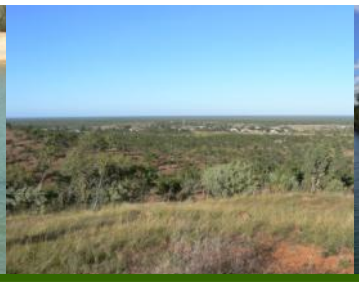
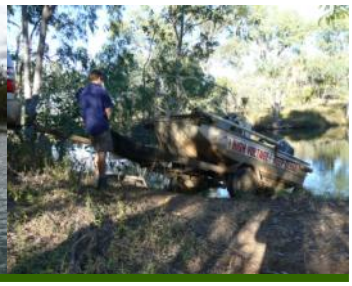
Freshwater fish and bugs in the Gilbert River



Inside :

Special points of interest:

- 1557 fish measured
- 38 fish species found
- 9 fish species recorded for the first time in the Gilbert
- 2 totally new species and 3 requiring further investigation
- 3599 "bugs" collected
- 75 families of aquatic invertebrates (bugs)

Collecting the facts

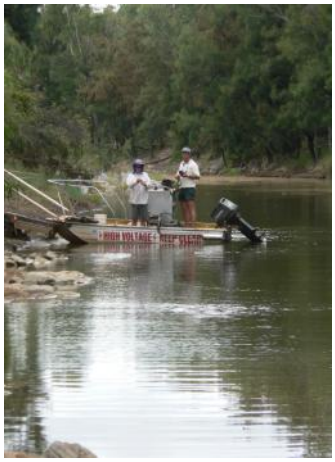
During June 2006, the *Department of Primary Industries and Fisheries* (DPI&F) and *Ecowise Environmental Pty Ltd* surveyed the fish and visible aquatic invertebrates (bugs) in the Gilbert River catchment. The survey was initiated by the Northern Gulf Regional Management Group (NGRMG) to address the lack of knowledge of the diversity of life in the region's waterways.

Over a 10 day period, 20 sites were sampled to identify the visible bugs, which fish and how many lived there, and how healthy the catchment was at the time. While the trip was hectic and involved being bogged, bush bashing, crocodile wrestling and of course catching fish, the scientists enjoyed fantastic local hospitality and support, for which we were most grateful.

In this newsletter you will find out how an electrofisher works, how we determined the health of the Gilbert River catchment and why aquatic habitat is important. This is a quick summary of the findings and an explanation of the importance of maintaining river flows and floods. A much more detailed report is available from the NGRMG office.

So whether you are keen fisher, a budding naturalist or just interested in the water quality and aquatic biodiversity of the local area, something in this short newsletter will interest you.

The information gathered will assist the NGRMG and locals to make and contribute to management decisions for the northern Gulf region.



Surveying near Mt Surprise

Gilbert catchment clean and healthy

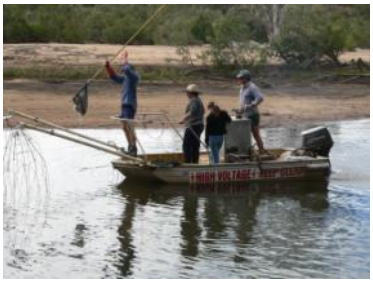
The fish and invertebrate community, water quality and aquatic habitat in the Gilbert catchment are in a very healthy state. The obvious threats to this healthy status are weeds and feral pigs. Weeds can smother trees and grazing land. Pigs destroy river and lagoon banks and degrade water quality.

The technical report from this study will assist the NGRMG to access funds to reduce weed and pig infestations.

At the sites surveyed, current pasture condition had no obvious influence on fish diversity or abundance or water quality.

However any changes in water management practices will need careful consideration as river flows are the single most important factor influencing catchment health.

Attempting to get the boat to the water



Station owners/managers participated in sampling at most sites

Increasing local awareness

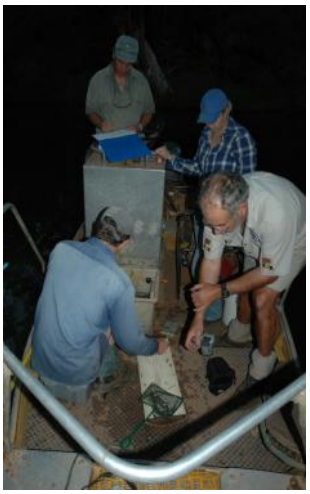
An important part of this project was to increase the capacity of NGRMG staff and Gulf residents to understand and become familiar with the different ways to describe and assess catchment condition.

