



# FISHES of SAHUL



VOLUME THIRTY  
NUMBER FOUR

December 2016

JOURNAL OF THE AUSTRALIA NEW GUINEA FISHES ASSOCIATION

Incorporated Registration No. A0027788J. ISSN: 0813-3778 (print) ISSN: 2205-9342 (online)



Male Malanda Rainbowfish (40 mm TL) from unnamed creek Wallace Road.

Photo: Keith Martin

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# Malanda Gold: the tale of a unique rainbowfish from the Atherton Tablelands, now on the verge of extinction

Peter J. Unmack<sup>1</sup>, Keith Martin<sup>2</sup>, Michael P. Hammer<sup>3</sup>, Brendan Ebner<sup>4</sup>, Karl Moy<sup>1</sup> & Culum Brown<sup>5</sup>

## Introduction

Don't be too concerned if you have never heard of the Malanda Rainbowfish. It is a new common name for a striking gold and red coloured, dwarf-sized rainbowfish that is currently waiting to be formally described. Its taxonomic status has not been well understood until very recently, and it is now in danger of becoming extinct before it can be formally named!

The fish is named due to its restricted distribution in the headwater streams of the North Johnstone River in the Malanda district, on the southern Atherton Tablelands in Queensland. The Queensland Place Names Database gives the following origin for the name of the town of Malanda: "Derived from Malanda Creek, which reportedly is an Aboriginal name, lan-



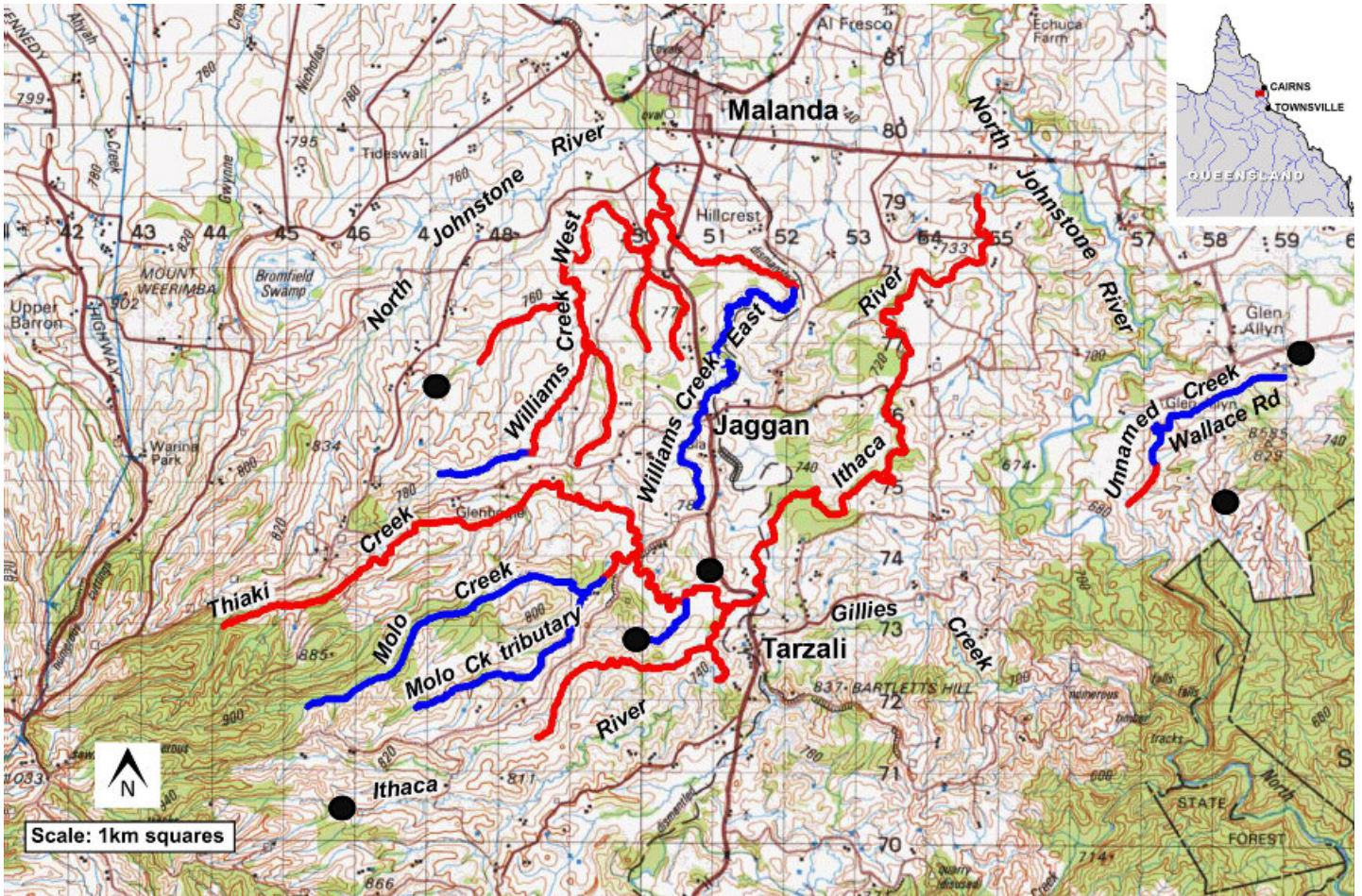
Female Malanda Rainbowfish from Williams Creek East Branch (35 mm TL). Photo: Keith Martin



