internal report 424

Freshwater fish of the Top End: Biogeography, ecology and conservation

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supervising scientist

Freshwater fish of the Top End:

biogeography, ecology and conservation

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Background

This seminar was presented to the Northern Territory Field Naturalists Club on 11 June 2003. It was followed by a field day to Howard Springs Reserve and Howard River where 11 club members discovered the pleasures of identifying fish from the bank, under water observation from the *eriss* visual count boat and collecting small fish with a seine net and getting up close and personal with them in small aquaria. They encountered 14 species for the day out of a likely list of 20 species.

Most of the fish photographs were purchased by *eriss* from Gunther Schmida. Other photos were borrowed from Allen et al. (2002).

What is a freshwater fish?

- Many fish species found in freshwater do not and/or cannot breed there and they can differ widely in their levels of tolerance to salinity
- Scientific definition of a *freshwater fish* is, as a result, confusing

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What is a freshwater fish?

- Primary freshwater fish
- Secondary freshwater fish
- Diadromous fish
- Marine Vagrants

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Primary Freshwater Fish

- Species confined to freshwater that have evolved from freshwater ancestors
- Most groups evolved early in evolution of bony fishes - Devonian era
- 2000 out 8000 freshwater fish of this type world wide
- Only 4 out of 302 species in Australia
- One in NT – saratoga
- Others – southern saratoga and lungfish in Qld and Ledidogalaxias in SW WA

The Top End's only Primary freshwater fish

Saratoga (Guluibirr) ***Scleropages jardinii***

What is a freshwater fish?

Secondary freshwater fish

- Fish confined to freshwater that have evolved from marine fish ancestors
- Many have some limited tolerance to higher salinities and may occur briefly in estuaries
- The freshwater species of these families have evolved at various times comparatively recently in geological time scale
- Most Australian freshwater fish of this type
- 202 species in Australia and 62 in the NT

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What is a freshwater fish?

Diadromous fish

- *Catadromous* – breed in marine waters and early or all growth phase in freshwater
  - Eg. Barramundi, tarpon in top end;
  - mullet, bass, herring & eels in east Australia
- *Anadromous* – breed in freshwater and growth phase in salt water eg salmon - lampreys and Tasmanian smelt in Australia
- *Amphidromous* – migration in either direction NOT related to breeding

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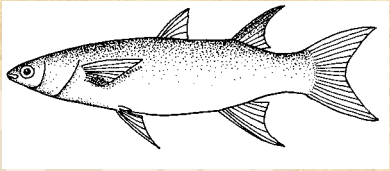
Catadromous fish in the NT

Barramundi (Na-marngorl)
Lates calcarifer



Ord River mullet (Madjaba)
Liza alata

Tarpon (Garlalba)
Megalops cyprinoides

Indian short-finned eel
Anguilla bicolor

What is a freshwater fish?

Marine vagrants

- Marine or estuarine fish that move between fresh and marine waters on an irregular basis
- Euryhaline species – extremely tolerant of differing salinities
- Many fish of this type in Australian freshwaters
- Sharks, rays, scats, mangrove jack, gudgeons and gobies

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Marine vagrants – sharks and rays

Bull shark/river whaler
Carcarhinus leucus

Spear tooth sharks
Glyphis spp.

Freshwater saw shark
Pristis microdon

Freshwater whip ray
Himantura chaophrya

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Some other common marine vagrants

Spotted Scat
Scatophagous argus

Silver biddy
Gerres filamentosus

Mangrove Jack
Lutjanus argentimaculatus

Adult

Juvenile

Spangled gudgeon
Ophiocara porocephala

Biogeography

- The 200 species of freshwater fish in Australia, excluding vagrants and diadromous spp., is very low for the size of the land mass – One lake in Cambodia has 1200 species!
- Low species richness in Australia related to lack of water, BUT
- Species richness in relation to catchment size is similar to rivers elsewhere (Bishop and Forbes 1989)

- Freshwater fish fauna of temperate and tropical Australia are very different and dominated by very different families
- **Temperate** – Galaxiids (17 spp) and Percichthyidae (bass, cod, perch; 23 spp.)
- **Tropical** – Rainbowfish (15 Spp) and Grunters (25 spp)