Several members of the NGRMG, local residents and landholders participated in field sampling which provided them with basic aquatic ecology skills. This included identification of fish and bug species, measurement and interpretation of water quality and basic habitat assessments.

All landholders were supplied with a written summary of aquatic habitat, water quality and fish species found in their waterbodies.

Feedback from participants was extremely positive and requests for return visits have been received.

The skills learned will assist landholders to develop farm management plans and to understand "jargon" often used by government consultative committees.



Savannah guides also participated in sampling

Backpack electrofisher in a small waterbody

Catching fish with electricity

"it's powerful enough to kill a human yet fish are only unconscious for up to 90 seconds"

Electrofishing is the best way to capture large numbers of fish quickly with no harm to the fish. We use two types of electrofishers. For very small waterbodies we have a backpack unit powered by a battery, and for everywhere else, a boat mounted unit powered by a 7.5KVA generator.

Electrofishing only works in freshwater. Many factors influence its effectiveness, including water hardness, water temperatures and operator skill. It is not as easy as it looks and requires lots of experience to pick the most effective settings to collect whatever fish are present. An electric current basically anaesthetizes fish. We use up to 1000 volts and 7 or more amps, more than enough to kill a human, yet fish are only unconscious for up to 90 seconds. And before you ask, yes it does stun crocodiles … briefly!

Fish were identified and up to 20 of each species measured and recorded then returned unharmed to the water.

Any fish that were "new" or different were preserved and sent to the Queensland Museum for positive id.

What about river frontage land condition?

"Most pleasing was the lack of urban rubbish"

At each site the condition of land adjacent to the waterbody was assessed using the ABCD rating system adopted by the Grazing Land Management (GLM) project (A = excellent to D = poor). Our assessment was reviewed by a member of the GLM team (Kev Shaw) from photos. While most sites had good ground cover because a good "wet" had just finished, a lot of it was weeds and grass species not desired by the grazing industry. This meant most sites were rated C. The best rating was a B and two sites rated D.

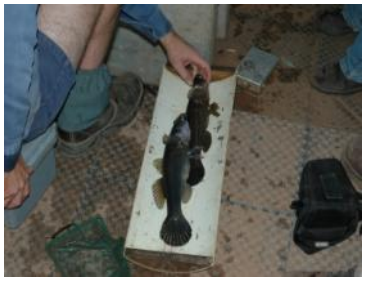
The greatest disturbance to river banks was caused by pigs which contributed to the sites with a "D" rating. Unfortunately this damage is difficult to manage.

No link was found between GLM land condition, water quality, fish distribution or abundance. Whether this remains the same throughout the year is unknown.

What was noticeable throughout the catchment was the absence of rubbish. Obviously the community cares about its catchment.

Where are the fish?

Fish captured during ten minutes



Sleepy cod being measured

While site specific data was kept confidential by request, trends within the fish population on a catchment scale were obvious. No secret fishing spots revealed in this segment … sorry.

Barramundi were scarce in the middle to upper reaches of the catchment despite suitable habitat. The timing and size of the wet season may influence how far and where barramundi travel. It appears that in 2006, barramundi were limited to areas less than 195m above sea level (AHD).

Only two fish species were found at all sample sites: spangled perch and rainbowfish. Five fish species were found only above 195m AHD while 12 species were only found below.

The most widespread and common species of interest to anglers include sleepy cod, archerfish, sooty grunter, gulf grunter and barramundi. There were also eight different species of catfish.

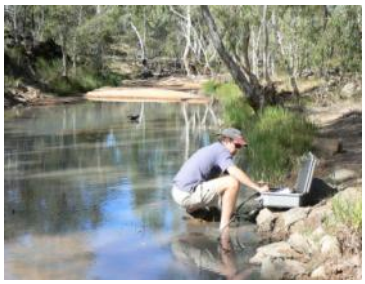
Three species, the Papuan river sprat, northwest glassfish and freshwater anchovy, were only found in offstream lagoons.

Sites closer to the coast tended to have a greater number of fish species.

