Females produce several thousand (24,000 to 113,000) small eggs that hatch in 1 to 2 days after being laid. Breeds in the build up and early wet season

Description

Diet
Is omnivorous and feeds on small fish, insects, crustaceans, mollusks, worms and takes some plant material.

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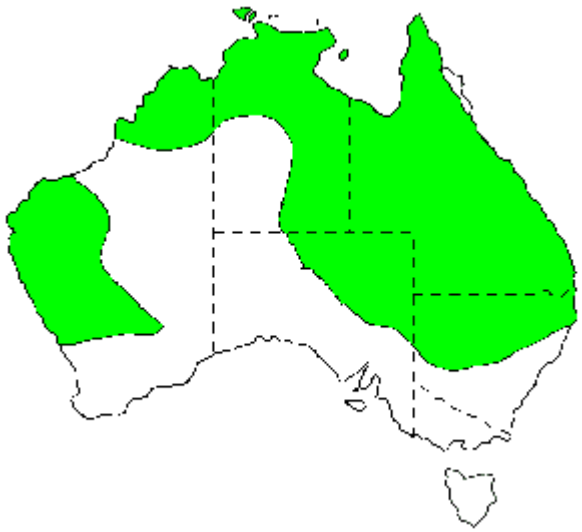
Distribution



Australia's most wide spread species that is abundant in all the locations where it occurs.

Habitat
Inhabits waters from the rainforest to the desert bores under equally variable regimes of salinity (pure fresh to seawater), pH (4.0 to 8.6) and temperature (5° to 44° C).

Parks
Kakadu National Park, Litchfield National Park, Djukbinge, Fogg Dam, Manton Dam, Mary River and Shady Camp.

Habits
A very tough species of fish that is able to travel long distances in shallow water from rainstorms and is able to populate new water very quickly. It is thought to fall out of the sky by some people but its appearance in new storm water is mostly attributed to its ability to travel long distances.

Notes/ Observations
Easily seen in clear waters. It is a very curious fish and will come to the edge to look at the observer.

Aquarium notes
Not a very nice species to use as a community fish, as it is very aggressive. It will chase and harass the other fish in the aquarium. It is easy to keep and will accept most prepared and frozen fish food, but is best kept as a single species.

Contributors: Dave Wilson, Kevin Forbes, Sambo Burra Burra, Ian Morris
Photographer: Pascal Caro

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Map details: Drawn by Dave Wilson from Allen, Midgley & Allen (2002)

References

Larson & Martin (1989) Freshwater Fishes of the Northern Territory
Allen, Midgley & Allen (2002) Freshwater Fishes of Australia
http://www.fishbase.org (2002)
Merrick & Schmida (1984) Australian Freshwater Fishes, Biology and Management

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Common name: Tarpon or Ox-eye Herring

Scientific name*:*	***Megalops cyprinoides*** (Lacepede, 1803)
Order:	Elopiformes
Class:	Teleostomi
Family:	Megalopidae
Status:	Common, not listed under Commonwealth or Territory legislation as threatened.
Size:	grows to 100 cm

Aboriginal information

Language name: Marlarmyan (in Wagiman language)

Breeding

Matures over 300 mm. Breeds in shallow coastal seas or estuaries and is believed to breed in the early wet season in the NT (Merrick & Schmida). The small flat clear lever like larvae penetrate inland from estuaries. These larvae can be found in the coastal drains of the Darwin area during the wet season when the water is flowing.

Description

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Diet
A carnivorous species with prey consisting of small insects, micro crustaceans when juvenile to fish and larger crustaceans when adult, with a preference for fish prey when larger.

Distribution

It occurs in the Tropical Indo-West Pacific region, New Guinea, East Africa, and Society Islands. In Australia it is in all tropical seas adjacent to land. It penetrates inland in freshwater more frequently in more northerly locations.

Habitat
Inhabits estuaries, among mangroves and enters freshwater where it forms schools in lowland billabongs. It penetrates well inland in larger rivers and creeks.

Parks
Kakadu National Park, Litchfield National Park, Djukbinge, Fogg Dam, Manton Dam, Mary River, Shady Camp

Habits
Forms schools in the main channels of rivers and billabongs. It has an auxiliary lung and can be seen gulping air in billabongs. If there are fish kills from low oxygen levels it is usually one fish that can survive longer than others in these poor conditions. Fisheries Scientists usually look for this species when there has been a fish kill. If it survives where others have died it is an indicator that the fish kill may have been from natural causes. That being an increased oxygen demand from decaying vegetation in the build up to the wet season or early wet season when fish kills are common in NT billabongs.