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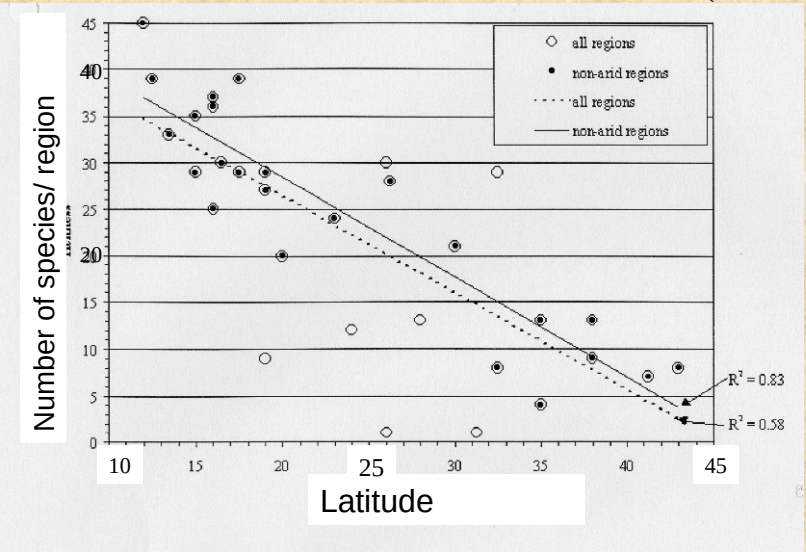
Species richness of Australian freshwater fish at different latitudes

(Unmack 2001)



•The **species richness** in different drainage systems decreases with increasing latitude with greatest number on Cape York (45) and Timor sea drainages (39)

•Pattern possibly related to diversity of potential marine colonisers

Australia and New Guinea affinities

- The freshwater fish fauna of northern Australia is very similar to southern New Guinea with many of the same families
- New guinea has many more spp (330 spp), but
- Many species occur in both areas

  - 33 spp from North Aust in New Guinea
- Explained by past land connections and changes in sea level over last 20,000 years

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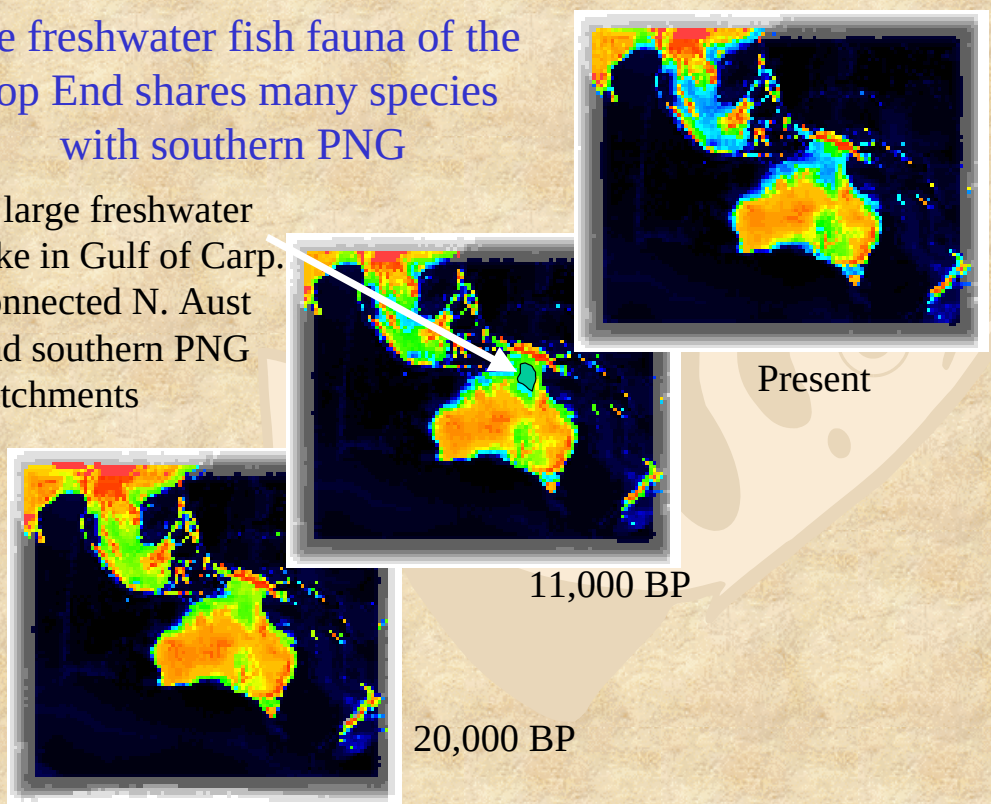
The freshwater fish fauna of the Top End shares many species with southern PNG