Male Malanda Rainbowfish from Williams Creek East Branch (45 mm TL).

Photo: Keith Martin

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Known distribution of Malanda Rainbowfish populations. Red lines indicate likely former distribution; blue lines indicate known distribution as at November 2016; black dots represent release sites November 2016. Insert map shows the study region (small red rectangle) in Queensland. Source base map: Geosciences Australia.

gauge and dialect not recorded, indicating the stream known as the Upper Johnstone River, possibly with the connotation little stream with big stones". This latter reference makes the name even more appropriate given

Malanda Rainbowfish was likely common in many smaller rocky creeks in the area prior to European settlement.



Male Lake Eacham Rainbowfish (yawning) from Dirran Creek, an upper North Johnstone tributary (50 mm TL).

Photo: Keith Martin



Male Eastern Rainbowfish from an upper North Johnstone tributary (75 mm TL).

Photo: Keith Martin



Male Malanda Rainbowfish from Williams Creek East Branch (45 mm TL).

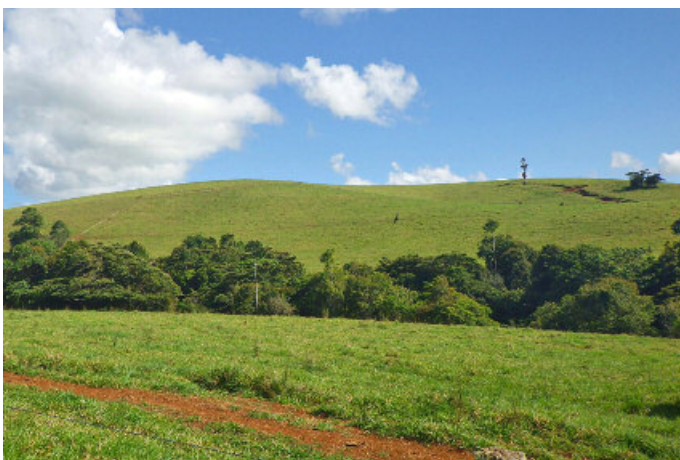
Photo: Keith Martin



Rainforest bordering cleared agricultural land in the upper Thiaki Creek catchment. This entire region was once dense rainforest.

Photo: Michael Hammer

There are a bewildering variety of rainbowfish colour forms on the Atherton Tablelands and this has hindered efforts to understand the taxonomy of rainbowfishes from this region (e.g., Crowley & Ivantsoff 1991; Ivantsoff & Crowley 1992; Pusey et al. 1997; Zhu et al. 1998). Indeed, Malanda Rainbowfish has been confused with several species in the past. For example, it has long been confused with Lake Eacham Rainbowfish (*Melanotaenia eachamensis*) – another species with a confusing taxonomic history (e.g., Williams Creek form in the aquarium hobby) – as well as being touted as a distinct upland form of Utchee Rainbowfish (*M. utcheensis*) (McGuigan 2001). Further, a precise understanding of its appearance has been blurred by a rapidly emerging threat of hybridisation with Eastern Rainbowfish (*M. splendida splendida*).