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Notes
Observations: When fishing in larger floodplain billabongs in the NT this fish is easily observed rising to the surface to gulp air. As it leaves the surface there is a tell tale sign of small bubbles rising back to the surface.

Aquarium and Pond notes
Juveniles make an attractive aquarium species but prefer water that is well oxygenated and clean. Their aquarium requires good filtration and water movement. Specimens can be trained to accept freshly thawed fish and prawn bait from the bait shop or aquarium shop. This species also makes a visible and interesting addition to the large tropical garden pond. They become curious and get to know the person who feeds them. Tarpon make an attractive display with Archer Fish and it is good to consider these species for a garden pond in the tropics instead of introduced species that may become a pest species if the garden pond is in a flood prone area.

Contributors: Dave Wilson
Photographer: Rudie Kuiter
Distribution map: drawn by Dave Wilson from Merrick & Schmida

References
Larson & Martin (1989) Freshwater Fishes of the Northern Territory
Allen, Midgley & Allen (2002) Freshwater Fishes of Australia
http://www.fishbase.org (2002)
Merrick & Schmida (1984) Australian Freshwater Fishes, Biology and Management

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Common name: Chequered Rainbowfish

Scientific name*:*	***Melanotaenia splendida inornata*** Peters 1866,
Family:	MELANOTAENIIDAE
Order:	Atheriniformes
Class:	Osteichthes
Status:	Common within its range, DEH – secure On the list of Fed Gov exempt species. Export of aquaculture specimens is permitted.
Size:	Grows to 130 mm

Aboriginal information
Language name: Rembarunga (Bulman, Beswick area NT)
Fish Name: all rainbowfish - werretje
Traditional uses: None known

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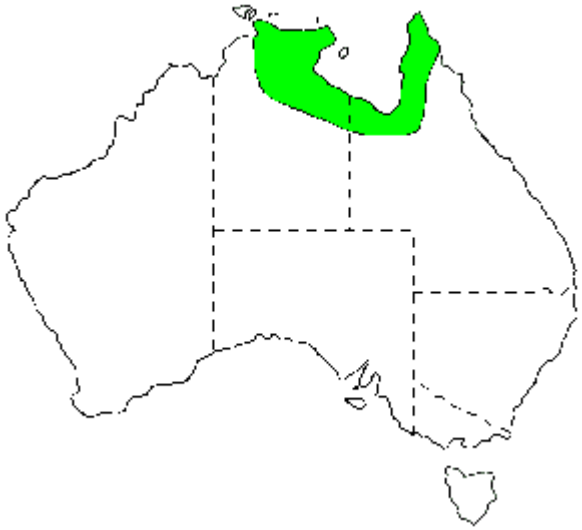
Breeding
Males select a site near some aquatic vegetation and display to females by flicking fins and swimming rapidly around, back and forth trying to move the female toward the selected area. Approx 40 to 100 are laid each day while conditions are good.

Description
A deep bodied rainbowfish with mostly green and yellow with a darker chequered pattern. The colours and shape vary from very bland looking specimens from the Charloette River NT to rather spectacular looking colourful examples from Central Arnhem land. Some colour forms have red colouration in the fins and on the rear of the body.

Diet
Chequered Rainbowfish eat algae, aquatic plants, aquatic and terrestrial insects, small aquatic crustaceans such as moina, daphnia and cyclops.

Distribution



Habitat
Streams, Rivers and Billabong in backwaters out of the current near aquatic vegetation.

Parks
Kakadu National Park, Djukbinge, Fogg Dam, Manton Dam, Mary River, Shady Camp.

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Habits
This species appears to prefer large still bodies of water such as billabongs even though it occurs in creeks and rivers where it inhabits the quieter backwaters. It is common in heavily planted shallow billabongs within its range and appears to be more tolerant of lower oxygen levels than some rainbowfish such as the banded rainbowfish.

Notes/ Observations/Aquarium notes
It is an easy species to keep in an aquarium but will grow over 100 mm in length. When it is this size it needs an aquarium over 60 cm wide to be comfortable. It can tolerate a wide range of water qualities. A planted aquarium with some clear swimming space is preferred but the species will eat aquatic plants. Captive diet should include a good quantity of vegetable material. A prepared diet of 30% prawns, 30% fish fillet and 40% vegetables such as zucchini, green peas, cooked carrot, all blended together with 100 gm of calcium ascorbate per 3kg of finished product will keep your fishes very healthy. The food can be frozen into flat slabs then pieces broken off each day for feeding.