- A large freshwater lake in Gulf of Carp. connected N. Aust and southern PNG catchments



Present

11,000 BP

20,000 BP

Gondwanaland

- The oldest fossil freshwater fish found in Australia are relatives of the lungfish and Saratoga indicating their presence at the time of Gondwanaland 300mya. These species are therefore the *oldest* fish residents of freshwater
- The most *primitive* fish in Australia are the jawless lampreys, not saratoga or lungfish
- Saratoga relatives occur today in NG, SEA, India , Africa and S. America (the amazonian Arowana is reputed the largest of all freshwater fish)
- The S Aust galaxiidae and percichthyidae are also confined to Southern Hemisphere continents suggesting a Gondwanaland connection and a long history in Australia

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Secondary freshwater fish of the Top End

- Photos. Names (English, Gunjehmi and Scientific) and where they occur

Fork Tailed Catfish (Ariidae)

Shovelhead catfish, silver cobbler *Arius midgleyi*

Salmon catfish (Al-makawarri) (*Arius leptaspis)*

Blue catfish *Arius graeffei*

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Eel tailed catfish *Plotosidae*

4 common species in top end

Black catfish, Binjdjarrang *Neosiluris ater*

Rhendahl's catfish, Ganbaldjdja ?? *Porochilus rendahli*

Toothless catfish, Nagurl *Anodontiglanis dahli*

Hyrtl's catfish, Ganbaldjdja *Neosiluris hyrtlii*

Herrings *Clupeidae*

Bony bream
Nematalosa erebi

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Cardinal fish *Apogonidae*

Mouth-all-mighty
Glossamia aprion

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Grunters *Therapontidae* *24 species in Australia,* 5 common species in Top End, 3 highly restricted spp, 3 others

Sharpnose or Butler's grunter Durnbumanj
Syncomistes butleri

Spangled grunter, Burd
Leiopotherapon unicolor

Midgleys or black analfin grunter
Pingala midgleyi

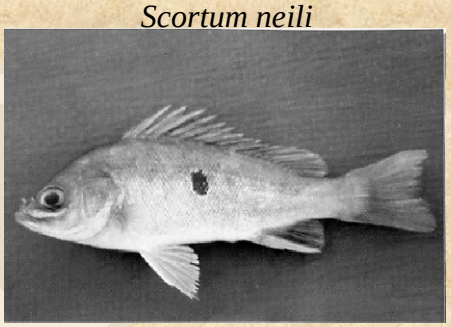
Banded grunter, Mandidi
Amniataba percoides

Sooty grunter, Durnbumanj
Hephaestus fuliginosus

Grunters continued: Restricted species

Coal grunter *Haephaestus carbo*

Angalari grunter
Scortum neili



Finnis River grunter
Pingalla lorentzi

Other territory species

Western sooty grunter *Hephaestus jenkinsi*

Barcoo grunter *Scortum barcoo*

Gulf Grunter *Scortum ogilbyi*

Longtoms or needlefish *Belonidae*

Freshwater longtom *Strongylura krefftii*

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Archerfish *Toxotidae*

Common archerfish
Toxotes chatareus

Primitive or Lorentz archerfish
Toxotes lorentzi

Glassfish ***Ambassidae***

Mullers glassfish
Ambassis mulleri

Sailfin glassfish
Ambassis agrammus

Reticulated glassfish
Ambassis macleayi

Pennyfish *Denariusa bandata*

Rainbowfish *Melanotaeniidae*

Endemic to Australia (15 spp) and New Guinea 50(spp)

