National Environmental Research Program

NORTHERN AUSTRALIA HUB

BIG WET ebbs and flows

DAVID CROOK AND RESEARCHERS FROM CHARLES DARWIN UNIVERSITY AND NORTHERN TERRITORY FISHERIES ARE TRACKING TWO OF KAKADU'S MOST IMPORTANT FISH SPECIES TO UNDERSTAND WHERE AND WHY THEY MOVE DURING THE WET SEASON.

The Northern Territory is an unrivalled fishing destination, drawing interstate and international anglers to the region in droves every year. Australia's mighty Barramundi are arguably the fish icon of the Top End. The quest to find the best spot to hook the impressive sports fish is, however, easier said than done. New research is proving there is a good reason why Barramundi keep anglers on their toes.

ABOVE: TRACKING FISH BY BOAT. PHOTO MICHAEL LAWRENCE-TAYLOR. BELOW: A PRIZED BARRAMUNDI. PHOTO MICHAEL DOUGLAS.

Secrets below the surface

Solid progress has been made in understanding freshwater ecosystems in northern Australia, however, there is still much to learn about the key factors that sustain aquatic species. Floodplains have long been recognised as critical to the maintenance of aquatic food webs, where small fish feed on microscopic plants and animals, later providing sustenance for larger species. To better understand how these floodplains function, researchers from Charles Darwin University and Northern Territory Fisheries, funded under the Australian Government's National Environmental Research Program, have been studying the movements of two large-bodied fish; Barramundi (*Lates calcarifer*) and Salmon Catfish (*Neoarius leptaspis*).

Both these fish are major players in healthy food chains in the rivers and estuaries of Kakadu National Park, where the research took place. Anglers have long been attracted by the abundant numbers of Barramundi—but just what is sustaining them and the large populations of catfish?

"Previous research has shown that the productivity of fish populations in rivers is very reliant on the transport of energy from the floodplain and estuary," said Charles Darwin University Associate Professor David Crook.

"For example, only about one fifth of the energy contained in the tissue of Barramundi was derived from sources within the river itself. We wanted to explore the importance of fish movement as a means of transporting energy from floodplains and estuaries into freshwater fish populations."

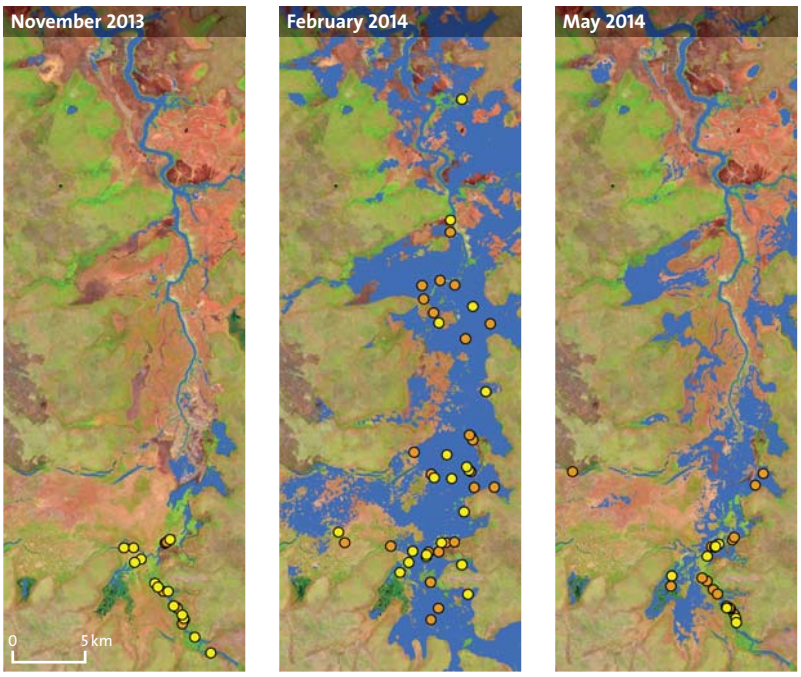
Along with other research on floodplain function and food webs, this project is helping to establish the importance of having large wet season flows over floodplains.

