

TropWATER team conducting an electrofishing survey

UPDATE ON HORSESHOE AND LILLIESMERE LAGOONS

THE Connecting Burdekin Cane Farmers To Their Local Wetlands project is at the halfway point, and BBIFMAC and the participating farmers have been busy trialling and monitoring practice changes.

NQ Dry Tropics and the JCU TropWATER team have also been evaluating the health of Lilliesmere and Horseshoe lagoons with fish surveys, water quality monitoring and pesticide sampling.

HORSESHOE LAGOON - WATER QUALITY

The quality of water at Horseshoe Lagoon is considered relatively satisfactory for fish habitat.

The numbers and diversity of the fish indicate that the lagoon is in balance, considering local pressures such as turbidity and upstream runoff.

Monitoring showed there was a good level of available dissolved oxygen, probably due to the wind action blowing across the surface.

This wind also stirs up sediment, making the water murky.

Light for photosynthesis was in the top layer of water, which may explain why there were not many submerged plants.

Pesticide monitoring between December 2017 and January 2018 detected 32 chemicals, including the five priority PSII herbicides: ametryn (e.g. Krismat, Ametrex), atrazine (e.g. Attradex, Spike), diuron, hexazinone (e.g. Grunt) and tebuthiuron (used to control woody weeds).

Other herbicides present include 2,4-D (e.g. Amicide), metolachlor (e.g. Dual Gold), MCPA (e.g. Agritone) and imazapic (e.g. Flame, Impose).

Water concentrations of these pesticides did not exceed ecotoxicity thresholds (the concentration of a chemical below which 95% of freshwater species are protected), apart from diuron, which was 2.3 times higher.

Continued efforts to reduce pesticide runoff will improve this impact on the lagoon and the Great Barrier Reef (GBR).

WHAT IS WATER QUALITY?

WATER quality refers to the chemical, physical, and biological characteristics of water.

Measures of water quality can include pH, dissolved oxygen, temperature, nutrients, and clarity.

Water quality is usually measured in relation to the needs of a species, such as the amount of dissolved oxygen required by fish.

Monitoring showed there was a good level of available dissolved oxygen, probably due to the wind action blowing across the surface.

PSII HERBICIDES

PHOTOSYSTEM II (PSII) herbicides interfere with plant photosynthesis.

In the coastal waters of the GBR, PSII herbicides are the most commonly detected pesticides with the highest concentrations.[1]

For example, in a 2012 study, they made up 79-88% of the total pesticide load from nine GBR catchments, including the Haughton and Burdekin.[2]

Annually, it has been calculated that more than 17,000kg of PSII herbicides reach the GBR lagoon.[3]

Five PSII herbicides have been prioritised for reduction due to their toxicity: ametryn, atrazine, diuron, hexazinone, and tebuthiuron.

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FISH SURVEYS (HORSESHOE LAGOON)

Two surveys in Horseshoe Lagoon (July 2017 and April 2018), identified 337 individual fish from 17 different species (Table 1).

Bony bream made up nearly 50% of the catch and tilapia 15%. No barramundi were caught during the two surveys.

Table 1: Horseshoe Lagoon fish survey results from July 2017 and April 2018, showing total number of fish from the surveys. The surveys were completed using TropWATER electrofishing boat - which temporarily stuns fish so they can be identified, measured and returned to the water, unharmed.

NATIVE (15 SPECIES)	INVASIVE (2 SPECIES)
Marled eel (2 fish), bony bream (161), black catfish (1), fly-specked hardyhead (57), eastern rainbowfish (15), mouth almighty (2), snakehead gudgeon (2), empire gudgeon (8), sleepy cod (7), tarpon (3), banded grunter (2), salmon catfish (11), snub-nosed garfish (8), archer fish (2), glass perch (4)	Three spot gourami (2), tilapia (50)

Six of the species found were diadromous (they require saltwater to complete their life cycle).

This may indicate a connection to the downstream estuary, perhaps directly or via the Haughton River in a flood. Of the 38 species of fish found in the Burdekin floodplain, only 17 species were found in Horseshoe Lagoon, suggesting limited connectivity.



TropWATER team undertaking an electrofishing survey at Horseshoe Lagoon in April 2018.