Black-banded rainbowfish
M. nigrans

Chequered rainbowfish, Dilebang
Melanotaenia splendida inornata

Western rainbowfish,
M. australis

Northern rainbowfish
M. solata

Other less common Rainbowfish

Banded rainbowfish,
Melanotaenia trifasciata

Exquisite rainbowfish,
M. exquisita

Macculloch's rainbowfish,
M. maccullochi

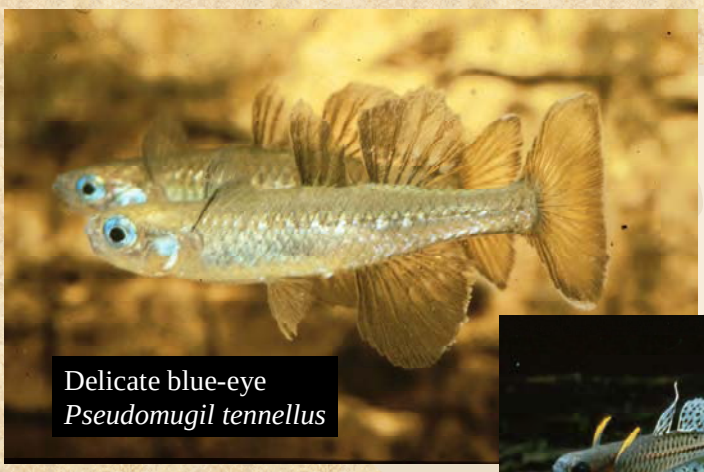
Threadfin rainbowfish,
Iriatherina werneri

Hardyheads *Atherinidae*

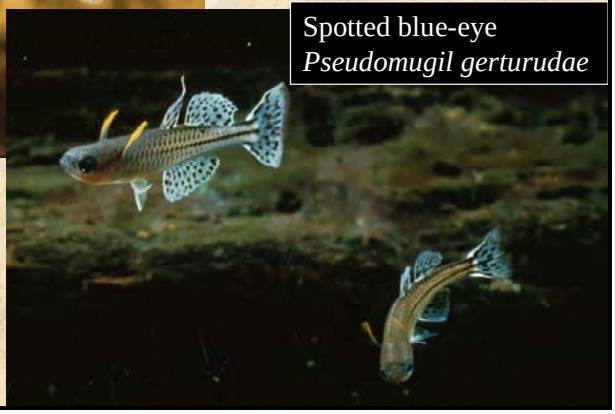
Mariana's hardyhead
Crateroceph alus marianae

Fly-specked hardyhead
Crateroceph alus stercusmuscarum

Blue-eyes *Pseudomugilidae*



Delicate blue-eye
Pseudomugil tennellus

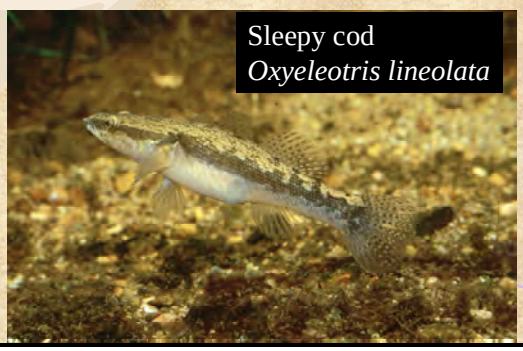


Spotted blue-eye
Pseudomugil gerturudae

Gudgeons *Eleotridae*

Giant gudgeon
Oxyeleotris selheimi

Purple spotted gudgeon
Mogurnda mogurnda



Sleepy cod
Oxyeleotris lineolata

Gudgeons *Eleotridae*

Empire gudgeon
Hypseleotris compressa

Dwarf gudgeon
Oxyeleotris nullipora

Freshwater soles *Soleidae*

Tailed sole *Azerragodes klunzingeri*

Salt pan sole *Brachirus selheimi*

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One gilled eels Synbranchidae

One gilled eel *Ophisternon gutterale*

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Gobies Gobiidae

Flathead goby *Glossogobius giuris*

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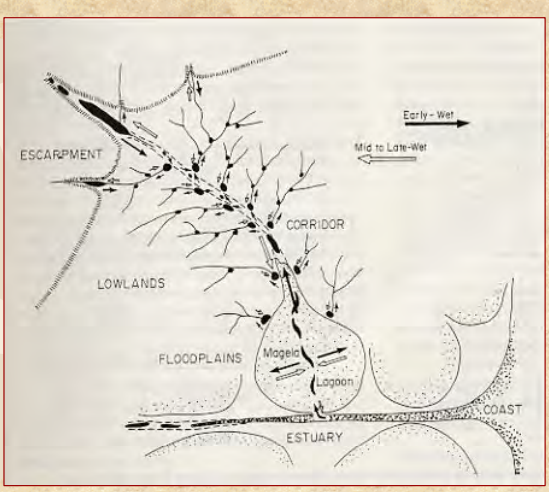
Behaviour and Ecology

The wet-dry cycle of rainfall has a marked effect on fish behaviour.