Typical modern-day landscape on the Atherton Tablelands – cattle country in the Williams Creek catchment. Photo: Michael Hammer

We are now beginning to overcome most of the difficulties in identification with comprehensive geographic sampling and new genetic techniques that for the first time provide information from thousands of individual pieces of DNA (nuclear genetic loci) from across each species genome (Unmack et al. unpublished). Early indications are that the North Johnstone River catchment has five (**FIVE!**) species from the “Australis” group – a genetic lineage of closely related rainbowfishes as defined in Unmack et al. (2013), – namely Eastern Rainbowfish, Malanda Rainbowfish, Lake Eacham Rainbowfish, Tully Rainbowfish (*M. sp.*) and Utchee Rainbowfish. In addition, Unmack’s Australis group also includes: *M. australis* and the New Guinea species *M. albomarginata*, *M. aruensis*, *M. parkinsoni*, *M. patoti* and *M. rubrostriatus*. Note that this is different to Schmida’s “australis” group (Schmida 1997), which contains all the Australian species listed above minus *M. splendida*. All of the endemic rainbowfishes, except the Utchee Rainbowfish, occur in the upper portion of the catchment at elevations above 650 m. This number of species from the same rainbowfish lineage in the same catchment is unparalleled. It is important to note that none of these species co-occur long-term as when they intermingle they form hybrid populations. In most river systems where multiple rainbowfish species are found they tend to co-exist (at least in Australia). However, each co-existing species is from a different lineage (e.g., one species from two or more of the Australis, Nigrans, Goldiei and Maccullochi lineages) and it is quite rare for species in the same lineage to co-occur.

Unfortunately, the rainbowfish assemblage in the



Karl Moy, Michael Hammer and Peter Unmack collecting rainbowfish in Williams Creek at Jaggan. Photo: Keith Martin

include the extensive construction of many small farm dams (which sometimes end up with introduced fishes in them), riparian vegetation clearing, and streamside cattle grazing, all now potentially exacerbated by climate change. These combined impacts pose a major threat to maintaining the current high biodiversity and natural heritage of this unique rainbowfish assemblage.

Malanda Rainbowfish inhabits the small upper tributaries of the North Johnstone River, at elevations between 650–800 m. It is one of the few Australian rainbowfish species that is restricted to high elevations. Originally the streams where this species occurs would have run through rainforest, but the area is now largely cleared for dairy and beef cattle production. The streams where this fish lives are small, fast flowing and cool (16–22 °C [data collected by Keith Martin & Susan Barclay]). They are generally shallow with a base of basalt rock platforms, boulders and cobbles, interspersed with red silt and often punctuated by low (<1 m), vertical drop waterfalls. This landscape has been shaped by the eruption of the Malanda Volcano some three million years ago (Lottermoser et al. 2008). There is little aquatic vegetation in these streams except for occasional stands of *Blyxa aubertii* and the beautiful Queensland Lace Plant (*Aponogeton bullosus*).

#### Appearance of Malanda Rainbowfish

The identity of the Malanda Rainbowfish as a distinct species has been confirmed through genetic study. Examination of different populations based on genetics has also allowed us to get an eye in for the physical

North Johnstone River is threatened as the catchment area has been extensively modified. The principal threat is hybridisation due to the translocation of other rainbowfish species, primarily Eastern Rainbowfish. Introductions of exotic species like Eastern Gambusia (*Gambusia holbrooki*), Tilapia (*Oreochromis* spp.) and Guppies (*Poecilia reticulata*) have also occurred in the catchment and are likely to have negative impacts on Malanda Rainbowfish populations. Furthermore, additional impacts likely exacerbate their decline. These



A magnificent “Malanda Gold” straight out of the net from Williams Creek East Branch at Jaggan.

Photo: Michael Hammer

characters that separate this species from the two other species, Eastern Rainbowfish and Lake Eacham Rainbowfish, that occur in the same area. Malanda

Rainbowfish is a dwarf species, growing up to 61 mm for males (but usually under 50 mm), and females slightly smaller. The body is laterally compressed, con-



Pinned rainbowfish samples from upper North Johnstone streams; numbers represent museum codes. Males on the left with the corresponding female on the right. Top to bottom: Lake Eacham Rainbowfish from Dirran Creek. Malanda Rainbowfish – first from unnamed creek Wallace Road above falls; then Williams Creek East Branch at Jaggan; then Williams Creek West Branch. Bottom line is Eastern Rainbowfish from Gillies Creek, south of Tarzali. Photos: Michael Hammer



Karl Moy prepares fish specimens for genetic and morphological research.