Reeling in the numbers

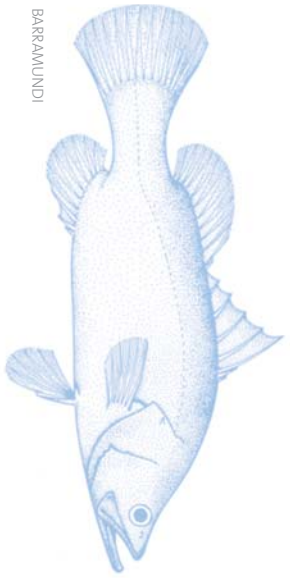
Between October 2013 and May 2014, David and his team tracked the movements of 65 Barramundi and 50 catfish in the South Alligator River and associated wetlands. The initial field work took place in the Yellow Water wetland system and nearby billabongs; the Barramundi were caught by electrofishing, while the catfish were hooked from a boat with help from Traditional Owners.

Acoustic and radio-transmitters were surgically implanted into the gut cavity of the fish. Movements of the radio-tagged fish were tracked every two weeks by boat and, eventually helicopter, to cover more ground as the floodplains became inundated. Fish tagged with acoustic transmitters are still being monitored, using an extensive array of fixed receivers extending from the Yellow Water area downstream to the estuary mouth.

The results provided some surprises, with the tagged fish wasting no time when the first significant rain of the season fell in November. Having spent the dry season moving only small distances within their local area, the fish started moving much longer distances and began to use inundated floodplains as habitat as soon as the first major flows of the wet season arrived.



Examples of the results of fortnightly tracking surveys conducted throughout the wet season. The fish start to return to their home billabong as the floods recede.
■ Flood extent ● Barramundi ● Salmon Catfish


BARRAMUNDI


CATFISH

January's monsoon brought even more movement, and by February the fish had dispersed widely. One Barramundi travelled an incredible 80 kilometres downstream within a few days. Most other Barramundi and catfish moved around extensively on the inundated floodplains and channels 5–20 kilometres downstream of their tagging location. As the wet season progressed, the fish began returning. By early March, most of the fish had returned to the same billabong from where they were originally collected.

Interestingly, the return to billabong habitats began before the area of floodplain inundation had peaked, with this earlier than the researchers expected. It could be because dissolved oxygen levels decline and vegetation thickens on the floodplain as the wet season progresses, making it less hospitable for the fish.

Lazy lovers

The overwhelming pattern of the Barramundi to remain within fresh water throughout the wet season was particularly interesting to the researchers. Barramundi require salty water to successfully spawn, yet only one of the tracked fish moved into the lower estuary where the salty water occurs. David says until now we would have expected most adult fish to move down to estuaries and the ocean to spawn each year.

"It's really turned a lot of our ideas on their head—along with other recent research, we are beginning to build a picture showing that many fish don't contribute to spawning each year." It also raises the possibility that many freshwater Barramundi aren't contributing at all to the reproductive output of the population. We'll monitor the tagged fish for another season; if we can confirm our first year's results, it will have important implications for the management of Barramundi fisheries in Australia."

Lessons learnt

The research demonstrates the importance of large-bodied fish as key transporters of energy from floodplains to main channels. The fish are not simply a product of the channel from where they were caught. The tracking results show how critical it is to maintain connectivity between the floodplain, river and estuary. Without this connectivity our rivers couldn't support as many of these large-bodied fish as they do. This work provides more information for policy makers to consider when making trade-offs between development, and ensuring the environment can sustain the ecosystems that depend upon it.

Principal research scientist at the Department of Primary Industry and Fisheries, Thor Saunders, says the research has increased their understanding of these two key species.

"Barramundi are incredibly important to the Northern Territory's fishing sector. The species is worth about $120 million to the recreational, charter and commercial fisheries. It's also of high cultural significance to Indigenous communities, as well as catfish. This research demonstrates how critical it is to ensure these species continue to have access to inundated floodplains during the wet season."

While the research has addressed many knowledge gaps, it has also raised more questions. It has certainly challenged previous theories about Barramundi breeding patterns and highlights the need for further research. The project team will continue to analyse the data to help build a better picture of how floodplains function and what is required to preserve these treasured fisheries.

FOR FURTHER INFORMATION
David Crook—david.crook@cdu.edu.au
www.nerpnorthern.edu.au/research/projects/31