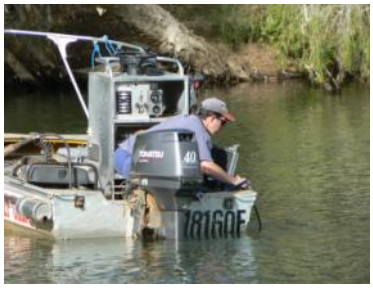
Even more species are likely to exist in the lower reaches of the Gilbert River. However wet weather prevented access.

The great news was that no feral or exotic fish were detected.

Water quality and habitat "excellent"



Water quality monitoring



Water quality across the catchment was generally excellent. One spring had surprisingly low conductivity (almost as pure as rainwater).

Conductivity is basically a measurement of dissolved minerals. Spring and bore water normally contains high levels of dissolved minerals and is classified as "hard". The reasons for such a low reading are a mystery.

Dissolved oxygen, pH, temperature and turbidity (water clarity) were also measured. Water in offstream lagoons tended to be cloudier than the instream waterholes. This is usually because floodplain lagoons are filled by sediment laden floodwaters.

Dissolved oxygen is critical to aquatic life. All sites had good levels of oxygen. We found that the wider the water body, the more oxygen there was in the water and the more species it contained.

Fish habitat was excellent at most sites, with overhanging trees, snags and aquatic plants plentiful. Erosion and siltation was generally low with the exception of one site which had major pig damage. The banks had been uprooted and the water quality was also lower than at similar sites.

Floods and flows are vital

According to historical records, rainfall is surprisingly evenly distributed across the Gilbert catchment. There is distinct seasonality though, with most rain falling between November and March. This does not always translate to regular river flows. The only months to always have some flow are February and March. There may be multiple flood peaks in between low or no flows.

What does this mean for fish?

Fish within the Gilbert catchment require both flood peaks and a good steady flow in the river to move about, spawn and access permanent water to sustain them through the dry season. Reduced floods or flows will reduce fish distribution, abundance and diversity. The timing of the flows is also important to species such as barramundi that move between salt and freshwater. If flows are too early or late they miss the chance to migrate downstream to spawn and the juveniles don't get an opportunity to migrate upstream and across floodplains.

Managers (this includes landholders) of streams within the catchment require a good understanding of the flow characteristics and their relationship with aquatic ecology. Any development that is likely to change the flow of streams within the Gilbert catchment needs to be thoroughly assessed for potential impacts on the aquatic environment.

Typical small aquatic macroinvertebrate animals that live in the Gilbert River. (Photo: Ecowise Environmental)

Aquatic Macroinvertebrates (visible water bugs)

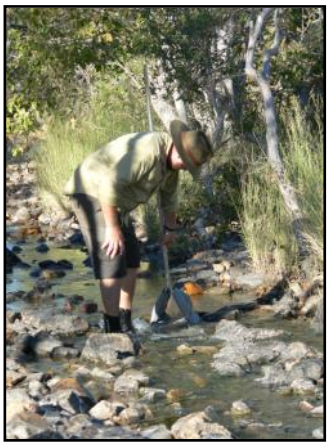
The Aquatic Fauna Biodiversity Survey conducted for the NGRMG in June 2006 focused on both fish and aquatic macroinvertebrates at 20 sites in the Gilbert River Catchment. Whilst we all know what fish look like (and how tasty they can be) very few of us are familiar with aquatic macroinvertebrates, the small aquatic animals without backbones that live in the waterways of the region and comprise insects, bugs, beetles, shrimps, worms and snails (amongst other groups). They inhabit the water column, stream bed, aquatic plants, logs and rocks and form a very important part of the ecology of our waterways. Their survival and well-being is crucial for the long-term survival of fish and waterbirds, many of which use bugs as a primary food source.

Across Australia and overseas, biologists have found that the diversity (i.e. range of different species) and abundance (i.e. numbers of animals) of aquatic macroinvertebrates can provide an accurate measure of the health and condition of our waterways. Essentially, the greater the diversity and abundance of aquatic macroinvertebrates the healthier the waterway. Long term monitoring will show any changes to the health of our waterways.

The current study conducted by **Ecowise Environmental** for the NGRMG had two main aims. Firstly, to find out just what lived in the Gilbert River catchment, as few studies have been conducted in the past in this region. Secondly, to determine the health and condition of the waterways in the catchment. The end point of all of this important information is the sustainable management of the region's precious water resources and the animals, industries and people that rely on that water.