Photo: Peter Unmack

siderably more so than Eastern Rainbowfish and similar to Lake Eacham Rainbowfish. Not only is it a small species, but the body is also quite short compared to the other two species, giving it a rather dumpy appearance. The head is rounded and the eye is large and close to the snout, giving the face a rather “bullnosed” appearance, particularly when compared with the pointed snout of Eastern Rainbowfish.

Male Malanda Rainbowfish have a very tall, flag-like first dorsal fin and have square shaped second dorsal and anal fins when extended. All of these fins are shorter along the body than in the other two species. The second dorsal and anal fins never overlap the caudal peduncle in Malanda Rainbowfish whereas they do so in Lake Eacham Rainbowfish. In adult Eastern Rainbowfish these fins can be long, pointed and trailing, overlapping both the caudal peduncle and tail.

Male Malanda Rainbowfish have narrow orange to brown lateral body stripes and an overall brown-golden sheen, intensifying during the breeding season to be bright golden yellow with thin red stripes and reddish soft dorsal, anal and caudal fins. All fins can be edged in black in breeding males. Lake Eacham Rainbowfish can be similarly coloured although this species usually has a more uniform background body colouration with faint striped patterning and scale reflections giving a somewhat speckled appearance, occasionally with faint vertical barring. Eastern Rainbowfish from the upper

North Johnstone River are typically golden bodied, with a strong dark dorsolateral stripe underlined by a thin silvery stripe. The fins and tail may be red, pinkish or yellow.

Female Malanda Rainbowfish have a distinctly oval shaped body and triangular first dorsal fin, the body is silver-brown with paler orange-brown horizontal stripes. It is difficult to separate the species based on female characteristics other than size.



Michael Hammer prepares rainbowfish specimens for genetic and morphological research.

Photo: Peter Unmack



Variations in populations and comparisons with the other two species are illustrated in the collage on page 1043. Comparison photos of live Lake Eacham and Eastern Rainbowfishes from the upper North Johnstone tributaries are shown on page 1040 and 1041 respectively.

### History of the discovery of Malanda Rainbowfish

It is not clear who first noticed the different rainbowfishes in the North Johnstone River. No doubt early rainbowfish enthusiasts collected them from some of these creeks, but the information that would allow them to recognise them as different species would have been lacking. Schmida (1997) in a discussion on Lake Eacham Rainbowfish, accurately predicted that “there are many other forms of the australis group on the tablelands”.

The first documented collection of this fish was probably in 1988, when the late David Liddle of Mareeba took Gerald Allen to Dirran Creek to collect what they thought (correctly as it turned out) may have been a new population of Lake Eacham Rainbowfish. On the return trip, they also collected rainbowfish at Gillies and Williams creeks and assumed that these were the same form (Allen 1989). We now know that Williams Creek fish are not Lake Eacham Rainbowfish, but the

new Malanda Rainbowfish (it remains unclear which species was present in Gillies Creek, today it has Eastern Rainbowfish). In 1999, Keith Martin stayed at the Fur and Feathers (now called The Canopy Rainforest Treehouses & Wildlife Sanctuary) on the Ithaca River a kilometre or two downstream of the main highway. The owners had an aquarium and Keith collected some rainbowfish which they kept in their aquarium. Although Keith later keyed them out to Lake Eacham Rainbowfish based on length/depth ratio, fin ray counts and eye size/location, this population is now recognised as Malanda Rainbowfish.

Many ANGFA members and others have collected and kept these fish, unsure of their identity. In 2010, an ANGFA field trip to the Wet Tropics visited lower Williams Creek. Photos of the “Williams Gold” were posted on the online ANGFA forum, and also featured in a ANGFA Victoria presentation about the trip by John Lenagan. However, at least some of these locations sampled in the 2010 field trip are likely to consist of fish with mixed ancestry based on the pictures posted.

Craig Moritz’s laboratory – which at the time was based in Brisbane at the University of Queensland – had considerable interest in the broader biota of the

