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NOTE

Juveniles of the Bluespotted Trevally, *Caranx bucculentus* (Teleostei: Carangidae), schooling with venomous catfishes (Plotosidae): a new case of mimicry

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The Striped Catfish, *Plotosus lineatus* (Thunberg), occurs from east Africa and the Red Sea to Samoa and feeds primarily on crustaceans and occasionally mollusks and small fishes. These catfish have venomous dorsal and pectoral -fin spines and their stab wounds are extremely painful (Randall 2005a, Bergbauer *et al.* 2009). The juveniles frequently swarm over the bottom and form compact ball-like schools, which provide additional protection by confusing predators. The juveniles “seem to know they are safe, as they make little effort to move when disturbed” (Bergbauer *et al.* 2009).

In 2006, at Lembeh Strait, Indonesia, juvenile trevallies (Carangidae) were first observed schooling with Striped Catfish, but the photographic images were too small to allow positive identification of the trevally species. On 6 April 2011, at a different site in Lembeh Strait, the same behavior was successfully documented with video (archived and available at <http://dx.doi.org/10.5281/zenodo.1345288>). The juvenile trevallies are the Bluespotted Trevally, *Caranx bucculentus* Alleyne & Macleay, a piscivorous Indo-West Pacific species known from Australia



Figure 1. Bluespotted Trevally, *Caranx bucculentus*; two juveniles schooling with venomous Striped Catfish, *Plotosus lineatus*, Lembeh Strait, Indonesia (frame of video by Anna & Ned DeLoach).

to Japan. This species differs from its congeners most obviously in having the straight part of the lateral line with enlarged scutes that extend anteriorly to below the first dorsal fin, combined with a very short, strongly arched, curved lateral line (Smith-Vaniz 1999). The prominent stripes of the trevally juveniles (Fig. 1) have not been observed previously in the species, clearly indicating alteration of the typical color pattern to more closely match that of the Striped Catfish.

Although the exact nature of the behavioral interaction is unknown, it is almost certainly a case of opportunistic rather than obligate mimicry. By traditional definition, this is a case of Batesian mimicry (Randall & Randall 1960, Moland *et al.* 2005, Randall 2005b), where a “harmless” species closely resembles a venomous species and thus is usually avoided by potential predators. Participation by the trevallies in the confusing compact catfish balls would also provide protection from predators. The relatively few numbers of trevallies compared to those of swarming catfish schools would make it difficult for a predator to learn to distinguish the palatable juvenile trevallies. The trevallies may also be attracted to the catfish schools primarily because the schooling behavior flushes potential prey for both species. In addition to primarily Batesian mimicry, and perhaps some aggressive mimicry for approaching prey, there may also be an advantage in social mimicry, whereby the trevally mingles unobtrusively with the schooling catfish.

Another presumed case of Batesian mimicry in a carangid was reported by Mahadevan & Nayar (1965). They observed 20 instances of 2–11 juveniles (largest individual 50 mm total length) of *Gnathodon speciosus* (Forskål), Golden Trevally, swimming in single file beside to an unidentified sea snake. Juveniles of *G. speciosus* are silvery to yellow with 7–11 usually alternating broad and narrow black bands, which closely match the color pattern of the sea snake. When approached or frightened, the trevallies moved closer to the sea snake, literally hugging its body and were very difficult to distinguish. The same association was observed on many occasions so the possibility that the association was coincidental seems unlikely. Evidently the matching color pattern of the juvenile carangids serves as protective coloration that enables them to move from place to place with the foraging sea snake without being eaten by larger predators.

An additional case of Batesian mimicry involving carangid fishes, but in this case as the model instead of the mimic, was reported from Brazil by Sazima (2002). Juvenile grunts of *Pomadasys ramosus* (Haemulidae) closely resemble and behave like juvenile leatherjacket, *Oligoplites palometa*, in tidal streams and mangrove habitats. The leatherjacket is a venomous fish, with venom glands in both the dorsal and anal-fin spines, and the juvenile displays a contrasting bicolored barred pattern as warning coloration. When the grunt occurs with the leatherjacket, it also displays the barred pattern and also swims in the open rather than using its typical camouflage strategy among the plant debris.

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