Sampling for Aquatic Macroinvertebrates

Collecting aquatic macroinvertebrates is relatively easy. A specially designed sweep net is all that is required. The still water environments along the *edge* habitat, and where available, the flowing water *riffle* habitat (i.e. shallow main channel section with a coarse sand/ rocky substrate) were sampled. A nationally recognised, standard sampling method was used which aimed to consistently collect the widest diversity of macroinvertebrates at each site in a reasonable timeframe. Once collected, the bugs were live picked in the field, preserved, and returned to the laboratory for positive identification and counting.



Sampling for aquatic macroinvertebrates using a sweep net and picking live bugs on the river bank

(Photo: Ecowise Environmental)

What Did We Find?

During this project, a total of 20 sites were sampled covering approximately 38,000 km² of catchment. A total of 75 macroinvertebrate families and 3,599 individuals were collected.

The aquatic macroinvertebrate data was analysed using a series of sophisticated tools including modelling and a range of complex statistical routines. The results from this analysis showed that the aquatic macroinvertebrate fauna were diverse and generally characteristic of a healthy ecosystem. The Gilbert River catchment is therefore considered to be in good to excellent condition with a high number of macroinvertebrate taxa present, good water quality, and reasonable physical habitat characteristics. This applied across the entire catchment from the upper reaches to the lower regions. Only one of the 20 surveyed sites was considered to be in relatively poor health in terms of macroinvertebrates and water quality.

No obvious differences were observed in macroinvertebrate community structure between offstream natural lagoons (4 surveyed), springs (2 surveyed) and instream pools (14 surveyed). All sites showed similar diversity and relative abundance values, with key influences being the diversity and quality of instream habitat. Similar patterns of macroinvertebrate diversity were also observed when the current survey data for 2006 was compared with historic data collected by the Department of Natural Resources and Water from the Gilbert catchment in 2003 and 2004. Ecosystem health ratings were consistent across sampling events indicating that the catchment and waterways have been relatively stable and in good condition for at least the last three years.

Have you ever wondered where the animals go when there is no water?

The Gilbert River is an intermittent temporary stream which flows only after substantial rainfall. It dries up to a series of pools and waterholes with large sections of dry sandy stream bed (Photo: Ecowise Environmental).

Whilst on the surface the pools and waterholes in a stream appear isolated, in reality they are closely and intricately connected through the saturated sediments below and beyond the banks of the stream. This zone is called the hyporheic zone and the animals living in it are called hyporheos. This sub-surface zone is critical for the survival of many macroinvertebrates during the dry season and for the maintenance of water quality. Aquatic macroinvertebrates exhibit a range of strategies for surviving the dry period in temporary streams including mobile adult stages, desiccation resistant eggs or larval stages, burrowing and hibernating, utilising moist leaf litter, and of course surviving in the last remaining permanent waterholes and pools until the next major rainfall event. The sub-surface zone is a region of dynamic exchange of water and materials between the groundwater, under bank aquifers and the river flowing above. When the river stops flowing the subsurface zone provides a constant and critical habitat for a variety of truly stream, rather than subterranean organisms. Moreover, their total numbers may be very high and this zone can be a major source of recruitment after floods and droughts. In future ecosystem assessments in the northern gulf region, it is strongly recommended that increased attention be paid to the ecology of the hyporheos, given the importance of this unique zone to the maintenance of biodiversity in streams. The sub-surface zones in many rivers are threatened by siltation, toxicants and increasing acidity, physical damage or altered groundwater levels (e.g. through mine dewatering). Damage to the hyporheic zone could severely impact on the capacity of a river or stream to recolonise (recover) following the dry season and this would in turn affect higher forms of life such as fish.

Another underground group of fauna is called stygofauna. These subterranean animals live in caves and aquifers and tend to be at greater depths than hyporheic fauna (usually some metres to over 100m below the surface). They have been largely unexplored in the northern gulf region. Along with the hyporheic fauna, any assessment of biodiversity or ecosystem health for the northern gulf should include stygofauna. Water management plans that are developed for the region that have the potential to impact on groundwater quality or quantity will have a direct influence on the biodiversity and health of groundwater dependent ecosystems, with the potential for species extinctions, even reduced numbers of fish.