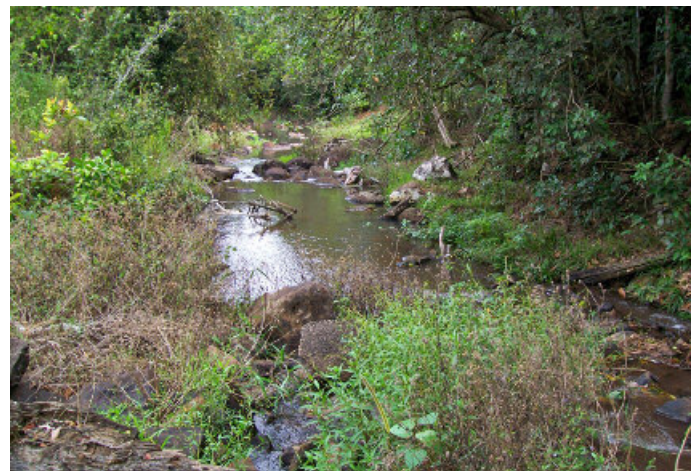


Karl Moy and Peter Unmack seine netting for Malanda Rainbowfish at Williams Creek East Branch at Jaggan. Photo: Keith Martin

Atherton Tablelands. Two of his students (Danqing Zhu and Katrina McGuigan) undertook the first DNA examination of rainbowfishes in this area, part of which focused on the taxonomic status of populations of Lake Eacham Rainbowfish found outside of Lake Eacham (e.g., those highlighted by Allen 1989). The Williams Creek and Ithaca River populations of Malanda Rainbowfish were first sequenced using mitochondrial DNA (mtDNA) by Zhu et al. (1998) who identified them as Lake Eacham Rainbowfish. Based on additional and broader mtDNA sequencing, McGuigan (2000) identified the Ithaca River population as a separate species (*M. sp. III*). Further details were provided in the formal description of Utchee Rainbowfish (McGuigan 2001), where *M. sp. III* was conservatively recognised as Utchee Rainbowfish. However, McGuigan stated they were morphologically and genetically different to that species and would likely be considered as a different species, but this would require further study to resolve their taxonomic status. Since that time these upper North Johnstone River populations have been informally known as the “Upland Utchee” Rainbowfish or more recently as the “Tarzali” or “Ithaca” Rainbowfish. Here we prefer the name Malanda Rainbowfish as that better describes the geography of where the species is found and provides a link to the local communities in that region whose involvement will be critical in Malanda Rainbowfish conservation efforts.

Culum Brown began working in the Malanda region back in the late 1990’s while starting his PhD research into rainbowfish behaviour and also helping Katrina McGuigan collect rainbowfishes as part of her PhD research. Culum’s interest in the area has continued since that time and he has focused on trying to document the distribution, taxonomy and invasion dynamics of Eastern Rainbowfish relative to Malanda Rainbowfish.

More recent investigation into the Tableland’s rainbowfish has been carried out by Keith Martin, based on his long held curiosity with the diversity and speciation of rainbowfishes in Far North Queensland. Keith engaged Michael Hammer’s help from a museum taxonomy perspective to try and resolve and determine the identities of various rainbowfishes he was finding. Peter Unmack became involved later by providing yet another perspective based on information gained from genetic



Lower Molo Creek above causeway. Contains Malanda Rainbowfish with some introgression from Eastern Rainbowfish. Photo: Karl Moy

research into these populations.

Culum Brown and his former student Craig Mercier currently have a study in progress which should provide the necessary information to allow for this species to be formally described in the near future. Although Malanda Rainbowfish presently remains undescribed, importantly it was recently nominated and accepted as Critically Endangered by the Australian Society of Fish Biology Threatened Fishes Committee in September 2016.

### Decline of Malanda Rainbowfish

We have now sampled extensively across the upper North Johnstone River region (over 70 sites around Malanda in 2016 alone) over several years and have documented a rapid decline in Malanda Rainbowfish (their decline was first observed by Culum Brown in the lower Ithaca River starting in the mid 2000s). Keith’s extensive sampling, plus Culum’s independent work indicate Malanda Rainbowfish are only found in three creek systems: Ithaca River and its tributaries (e.g., Thiaki and Molo creeks), Williams Creek, and an unnamed creek at Wallace Road. Subsequently, Peter Unmack and Michael Hammer briefly sampled across the Tablelands in August 2015 and then undertook intense sampling around Malanda in August 2016 with help from Karl Moy, Keith Martin, Susan Barclay and Brendan Ebner. In November 2016, Peter Unmack,

Table 1. Total, inhabited and extirpated kilometres of stream reach habitat in each river system containing Malanda Rainbowfish.

