

FRONTISPIECE



ODE TO A FERAL FISH

*O fish, little fish of beautiful hue,
Did you come here by chance,
Did you come from afar?
Are there others like you from similar climes,
Beyond the horizon or round the next bend?
Are you looking for refuge, are you friend, are you foe,
Where did you come from, where will you go?
Tell me, O fish, little fish of beautiful hue,
Are you here for a while,
Or just passing through?*

a.c. webb, Aug 2002

**THE ECOLOGY OF INVASIONS OF NON-INDIGENOUS
FRESHWATER FISHES IN NORTHERN QUEENSLAND**

Thesis submitted by

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in December 2003

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James Cook University

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All research procedures reported in the thesis received the approval of the JCU Experimentation Ethics Review Committee, Approval No. A444, 15 October 1997.

]

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ABSTRACT

This study investigated the ecology of invasions of non-indigenous freshwater fishes in northern Queensland and, in particular, examination of historical changes in their distribution patterns and establishment success in relation to their use of human altered habitats and interactions with indigenous predators and parasites.

Seventeen non-indigenous fish species were reported from northern Queensland fresh waters during the study with eleven species establishing breeding populations. Virtually all species were observed in waterways in agricultural and urban regions that have been altered by human activity. Non-indigenous fishes are continuing to disperse locally, with large-scale changes in range due to translocation by humans. Previous history of introductions elsewhere and indices of propagule pressure (frequency of introductions) and habitat matching (absolute latitudinal range overlap) are very good, though not absolute, predictors of establishment success of non-indigenous fishes in northern Queensland.

Field and laboratory studies demonstrated the importance of refuges, created by habitat disturbance, to the survivorship of some small, non-indigenous species. In the Ross River catchment, non-indigenous fishes were predominant in small streams and channels where access was blocked by dense aquatic vegetation and in isolated wetlands, but virtually absent from open water sites in the main channel of the Ross River and Ross Dam. Species diversity and abundances of indigenous fishes, however, were significantly less than for main channel sites.

There was a strong association between mass stocking of the predatory Barramundi, *Lates calcarifer*, and a significant reduction in catches between the pre-stocking (1991/92) and post-stocking (1997/98) periods, particularly of the indigenous Bony bream, *Nematolosa erebi*. Catches of the non-indigenous Mozambique mouthbrooder, *Oreochromis mossambicus*, were not affected. Piscivorous fish, including Barramundi and Mouth almighty, *Glossamia aprion*, apparently did not target non-indigenous fishes, even though the Mozambique mouthbrooder is a dominant component of the fish community in the weirs. Juvenile and subadult Mozambique mouthbrooder remained in refuge habitats inaccessible to large predators until they were large enough to join adult schools in more open water. At this stage, these fish are effectively too large (deep-bodied) and spinous to be selected as prey, even by large, gape-limited predators such as Barramundi. Experimental studies showed that piscivorous fishes, irrespective of foraging mode, were functional rather than taxonomic predators: they will eat non-indigenous fishes if available. In the absence of cover, predators chose slow, soft-finned and narrow-bodied fish as prey in preference to fast, evasive, deep-bodied fish with spines.

Non-indigenous fishes had depauperate, stochastically-determined parasite communities dominated by non-indigenous parasites introduced with the host. Non-indigenous fishes had significantly lower parasite species richness, intensity and prevalence and more aggregated parasite frequency distributions than indigenous fishes, particularly in high disturbance habitats. It is argued that these differences assist the invasion and establishment of non-indigenous fishes by reducing adverse affects of parasites on host fitness. There was a significant positive correlation between parasite acquisition and residence time for non-indigenous fishes. Parasite acquisition appears to be a very slow process and may occur over centuries – even millennia - rather than decades. This slow acquisition will also benefit non-indigenous fishes as it allows them a long period of adjustment to the new environment relatively free from parasites.

Management options for non-indigenous fishes in northern Queensland are discussed. It is argued that habitat restoration can play a key role in the long term management of non-indigenous fish species by increased exposure to predation and competition (biotic resistance) and so greatly reduce local populations of non-indigenous fishes and increase the probability of their extinction.

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