

Monitoring of Tilapia dispersal in the Endeavour River

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Introduction.

Fish surveys were conducted during May 2009 as part of a third survey effort assessing the spread of tilapia (*Oreochromis mossambicus*) in the Endeavour River since the initial detection of an established population in December 2007. Previous monitoring efforts had been carried out in September and December 2008 by ACTFR, Southern Cape York Catchments Group and QDPI& F staff. May 2009 surveys were to provide additional assessment of seasonal effects on tilapia distribution and abundance, particularly any potential range expansion associated with dispersal opportunities during the preceding 2008-2009 wet season. Previous survey effort had highlighted that standard electro-fishing techniques (boat and backpack) were not particularly effective in detecting tilapia, which appear relatively resistant to galvanotaxis (electro-shocking) compared to most native species. Electro-fishing was however again utilized in 2009 as the primary survey technique as documentation of the composition of native fish communities prior to tilapia colonization remains an important associated aim of the monitoring program. Considerable additional effort in the form of visual surveys and cast netting was also employed in May 2009 to supplement electro-fishing and maximize chances of accurate detection of tilapia at survey sites.

Tilapia had been conclusively detected in December 2008 as spreading as far upstream as the pools below the Leggett's Crossing causeway in the Endeavour River. Monitoring effort was therefore focused in May 2009 on defining any further upstream expansion of range, with additional sites added further upstream than previous monitoring efforts, and the most downstream existing site (Redlands) near the saltwater interface omitted.

Site samples and results.

Six sites in total were surveyed in May 2009. Site survey results are outlined from most downstream site, preceding to the uppermost site visited along the Endeavour River (I think).

1. Downstream of Jensen's Crossing.

This site downstream of Jensen’s crossing consists of a relatively shallow series of riffles and run environments, with sampling conducted using an ETS backpack electro-fishing unit supplemented with cast-netting. Large numbers of juvenile tilapia had been visually documented at this site during previous surveys in 2008. Fish species diversity was particularly high at this site in 2009 with 17 total species recorded. Much of the diversity at this site was due to the abundance of recorded species with marine-estuarine affinities such as *L. calcarifer*, *L. argentimaculatus*, *A. miops*, *R. bikolanus*, *B. gyrinoides* and *G. filamentous*. While no tilapia were observed or captured during electro-fishing or cast-netting, a single juvenile tilapia (ca. 25mm SL) was observed in the shallows prior to commencement of survey effort.

Common Name	Scientific name	Abundance
Empire gudgeon	<i>Hypseleotris compressa</i>	18
Sleepy Cod	<i>Oxyeleotris lineolatus</i>	7
Eastern rainbow fish	<i>Melanotaenia splendida</i>	6
Marbled eel	<i>Anguilla reinhardtii</i>	6
Barramundi	<i>Lates calcarifer</i>	5
Mangrove Jack	<i>Lutjanus argentimaculatus</i>	4
Sailfin glassperch	<i>Ambassis agrammus</i>	4
Flag-tailed glassperch	<i>Ambassis miops</i>	3
Black catfish	<i>Neosilurus ater</i>	3
Yellow-finned catfish	<i>Neosilurus hyrtlil</i>	2
Silver biddy	<i>Gerres filamentous</i>	2
False Celebes goby	<i>Glossogobius sp. 1</i>	2
Giant gudgeon	<i>Oxyeleotris sellheimi</i>	1
Tilapia	<i>Oreochromis mossambicus</i>	1 (obs.)
Purple-spotted gudgeon	<i>Mogurnda adspersa?</i>	1
Speckled goby	<i>Redigobius bikolanus</i>	1
Greenback gauvina	<i>Bunaka gyrinoides</i>	1
Spangled perch	<i>Leiopotherapon unicolor</i>	1
Effort		800 secs

2. Rudderford’s (15.42833 S 145.09889 E)

Rudderford’s is a large deepwater site, with a diversity of instream habitat types present (large woody debris, macrophyte beds, deep and shallow sections). A number of adult and juvenile tilapia had been observed in the ‘plunge pool’ below the rock wall control feature on the main Rudderford’s waterhole in 2008, although none had been detected in the larger upstream waterbody. A total of 11 species, with no tilapia observed, were recorded in May 2009 from the main Rudderford’s waterhole.