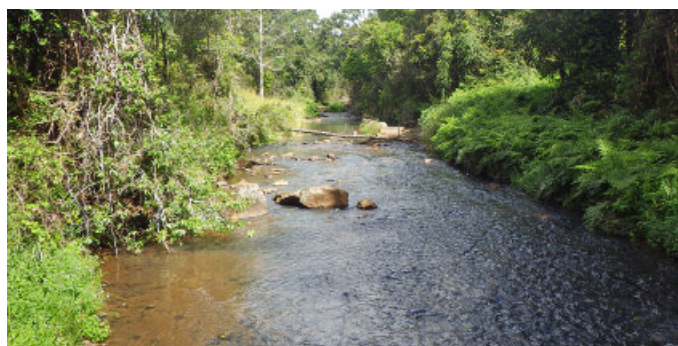
System	Total km	Inhabited km	Extirpated km	% lost
Ithaca River	35.9	9.3	26.6	74%
Williams Creek	23.8	6.7	17.1	72%
Unnamed creek Wallace Rd	3.5	2.7	0.8	23%
Total	63.2	18.7	44.5	70%

Note that these estimates for the Ithaca and Williams systems include reaches that are clearly starting to show evidence of introgression with Eastern Rainbowfish, thus these values underestimate the true decline. Genetically pure fish likely only inhabit around 50% of the inhabited kilometres in those two systems. Stream kilometres were measured from the Watercourse areas – Queensland, Spatial dataset 16/04/2014 (accessible from <http://qldspatial.information.qld.gov.au/catalogue/custom/index.page>), however they underestimate the precise stream length as they do not include the fine scale detail which includes all of the smaller bends and turns.

Karl Moy and Brendan Ebner specifically sampled creeks inhabited by Malanda Rainbowfish to map out their current up and downstream limits. These 2016 surveys have enabled a better understanding of the current distribution of Malanda Rainbowfish within these and other creek systems in the region. Below we summarise the status of Malanda Rainbowfish in the three creek systems.

### Ithaca River system

The headwaters of the Ithaca River drains the western edge of the upper North Johnston catchment immediately north of Dirran Creek. This extensive system consists of several major tributaries that include a large unnamed tributary, then Thiaki Creek, its tributary, Molo Creek, and an unnamed tributary to Molo Creek. Ithaca River joins the North Johnstone River approximately 20 km downstream from Malanda. Our sampling has demonstrated an ongoing major decline in Malanda Rainbowfish. Prior to 2000, Malanda Rainbowfish were present well downstream in Ithaca River. The upper section of Ithaca River has two waterfalls a couple of hundred meters apart which have excluded rainbowfish from colonising the upstream reaches. Fish that looked primarily like Malanda Rainbowfish sampled in 2014 from lower Thiaki Creek showed genetic evidence of introgression with Eastern



Ithaca River at Clarks Track, east of Jaggan, former Malanda Rainbowfish habitat. Photo: Michael Hammer

Rainbowfish. In 2016 the fish throughout Thiaki Creek were clearly quite mixed with Eastern Rainbowfish. Thus today virtually all of the Ithaca/Thiaki system contains Eastern Rainbowfish and/or hybrids with Malanda Rainbowfish, except for the upper most section of the unnamed tributary to Molo Creek and two small dams adjacent to lower Thiaki Creek on a small side tributary. Rainbowfish from upper Molo Creek proper have some genetic evidence of introgression (mixing) with Eastern Rainbowfish. In lower Molo Creek there is a concrete causeway about 900 m above the junction with Thiaki Creek. This causeway has a pipe with a small drop of perhaps 20 cm. Below the



One of two waterfalls approximately 100 m apart on the Ithaca River that prevents rainbowfish occurring further upstream. Malanda Rainbowfish have now been translocated to the upper reaches of the river. Photo: Karl Moy



Williams Creek East Branch at Jaggan. This was a source population for many of the Malanda Rainbowfish translocations.

Photo: Michael Hammer

causeway the rainbowfish were clearly dominated by Eastern Rainbowfish hybrids, above the causeway they looked more like Malanda Rainbowfish based on their colouration and morphology, but they almost certainly have some introgression with Eastern Rainbowfish (given that fish upstream do), but probably only at low levels as of 2016. Over time we expect the frequency of Eastern Rainbowfish hybrids will gradually expand upstream as they did in Ithaca River and Thiaki Creek. While rainbowfish in the upper reaches of the tributary to Molo Creek are currently pure Malanda Rainbowfish, there are no known barriers that will exclude or slow down the invasion of Eastern Rainbowfish.