- In the Dry season many rivers cease flowing and dry to a series of pools.
- The reliable annual rains connect river channels with large areas of off-stream wetlands.
- Fish disperse in a regular pattern to utilise the abundant wet season resources and retreat to dry season refuges



Fish movement patterns in Magela Creek, NT

Migrations

Some species move only along the stream channels and rarely enter the floodplain zone

- Sooty grunter, sharp-nose grunter, Midgley's grunter, mariana's hardyhead

Some species remain in their dry season habitat

- Exquisite, western and banded rainbowfish, Coal grunter in upland streams

Many/most species move into all available habitats during the wet and can found the entire length of the river system

Large migrations of fish from floodplain zones can occur during the late wet (Rainbowfish and glassfish) and at the end of the wet as water disappears (many species)

Reproduction

Some small species can breed year round (rainbowfish and fly specked hardyheads)

Most fish are highly seasonal and time their spawning to take advantage of the food and protection for young fish provided by the newly inundated wetlands at the start of the wet season

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Diet

Most fish are carnivorous but there are a number of omnivorous and herbivorous species

Herbivore/detritivore	Mullet, midgley's and sharp-nose grunters
Omnivores	Rainbowfish, blue-eyes, bony bream, ariid catfish, sooty, banded and spangled grunters
Small carnivores	Glassfish, hardyheads, purple spotted and empire gudgeon, eel-tail catfish, gobies
Insectivore	Archerfish
Large carnivores	Saratoga, barramundi, tarpon, longtom, sleepy cod, sharks

Fish community structure – depends on sampling methods

Fish numbers detected by different sampling methods in Jim Jim Creek

Scientific Name	Gill-netting	Seine-netting	Visual count*
Neosilurus ater	92	0	25
Nematalosa erebi	76	0	6
Syncomistes butleri	24	0	35
Megalops cyprinoides	29	0	0
Scleropages jardini	27	0	0
Anodontiglanis dahli	25	0	44
Neosiluris hyrtlii	22	0	5
Hephaestus fuliginosus	5	0	38
Arius leptaspis	4	0	0
Lates calcarifer	3	0	11
Toxotes chatareus	4	0	0
Arius midgleyi	1	0	0
Pingalla midgleyi	64	2	45
Leiopotherapon unicolor	45	5	28
Amniataba percoides	122	17	45
Strongylura kreffti	23	1	2
Ambassis macleayi	8	5	0
Glossamia aprion	5	1	1
Melanotaenia splendida inornata	62	376	289
Craterocephalus marianae	0	2313	439
Melanotaenia nigrans	0	321	106
Craterocephalus stercusmuscarum	0	261	267
Ambassis agrammus	0	34	24
Glossogobius giuris	0	18	0
Mogurnda mogurnda	0	3	1
Pseudomugil gertrudae	0	3	7
Denariusa bandata	0	0	1
Total No. of Species	**19**	**14**	**20**

*only made before road opened

Conservation issues for freshwater fish

Habitat management

- Water quality - pollution management
- Water flows – adequate volume & natural flow patterns
- Dispersal barriers – dams , weirs, roads
- Riparian zone – stream bed stability and trophic processes
- Catchment – erosion minimisation and weed control

Animal management

- Harvest – regulation
- Exotic animals – quarantine import control, eradication
- Translocation of native species – conservation of natural gene pools
- Disease – control of exotic diseases – quarantine regs

Field day options

Option 1

1. Howard springs reserve – bankside observation and snorkelling
2. Howard River crossing – collection of small fish,
   Angling for larger fish ?, Observation from bank,
   Observation from customised boat
3. Howard River wetlands – fish collection

Option 2

1. Wildlife Park aquarium tour
2. Berry springs reserve- snorkelling & bank observation
3. Darwin or Blackmore River – fish collection and boat observation

Bring

Mask and snorkel
Shoes for wading in water
Polaroid glasses or other sunglasses
Hat, sunscreen, tucker and yourself

Thank you