Common Name	Scientific name	Abundance
Bony bream	<i>Nematalosa erebi</i>	50
Eastern rainbow fish	<i>Melanotaenia splendida</i>	48
Mouth almighty	<i>Glossamia aprion</i>	46

Roman-nosed goby	<i>Awaous acritosus</i>	12
Marbled eel	<i>Anguilla reinhardtii</i>	8
Empire gudgeon	<i>Hypseleotris compressa</i>	8
Spangled perch	<i>Leiopotherapon unicolor</i>	4
Jungle perch	<i>Kuhlia rupestris</i>	3
Sailfin glassperch	<i>Ambassis agrammus</i>	2
Black catfish	<i>Neosilurus ater</i>	1
Barramundi	<i>Lates calcarifer</i>	1
Effort		2692 secs

3. Wood's Hole (South Endeavour Homestead?) (15.42.13.9 S, 145.05.96.3 E)

Most survey attention at this site was focused on backwater habitats, as well as the shallower bedrock dominated downstream reaches of the waterbody control feature (rock wall), where substantial numbers of juvenile tilapia had been observed the previous year (J. Carroll pers. comm.). Eleven total species were recorded from survey effort, including the capture of a single large adult male tilapia (316mm Standard Length, 405mm Total Length), the first such tilapia capture by electro-fishing during the course of surveys (Figures 1 & 2). Electro-fishing, as well as visual surveys of shallower downstream reaches of the site failed to detect any additional tilapia.

Common Name	Scientific name	Abundance
Eastern rainbow fish	<i>Melanotaenia splendida</i>	80
Bony bream	<i>Nematalosa erebi</i>	64
Spangled perch	<i>Leiopotherapon unicolor</i>	22
Mouth almighty	<i>Glossamia aprion</i>	15
Marbled eel	<i>Anguilla reinhardtii</i>	6
Roman-nosed goby	<i>Awaous acritosus</i>	3
Sailfin glassperch	<i>Ambassis agrammus</i>	1
Jungle perch	<i>Kuhlia rupestris</i>	1
Yellow-finned catfish	<i>Neosilurus hyrtlil</i>	1
Sleepy Cod	<i>Oxyeleotris lineolatus</i>	1
Tilapia	<i>Oreochromis mossambicus</i>	1
Effort		1000 sec

Figure 1. Adult Tilapia: Wood's Hole (May 11th 2009)



Figure 2. Adult Tilapia: Wood's Hole (May 11th 2009)



4. Leggett's (15.24.44.7 S 145.03.23.5 E)

The Endeavour River immediately downstream of the Leggett's Crossing/causeway marked the uppermost known extent of tilapia dispersal until December 2008. 10 fish species were recorded during the boat survey conducted above the causeway barrier on the 11th May 2009.

Common Name	Scientific name	Abundance
Eastern rainbow fish	<i>Melanotaenia splendida</i>	152
Sleepy Cod	<i>Oxyeleotris lineolatus</i>	19
Spangled perch	<i>Leiopotherapon unicolor</i>	12
Mouth almighty	<i>Glossamia aprion</i>	13
Marbled eel	<i>Anguilla reinhardtii</i>	2
Roman-nosed goby	<i>Awaous acritosus</i>	2
Sailfin glassperch	<i>Ambassis agrammus</i>	2
Bony bream	<i>Nematalosa erebi</i>	1
Jungle perch	<i>Kuhlia rupestris</i>	1
Sailfin glassperch	<i>Ambassis agrammus</i>	1
Effort		1468 secs

Due to higher flow levels than that evident during previous surveys, it was possible to traverse the upstream rocky control feature on the Leggett's waterbody and survey the Endeavour River for a further 200m upstream until a riffle section restricted further boat navigation. This section of the river was relatively shallow (often less than 1m deep) with moderate flow. No tilapia were captured or observed during the course of this survey effort.

4a. Upstream Leggett's Lagoon.

Common Name	Scientific name	Abundance
Bony bream	<i>Nematalosa erebi</i>	100
Eastern rainbow fish	<i>Melanotaenia splendida</i>	100
Marbled eel	<i>Anguilla reinhardtii</i>	6
Jungle perch	<i>Kuhlia rupestris</i>	6
Spangled perch	<i>Leiopotherapon unicolor</i>	2
Roman-nosed goby	<i>Awaous acritosus</i>	2
Black catfish	<i>Neosilurus ater</i>	1
Effort		340 secs

4b. Leggett's Lagoon (Backpack- 12/05/2009).

Leggett's crossing was revisited on the 12th May and shallower sections and macrophyte beds immediately downstream and upstream of the road crossing (boat launch site) were subjected to additional backpack electro-fishing to survey areas not able to be easily accessed by boat. No tilapia were observed with this additional survey effort. An additional three fish species were however identified using back-packing that had not been observed in any previous surveying effort at the Leggett's site. Several specimens of *M. adspersa* from this (and other) sites on the Endeavour were retained for genetic analyses to confirm identity, as the range of *M. adspersa* and the closely related congener *M. mogurnda* are uncertain around central Cape York, and some range overlap may occur (see Allen et al., 2002).