### Williams Creek

Williams Creek rises just north of Thiaki Creek and flows north to meet the North Johnstone River just upstream of Malanda. The Williams Creek system is slightly convoluted as there are two major branches, but both have the same name. Here we use eastern branch and western branch to differentiate between the two. Culum and Keith had previously found Malanda Rainbowfish throughout the Williams Creek system, although fish in the lower portion of the creek likely had some introgression, however, they predominately looked similar to Malanda Rainbowfish. Rainbowfish collected on the 2010 ANGFA trip in the lower section of Williams Creek east branch look to be slightly mixed



"Barrier" formed by the lower causway on Williams Creek East Branch.

Photo: Karl Moy



Upper Williams Creek West Branch. This was a source population for many of the Malanda Rainbowfish translocations.

Photo: Keith Martin



A minor barrier formed by a small dam on Williams Creek West Branch that represents the upstream limit of hybrid rainbowfish as of August 2016. Pure Malanda Rainbowfish were found upstream of this point. Photo: Michael Hammer

based on pictures posted on the ANGFA forum, whereas by 2016 they were very clearly dominated by Eastern Rainbowfish. Two causeways around 950 m apart are present in the mid section of Williams Creek east branch. Both have drops of perhaps 15–20 cm, but would be easily passable during slightly higher flows. Rainbowfish below the lower causeway were clearly dominated by Eastern Rainbowfish hybrids, fish above the causeway looked like Malanda Rainbowfish (but are probably slightly mixed based on what we found upstream). At the upper causeway some rainbowfish below it appeared to have some introgression, but most were quite Malanda Rainbowfish like. Above the causeway we only observed Malanda Rainbowfish. We suspect though that fish both below and above this upper causeway probably have some introgression given the

barriers are fairly minor. An additional small weir was found near the town of Jaggan, but it gets submerged during larger floods. No other barriers were identified. In the western branch of Williams Creek Malanda Rainbowfish are now restricted to only the upper most 1250 m of creek above a very minor barrier (small dam).

#### Unnamed creek Wallace Road

This unnamed creek is a small tributary on the eastern side of the North Johnstone River. This is the only creek system we found that has major barriers which exclude Eastern Rainbowfish. Three waterfalls are present, all are approximately 5–10 m high. In addition, a very large dam is present between the middle and uppermost waterfalls. Eastern Rainbowfish are present below the lowermost waterfall. For some reason no rainbowfish are present between the lower waterfall and the large dam, although Malanda



Peter Unmack and Karl Moy seining in the upper reaches of unnamed creek Wallace Road. Photo: Brendan Ebner



Unnamed creek Wallace Road, above upper waterfall. This section of creek is surrounded by dense Para Grass. Photo: Michael Hammer



Upper waterfall on unnamed creek Wallace Road.

Photo: Keith Martin

Rainbowfish are presumed to have been present originally (today this reach has a huge population of Eastern Gambusia). Today, Malanda Rainbowfish are found in 2.7 km of creek from immediately above the large dam (none were found in the dam itself) upstream to within 500 m of the spring source of the creek below a small rock barrier. The uppermost waterfall is present around 1 km upstream of the dam with Malanda Rainbowfish found above and below it.

#### Former range

It is difficult to know the former range of Malanda Rainbowfish, but they almost certainly were found in creeks beyond the three systems listed above. There may be some evidence found in their DNA suggesting they were once more widespread, but at this point insufficient DNA sequencing has been conducted. McGuigan (2001) did sequence rainbowfish from a number of populations, however those results do not make complete sense based on our knowledge today, thus it is unclear as to their validity. McGuigan found Utchee Rainbowfish haplotypes in some Atherton Tableland populations which we have been unable to replicate, but more work remains to be done.

#### Causes of decline

It is unclear as to why the range of Malanda

Rainbowfish is currently being invaded by Eastern Rainbowfish. As best we can tell Eastern Rainbowfish has been present in the Upper North Johnstone catchment for a long time (Gunther Schmida remembers collecting Eastern Rainbowfish below Malanda Falls in 1978), although precise details of early records are lacking. The lower reaches of Ithaca River and Williams Creek do not appear to have any obvious or significant barriers that would have prevented earlier invasion by Eastern Rainbowfish. One hypothesis is that Malanda Rainbowfish is better adapted to living in cooler rainforest covered streams, and that land clearing has



Mid reaches of Thiaki Creek, former habitat of Malanda Rainbowfish.

