

Pacific Islands flame angelfish probably all belong to the same stock

The flame angelfish, *Centropyge loricula* (Günther 1874), is one of the most popular reef fish in the marine aquarium trade. It is sourced exclusively from the Pacific region.



A flame angelfish, *Centropyge loricula* (Image: Colette Wabnitz)

Key to their appeal is their vibrant colouration and distinctive markings. Flame angelfish are characterised by a bold orange to red body with up to seven broad black bars running vertically down each side. The edges of the anal and dorsal fins are black with a blue margin. There are slight differences in the colouration and markings of this species in different locations (Pyle 2003). Flame angelfish in Marshall Islands are more red than orange, with thicker black bars; those in Kiritimati Island are red/orange and have thinner black bars; those in Tahiti are blood red in colour with a smaller number of black markings on the body, while in the Marquesas they are more orange in colour and completely lack the vertical black bars. Recent work by Schultz et al. (2007), based on mitochondrial DNA analysis of 116 individual fish from throughout the region, shows that, while there is a strong geographic component to the distribution of colour morphs in *C. loricula*, there is no evidence of corresponding genetic partitioning.

Centropyge loricula can be found at depths between 10 and 60 m on the reefs of a number of Pacific Island countries and territories at varying abundance levels. Flame angelfish are secretive and tend to stay close to shelter. They can be found associated with a variety of habitats, from coralline algae-encrusted rugose pavement, to thick *Halimeda* (green calcareous macroalgae) beds, to areas covered in 100% live coral. They feed predominantly on algae. Currently, these fish are primarily

collected from Marshall Islands and Kiritimati Island in the Central Pacific. Other important exporters are Vanuatu, Cook Islands and, until recently, Kosrae in Federated States of Micronesia.

Despite its popularity in the marine aquarium trade, relatively little is known about the basic life history parameters of this species (e.g. length-weight relationships, age-size relationships). Contrary to other angelfish species, information on the embryonic and larval development of *Centropyge* species is plentiful. Studies by Baensch (2002, 2006) and Rhody (2006), for example, have revealed that egg and larval characteristics are very similar among species and that many egg and early larval traits are similar across angelfish genera (see also Hioki and Suzuki 1987). Flame angelfish eggs are free drifting, with larvae measuring on average just over 1 mm when they hatch (Rhody 2006), which is known to occur 14 to 16 hours after fertilisation at 27°C (Baensch 2002). The angelfish pelagic larvae stage is complex and can last upwards of 6 weeks (Thresher 1985), settling and metamorphosing after 110 days (Baensch 2006).

To contribute to our understanding of the life history of *C. loricula* and to the management of the species as an important resource for the aquarium trade, SPC obtained morphometric data, fin clips and otoliths from a total of 234 individuals¹. The fish were collected across a gradient of fishing pressure from sites in Marshall Islands,

¹ Fin clips were also taken from an additional five fish in New Caledonia.

Vanuatu, Kiritimati, Kosrae, Cook Islands, Pohnpei (no active fishery), and Nauru (no active fishery). All samples were obtained and shipped by SPC and/or obtained with the support and collaboration of relevant local authorities and aquarium trade operators, following all necessary permit and quarantine requirements.

Preliminary results from genetic analyses, conducted by colleagues at the Institut de Recherche pour le Développement with whom SPC is collaborating for this part of the project, appear to corroborate the findings of Schultz et al. (2007), namely, that flame angelfish populations are not genetically partitioned in the region.

Morphometric measurements reveal that the size of flame angelfish on a given reef, on average, ranges between 26 mm and 89 mm total length, with most individuals falling within the 35 mm to 75 mm size bracket. The greatest spread in fish sizes was obtained from Kiritimati. Within this regional sample, no significant difference was found in the length-weight relationship of fish, whether they were obtained from operators,² reef sites from an island with an active fishery, or sites from an island without an active fishery.

Centropyge loricula is a relatively small fish with small to very small otoliths. Otoliths, also commonly known as earstones or fish ear bones, are hard, calcium carbonate structures (crystals) found directly behind the brain of bony fish. Their function has been compared to that of our inner ear; they assist fish with balance, orientation and sound detection. As a fish grows, new material is added to the exposed surface of the otolith over time, but existing material cannot be removed. Thin sections of an otolith under a microscope show bands of opaque and translucent material, much like the growth rings in a tree trunk. It is typically assumed that these rings form on a yearly basis. Counting the number of dark/translucent bands on an otolith will yield a fish's age. However, the smaller the otolith and the closer to the equator the fish is collected (Longhurst and Pauly 1987), the more difficult it is to see the bands and determine with accuracy the age of the fish. Initial results on 20 fish between 47 mm and 75 mm in length show that, although faint, there are bands of opaque and translucent material, yielding age estimates ranging between 2 and 6 years.

Final results and their analysis are expected at the end of the southern hemisphere's summer. These will be disseminated to project partners throughout the region and it is hoped they will inform the development of management considerations for this species where it significantly contributes to the marine aquarium trade.

References

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² These fish were often obtained just prior to export, meaning they had not been fed for up to three days to ensure they do not soil the bags in which they are shipped during transport. This optimises their health.