Common Name	Scientific name	Abundance
Eastern rainbow fish	<i>Melanotaenia splendida</i>	29
Purple-spotted gudgeon	<i>Mogurnda adspersa</i>	10
Spangled perch	<i>Leiopotherapon unicolor</i>	10
Marbled eel	<i>Anguilla reinhardtii</i>	6
Bony bream	<i>Nematalosa erebi</i>	5
False Celebes goby	<i>Glossogobius sp. 1</i>	6
Sleepy Cod	<i>Oxyeleotris lineolatus</i>	3
Black catfish	<i>Neosilurus ater</i>	2
Yellow-finned catfish	<i>Neosilurus hyrtlui</i>	2
Speckled goby	<i>Redigobius bikolanus</i>	1
Mouth almighty	<i>Glossamia aprion</i>	1
Effort		300 secs

5. Endeavour River at Dotsmere Homestead. (15.40125 S 145.04814 E)

Previous reconnaissance by SCYC staff had identified this reach as being a useful site for assessing potential upstream expansion of tilapia range in the Endeavour River. There was an abundance of prospective habitat for tilapia colonization and survey effort in the main Endeavour River itself with substantial shallow water habitat available. There was also a stretch of shallow, macrophyte and emergent vegetation dominated habitat present on a smaller, impounded creek feeding into the main Endeavour River at this point. Eleven native species were detected by electro-fishing, with no tilapia detected during electro-fishing, cast-netting or visual assessments.

Common Name	Scientific name	Abundance
Eastern rainbow fish	<i>Melanotaenia splendida</i>	50
Purple-spotted gudgeon	<i>Mogurnda adspersa?</i>	20
Spangled perch	<i>Leiopotherapon unicolor</i>	15
Black catfish	<i>Neosilurus ater</i>	9
Marbled eel	<i>Anguilla reinhardtii</i>	6
Mouth almighty	<i>Glossamia aprion</i>	4
Yellow-finned catfish	<i>Neosilurus hyrtlui</i>	4
Sleepy Cod	<i>Oxyeleotris lineolatus</i>	3
Empire gudgeon	<i>Hypseleotris compressa</i>	2
Bony bream	<i>Nematalosa erebi</i>	2
Speckled goby	<i>Redigobius bikolanus</i>	1
Effort		520 secs

6. Isabella Creek Bridge Site. (need lat/long)

This small system was surveyed at a road bridge access point a short distance (ca. 200m) before its confluence with the Endeavour River. No tilapia were detected via electro-fishing or visual survey.

Common Name	Scientific name	Abundance
Spangled perch	<i>Leiopotherapon unicolor</i>	12
Sleepy Cod	<i>Oxyeleotris lineolatus</i>	4
Eastern rainbow fish	<i>Melanotaenia splendida</i>	4
Bony bream	<i>Nematalosa erebi</i>	2
Effort		180 secs

Discussion.

Previous surveys in 2008 had noted substantial apparent breeding and recruitment of tilapia in a number of colonized waterbodies, with numerous juveniles readily observed in shallow margins of several sites (Wood's Hole, Jensen's Crossing etc.). This suggested significant potential for upstream range expansions during 2008-2009 flood events and the associated inundation of dispersal barriers that exist during low flow conditions (rock bars, waterfalls, causeways etc.). Only two individual tilapia however were documented during the whole course of May 2009 surveys, in waterbodies already known to support resident tilapia populations. The apparent lack of any tilapia sightings or captures above Leggett's Crossing suggests that until this moment in time at least, tilapia distribution and abundance has not increased dramatically over the course of surveys. The failure to detect tilapia at any sites above Leggett's crossing does not necessarily guarantee their absence in these locations, or even further upstream. Numbers could be low enough in some waterbodies following successful dispersal-colonisation to avoid detection during standard 'one-off' rapid monitoring assessments, particularly surveys reliant on a methodology (electro-fishing) with limitations regarding tilapia capture.

Given that tilapia are now present in the Endeavour River system, public awareness and education is essential in minimizing their spread both within and outside the Endeavour River catchment. As illustrated in this case, tilapia introduction to new catchments is typically mediated by people physically translocating fish outside their existing range. If the spread of tilapia throughout the high environmental value Cape York catchments is to be minimized, public education of the mechanisms of feral fish dispersal needs to be emphasized.

References.

Allen, G.R., Midgley, S.H. & Allen, M. (2002). *Field Guide to the Freshwater Fishes of Australia*. Perth, Western Australia: Western Australian Museum.

Keatings Lagoon Survey (May 2009).

This survey was conducted on May 12th 2009 as part of a study examining impacts of pig exclusion fences on community composition of Keating's Lagoon freshwater fish communities. As per previous surveys the sampling protocol utilized boat electro-fishing as the main collection technique. Results are presented in Table ? below. Five species in total were recorded although it must be noted that undetermined electro-fishing equipment failures that arose soon into the survey cut short sampling effort. Survey results should be viewed as accordingly unreliable.

Common Name	Scientific name	Abundance
Eastern rainbow fish	<i>Melanotaenia splendida</i>	110
Bony bream	<i>Nematalosa erebi</i>	12
Marbled eel	<i>Anguilla reinhardtii</i>	2
Barramundi	<i>Lates calcarifer</i>	1
Sleepy Cod	<i>Oxyeleotris lineolatus</i>	1
Effort		407 (dodgy)