Photo: Michael Hammer



"Barrier" at causeway on lower Molo Creek. Below this barrier most rainbowfish were clearly hybrids, above they looked pure, but with some genetic introgression. Photo: Karl Moy



Upper unnamed tributary of Molo Creek. This was a source population for many of the Malanda Rainbowfish translocations. Photo: Karl Moy



Peter Unmack and Karl Moy seining a tributary to Williams Creek West Branch. Photo: Brendan Ebner

increased stream temperatures and provided a more favourable environment for Eastern Rainbowfish. However, one complication is that much of the major land clearing occurred a long time ago, thus this isn't a recent change. Recent climate change may potentially be a further influence on the biota. Presumably the interaction of loss of riparian shading, increased sedimentation and climate change have shifted the instream conditions in favour of Eastern Rainbowfish in the Malanda District.

### Saving Malanda Rainbowfish

Given the precarious nature of remaining Thiaki and Williams Creek populations we have started a formally sanctioned and carefully considered program in conjunction with Queensland Fisheries to urgently translocate fish from wild genetically pure populations to refuge habitats (e.g., farm dams) in the upper North Johnstone catchment. As much as possible fish are being translocated within their existing sub-catchments, but we also intend to establish populations else-



Brendan Ebner releasing Malanda Rainbowfish into a farm dam on upper Brodie Creek. Photo: Karl Moy

bowfish free streams large enough to support a population). Five dams were stocked, each with fish from their local catchment. Two dams on the creeks immediately south (unnamed) and north (Brodie Creek) of Wallace Road Creek were stocked with 50 fish each from Wallace Road Creek. One dam on a tributary of Williams Creek west branch received 100 fish from upper Williams Creek west branch. Two dams by Thiaki Creek were each stocked. One dam received 100 fish sourced from upper Molo Creek tributary, the second much larger dam received 200 fish, half from Molo Creek tributary and half from the small creek immediately below the dam wall. It remains unclear how well Malanda Rainbowfish will do in dams as we have rarely found them in that habitat as they likely have had little chance to colonise them.

It is too early to determine the success of these efforts, but we will monitor these new populations and use the outcomes to guide future translocations. Fortunately, captive populations of Malanda Rainbowfish have also been established. Malanda Rainbowfish has proven very hardy and easily bred in captivity, so it should not be long before this special species will be more broadly available to the ANGFA community as well as to overseas enthusiasts.



Farm dam by Thiaki Creek, one of the Malanda Rainbowfish release sites. Photo: Karl Moy

where in the region in other sub-catchments in the upper North Johnstone catchment that likely formerly contained Malanda Rainbowfish, or lacked rainbowfish populations completely. New populations will be established by translocating sustainable numbers of wild adult fish with equal sex ratio. No fish will be translocated within the Dirran Creek sub-catchment as it contains Lake Eacham Rainbowfish.

As part of this effort Peter Unmack, Karl Moy and Brendan Ebner spent two days at the end of November 2016 moving 740 Malanda Rainbowfish to six new homes in each of the three catchments. The upper Ithaca River received 240 fish, consisting of an equal mix of Malanda Rainbowfish from all three systems (upper Molo Creek tributary [80 fish], each upper branch of Williams Creek [40 from each] and Wallace Road [80 fish]). The upper Ithaca River provides the best chance for establishing a major population due to the presence of two large waterfalls which have excluded rainbowfish from upstream. This should provide at least 5 km of stream habitat, at least half of which consists of a large river (we are yet to find any other rain-



Karl Moy releasing Malanda Rainbowfish into the upper Ithaca River. Photo: Brendan Ebner





Karl Moy releasing Malanda Rainbowfish into a farm dam by Thiaki Creek.

Photo: Peter Unmack

In summary the Malanda Rainbowfish is a unique species endemic to a small area of upland rainforest habitat in Far North Queensland. It is a fish that faces a very real and urgent battle against extinction through hybridisation with other rainbowfish. To stave off pollution of its genome and ensure its long term survival will require a concerted effort from a broad range of scientific and community groups. The first steps towards securing the future of this unique fish have now been taken.

### Acknowledgements

We'd like to thank all of the land holders for their tremendous generosity, information, willingness to help and for access to creeks and farm dams which are virtually all on private land. A special thanks to those landholders who allowed us to stock Malanda Rainbowfish on their properties. Lastly, thanks to Steven Brooks and staff from Queensland Fisheries for all their assistance with obtaining permits to translocate fish. All research and translocations were conducted under Queensland Fisheries Permit #168221 and University of Canberra Animal Ethics approvals CEAE 15-05 and 16-03.

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