Contributors: Dave Wilson
Photographer: Neil Armstrong
Photograph details: 72 DPI, 640 pixels X 480 pixels, Pic file
Map details: dawn by Dave Wilson from Allen Midgley and Allen

References
Larson & Martin (1989) "Freshwater Fishes of the Northern Territory"
Allen, Midgley & Allen (2002) "Freshwater Fishes of Australia"
http://www.fishbase.org (2002)
Merrick & Schmida (1984) "Australian Freshwater Fishes, Biology and Management"

Common name:	**Black-banded Rainbowfish**
Scientific name*:*	***Melanotaenia nigrans*** Richardson, 1843
Family:	MELANOTAENIIDAE
Order:	Atheriniformes
Class:	Osteichthes
Status:	Common within its range, DEH – secure On the list of Fed Gov exempt species. Export of aquaculture specimens is permitted.
Size:	grows to 10 cm

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Aboriginal information
Language name: Rembarunga (Bulman, Beswick area NT)
Fish Name: all rainbowfish - werretje
Traditional uses: None known

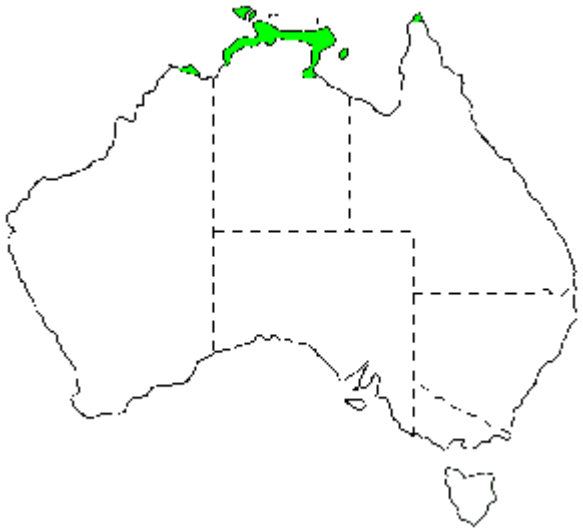
Breeding
Males select a site near a wood or rock feature or some aquatic vegetation and display to females by flicking fins and swimming rapidly around, back and forth trying to move the female toward the selected area. Approximately 40 to 100 eggs are laid each day while conditions are good.

Description

A slender bodied rainbowfish with yellow, mauve or red on the fins with a bronze or grey coloured body. It has one very distinct dark lateral line running from tip of snout centrally to the end of the caudal penduncle.

Diet
It eats aquatic and terrestrial insects, algae and small crustaceans such as moina and copepods.

Distribution



Rapid Creek NT. Scotts Ck NT, Adelaide River NT, Mary River NT, Kalumburu WA

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Habitat
Rivers, creeks and billabongs close to the coast. Rocky creeks on top of the Litchfield escarpment in the NT.

Parks
Kakadu National Park, Litchfield National Park, Djukbinge, Fogg Dam, Mary River

Habits
A schooling fish, that accumulates below small rapids. It is common in the upper reaches of non-permanent streams. They seem to repopulate the streams in the wet season each year.

Notes
Appears to be more abundant just after the wet season where hundreds of thousands of individuals congregate at the road crossing of Scotts Creek in Djukbinge National Park. This species has been promoted as a local mosquito larvae control agent by the NT Department of Health.

Aquarium notes
Easy to maintain popular Australian rainbowfish among growing numbers of Australian native fish enthusiasts worldwide. Very easy to breed in captivity.

Photographer: Gunther Schmida
Photograph details: 72 DPI, 1024 pixels X 683 pixels, Pic file
Map details: drawn by David Wilson from Allen Midgley and Allen

References
Larson & Martin (1989) "Freshwater Fishes of the Northern Territory"
Allen, Midgley & Allen (2002) "Freshwater Fishes of Australia"
http://www.fishbase.org (2002)
Merrick & Schmida (1984) "Australian Freshwater Fishes, Biology and Management"

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Common name: Purple Spotted Gudgeon or Northern Trout Gudgeon

Scientific name:	*Mogurnda mogurnda*
Order:	Perciformes
Class:	Osteichthyes
Family:	ELEOTRIDAE
Status:	Secure, very common
Size:	up to 200 mm but usually less than 120 mm

Aboriginal information
Not known.