Research Assistant, Tony Squires (TropWATER, JCU) with a large barramundi caught during surveying in the Lilliesmere Lagoon sub-catchment.

LILLIESMERE LAGOON - WATER QUALITY

Fish diversity and numbers suggest Lilliesmere Lagoon is currently able to function as suitable habitat despite the local pressures it faces from upstream.

Pesticide samplers installed in Kalamia Creek and at the top of Lilliesmere Lagoon from November to December 2017 detected a total of 35 chemicals, including all five priority PSII herbicides.

Other pesticides present included metolachlor, 2,4-D, asulam (e.g. Rattler), imidacloprid (e.g. Confidor), imazapic, metribuzin (e.g. Soccer, Mentor), and isoxaflutole (e.g. Balance).

Two methods measured chemical concentrations: the first in which the chemicals accumulate on the sampling equipment surface, the other sampling lagoon water.

Via the first method, diuron was found in Kalamia Creek in concentrations exceeding the ecotoxicity threshold by 1.2 times, and, in Lilliesmere Lagoon, by 2.3 times.

In samples taken from Lilliesmere Lagoon on 16 November 2017, the diuron concentrations were 1.5 times higher than the threshold, and, on 14 December 2017, 2.5 times higher.

Continued effort to reduce runoff from farms will improve the impact pesticides can have on freshwater ecosystems and the GBR.

Monitoring of other water quality measures since 2015 has shown improved cycling of dissolved oxygen since the installation of the automated gates and fishways, and extensive weed control activities, undertaken as part of NQ Dry Tropics' Systems Repair project (2013-18).

FISH SURVEYS

Fish surveying before and after installation of the vertical slot fishways showed a slight increase in fish numbers.

Six out of the 21 species captured were diadromous, including barramundi, showing connectivity to the coast.

Large numbers of freshwater turtles and birds were also noted.

The following species were found during surveys undertaken between 2015-2018:

- marbled eel;
- Pacific short-finned eel;
- bony bream;
- black catfish;
- Hyrtl's tandan;
- snub-nosed garfish;
- Rendahl's catfish;
- fly-specked hardyhead;
- eastern rainbowfish;
- sailfin glassfish;
- barramundi;
- seven-spot archerfish;
- mouth almighty;
- sleepy cod;
- snakehead gudgeon;
- empire gudgeon;
- western carp gudgeon;
- Midley's gudgeon;
- tarpon;
- barred grunter; and,
- freshwater longtom.

PESTICIDE TOXICITY

PESTICIDES are just as harmful to other plants as they are to weeds[1].

Seagrass meadows growing close to nutrient sources such as river mouths, can receive many chemicals all at once during a flood.

The resulting poor growth also affects dugongs and turtles, as seagrass is their main source of food.

Pesticides also directly affect fish and mammals, including humans.

Atrazine and diuron, for example, are moderately toxic to mammals and most aquatic life[4].



Dr Nathan Waltham (funded through the National Environmental Science Program, Tropical Water Quality Hub) from JCU TropWATER with a salmon catfish captured during the July 2017 fish survey at Horseshoe Lagoon.

TIME WILL DEMONSTRATE EFFECT OF POSITIVE CHANGE

CONCLUSION

TropWATER will continue to evaluate the condition of these lagoons, and in time, this will reflect the positive changes that farmers are undertaking to reduce runoff into the wetlands. Evaluation activities will include more fish surveys, water quality monitoring and other activities such as sediment sampling.

References

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NQ DRY TROPICS

WHO ARE WE?

We are a community-based, not-for-profit organisation that supports people in the Burdekin Dry Tropics of North Queensland to sustainably manage natural resources including soil, water and biodiversity. These resources underpin our regional economy and our way of life.

HOW DO WE HELP PROTECT WETLANDS?

Our Waterways, Wetlands and Coasts team works with landholders, industry, government and community groups to manage priority wetlands. We promote the benefits of restoration and revegetation, and help farmers better understand how changing land management practices can improve water quality downstream.

BBIFMAC

Tropical Water Quality Hub
National Environmental Science Programme

TropWATER
Centre for Tropical Water and Aquatic Ecosystem Research

JAMES COOK UNIVERSITY AUSTRALIA

Queensland Government

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