What to do?

There is a lot left to do. The Northern Gulf Region covers approximately 194,000 km², an area approximately three times the size of Tasmania. The Region comprises the catchments of the Norman, Gilbert, Staaten and Mitchell River systems, all of which flow into the Gulf of Carpentaria. To date we have looked at only the Gilbert River catchment. Future aquatic fauna survey work is planned for the Staaten River in 2008 and it is hoped the survey program can be extended over ensuing years to cover all the major waterways of the region. Consideration should also be given to looking at the unique and largely unexplored biodiversity of the region's groundwater aquifers and caves. Such information is essential to enable the sustainable management of the region's precious natural resources.

A small blind animal that lives its entire life in groundwater (Photo: Ecowise Environmental)

Consideration should also be given to looking at the unique and largely unexplored animals in the region's groundwater aquifers and caves.

Acknowledgements

We sincerely thank the NGRMG and staff for commissioning and supporting this study, which was made possible through funding from the Natural Heritage Trust. We are most grateful to the dozens of local pastoralists who provided advice, access and personal knowledge. We hope you continue to enjoy your environment. Thanks also to colleagues in the Queensland museum, DPI&F and DNRW.

Further Information

For further information or access to the technical report, please contact:

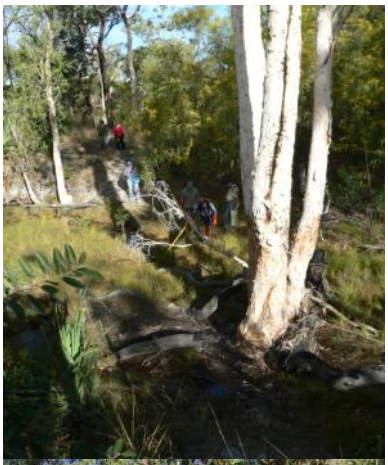
Noeline Gross
NGRMG Georgetown Qld 4871

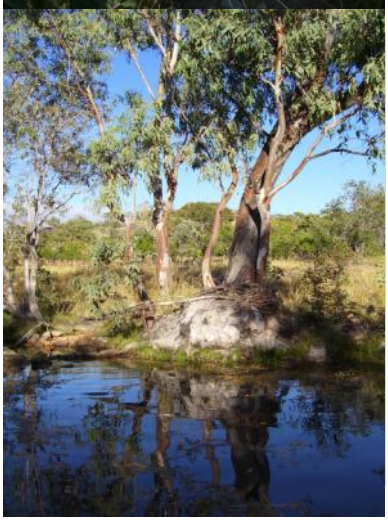
Phone: (07) 4062 1330
E-mail: gm@northerngulf.com.au

For further information on fish, please contact:

Alf Hogan
Alf Hogan and Associates Fish Ecologists

Phone: 0447 953 186
E-mail: alf@hoganfish.com.au





If you would like to discuss the aquatic macroinvertebrate program in more detail please contact:

Garry Bennison

Ecowise Environmental Pty Ltd

Phone: 0407 243 139 E-mail: gbennison@ecowise.com.au

Recommendations

The following recommendations are the views of the authors and may not be adopted by NGRMG. They are considered necessary to increase knowledge and thus assist with informed management. Further discussion is presented in the technical report.

1. Install and reactivate stream gauges in the catchment to accurately measure flows and monitor water management plans.
2. Accurately map and measure sub-surface flows and volumes.
3. Survey the sub-surface fauna, particularly in the bed sand aquifers (whole new ecosystems are being discovered in this environment).
4. Increase the effort on weed and pig control.
5. Publicise the litter-free status of the catchment, install road signs and produce educational material particularly for tourists to maintain the litter-free status.
6. Survey the fish and aquatic invertebrates of the lower reaches to complete the inventory of fish and aquatic invertebrates in the catchment.
7. Access for the general public to freshwater fishery resources needs to be facilitated which may require the development and adoption of codes for acceptable use. City dwellers won't appreciate or understand the Gulf if they never get to see it.

Future research

The Staaten River catchment is another area that has very little information on aquatic life. *DPI&F* and *Ecowise Environmental* successfully submitted an application for funding to NGRMG to conduct fish and macroinvertebrate surveys in 2008.