Breeding
The pair select a site on an area that has a hard clean surface, then they spend considerable time cleaning the site, then the female lays a patch of eggs that the male guards and fans with his fins until they hatch.

Description

Diet
Adult fish prey upon insects, crustaceans, worms, molluscs, fish and plant material.

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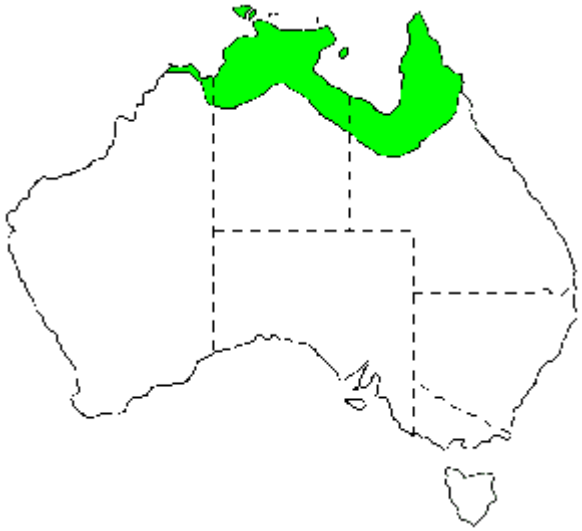
Distribution



Northern Australia and Southern New Guinea.

Habitat
Rivers, creeks, billabongs, shallow swampy areas in aquatic vegetation and up on the rocky escarpments.

Parks
Kakadu National Park, Litchfield National Park, Djukbinge, Fogg Dam, Manton Dam, Mary River and Shady Camp

Habits
This is an explorer fish that penetrates far into new waters and climbs into places that would seem impossible. They are on top of all the escarpments where there is only two or three species of fish present.

Notes/ Observations
These fish have been seen climbing fog dam when the water runs over the wall from wet season rains. They climb in the very shallow water among the grass with most of their bodies out of the water. They are also reported to climb waterfalls.

Aquarium notes
An easy to keep and interesting subject in an aquarium that will accept prepared frozen shrimps and fish. It is a fish that always looks for a way out when new in the aquarium and will jump out onto the floor if no lids are placed on top. After they settle it may be many months but when there is a thunderstorm or rainstorm they will try to escape and jump out of the aquarium so it is wise to keep the aquarium covered at all times. They are one of the easiest small fishes to breed in captivity.
Contributors: Dave Wilson
Photographer: Neil Armstrong
Map details: Drawn by Dave Wilson from Allen, Midgley and Allen (2002).

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References
Larson & Martin (1989) Freshwater Fishes of the Northern Territory
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http://www.fishbase.org (2002)
Merrick & Schmida (1984) Australian Freshwater Fishes, Biology and Management

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Common name: Hyrtl's catfish, Hyrtl's Tandan, Yellow-fin Catfish

Scientific name**:**	*Neosilurus hyrtlii*
Family	PLOTOSIDAE
Order:	Siluriformes
Class:	Osteichthyes
Status:	Common. Not on IUCN red list
Size:	usually about 150 to 200 mm but up to 340 mm

Aboriginal information
Nail fish (English language word)
Juborin (Wagiman language)

Breeding
It is said to breed in the beginning of the wet season. Nothing much is known about their breeding behaviour. Aquarium observations have up to 4 or 5 swimming nose to tail rapidly among the aquatic vegetation. This behaviour may indicate group spawning among the aquatic plants.

Description

Diet
An Omnivore that eats a range of small aquatic insects, crustaceans, worms and some detritus.

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Distribution

A very common species with a large distribution.

Habitat
Wetlands, Small creeks, billabongs and pools.

Parks
Kakadu National Park, Litchfield National Park, Djukbinge, Fogg Dam, Manton Dam, Mary River and Shady Camp.

Habits
Is mostly nocturnal and forages along the bottom for food. Large schools of this fish form at barriers in streams after the wet season.

Notes/ Observations
It has three strong spines on the dorsal fin and pectoral fins. These spines are sharp and can inflict a painful wound. There is mild venom associated with these spines and the pain from a sting lasts for a couple of hours.

Aquarium notes
A fine species for the large community Aquarium with native fish. It mostly inhabits the bottom one third of the aquarium.

Contributors: Dave Wilson
Photographer: Neil Armstrong
Map details: drawn from Allen, Midgley and Allen by Dave Wilson

References
Larson & Martin (1989) Freshwater Fishes of the Northern Territory
Allen, Midgley & Allen (2002) Freshwater Fishes of Australia
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