The Staaten catchment is especially interesting as it joins with the Gilbert and Mitchell catchments during major floods.

The outcomes of this study include:

- a description of fish species, their distribution and abundance
- aquatic macroinvertebrate diversity in the Northern Gulf
- Water quality and aquatic habitat assessment
- identification of potential threats to streams and wetlands
- aquatic ecology information for managers to make decisions about sustainable use of water resources
- increased awareness of aquatic biodiversity and local skills in monitoring biodiversity in the region

List of fish species found in the Gilbert River catchment during a post wet season survey in 2006.

Common name	Species name	# of Sites	Status
Eastern rainbowfish	*Melanotaenia splendida*	20	widespread (may be a number of subspecies)
Spangled perch	*Leiopotherapon unicolor*	20	widespread in northern Australia
Bony bream	*Nematalosa erebi*	16	widespread in northern Australia
Sleepy cod	*Oxyeleotris lineolata*	14	widespread in northern Australia
Archerfish	*Toxotes chatareus*	13	widespread in northern Australia
Sooty grunter	*Hephaestus fuliginosus*	12	widespread in northern Australia
Long tom	*Strongylura krefftii*	11	widespread in northern Australia
Mouth almighty	*Glossamia aprion*	10	widespread in northern Australia
Banded grunter	*Amniataba percoides*	10	widespread in northern Australia
Hyrtl's tandan	*Neosilurus hyrtlii*	8	widespread in northern Australia
Square-blotched goby	*Glossogobius sp. C*	4	widespread in northern Australia
Flathead goby	*Glossogobius giurus*	4	widespread in northern Australia
Barramundi	*Lates calcarifer*	3	widespread in northern Australia
Forktailed catfish	*Arius graeffei*	3	widespread in northern Australia
Tarpon	*Megalops cyprinoides*	1	widespread in northern Australia
Gulf grunter	*Scortum ogilbyi*	13	widespread in Gulf, Northern Territory
Reticulated glassfish	*Ambassis macleayi*	9	widespread in Gulf, Northern Territory
Golden goby	*Glossogobius aureus*	7	widespread in Gulf, Northern Territory
Berney's catfish	*Arius berneyi*	6	widespread in Gulf, Northern Territory
Salmon catfish	*Arius leptaspis*	4	widespread in Gulf, Northern Territory
Striped sleepy cod	*Oxyeleotris selheimi*	7	widespread in Gulf, Northern Territory, several colour variants
Carpentaria catfish	*Arius paucus*	5	widespread in Gulf, previously recorded as *A. midgleyi*
Northern trout gudgeon	*Mogurnda mogurnda*	4	widespread, but probably several species
Snub-nosed gar	*Arrhamphus sclerolepis*	3	widespread, but possibly an undescribed species
Fly-specked hardyhead	*Craterocephalus stercusmuscarum*	4	probably a number of genetically distinct subspecies
Freshwater anchovy	*Thryssa scratchleyi*	2	reported as uncommon
Gilbert's grunter	*Pingalla gilberti*	2	reported as uncommon
Elongate glassfish	*Ambassis elongatus*	9	new record for the Gilbert River, range extension
Giant glassfish	*Parambassis gulliveri*	3	new record for the Gilbert River, range extension
Northwest glassfish	*Ambassis sp.*	2	new record for the Gilbert River, range extension
Papuan river sprat	*Clupeoides cf. papuensis*	1	new record for the Gilbert River, range extension
Toothless catfish	*Anodontiglanis dahli*	8	new record for the Gilbert River
Black catfish	*Neosilurus ater*	6	new record for the Gilbert River
Saltpan sole	*Brachirus salinarum*	2	new record for the Gilbert River
Rendahl's catfish	*Porochilus rendahli*	1	new record for the Gilbert River
Freshwater sole	*Brachirus selheimi*	1	new record for the Gilbert River
unknown goby	*Glossogobius sp.*	1	undescribed species
Gilbert gudgeon	*Hypseleotris n. sp.*	1	undescribed species

Notes:

1. There were 20 sites surveyed. The number of sites listed is an indication of how widespread in the Gilbert catchment each fish species is. A low number does not necessarily indicate a species is rare.
2. This list is incomplete. A wider survey should find more species, particularly in lower reaches that were too boggy to access.