

Reef sites

Goby and shrimp associations: more than meets the eye



Fig. 1 Crustacean prey item being removed from the mouth of *Amblyeleotris latifasciata* by *Alpheus* sp. at Rig Reef, Brunei



Fig. 2 *Cryptocentrus sericus* being cleaned by its host *Alpheus* sp. at the burrow entrance in Lembeh Straits, Indonesia



Fig. 3 **a** *Alpheus randalli* feeding on fecal matter of *Stonogobiops nematodes* in Lembeh Straits, Indonesia. **b** Close-up of *A. randalli* feeding on fecal matter of *S. nematodes*

Interactions between the 120 species of gobies that associate with 13 species of *Alpheus* shrimps are often overlooked as these species are benthic and subterranean. Gobies act as sentinels at the entrances of burrows excavated and maintained by host shrimps and warn the latter of perceived threats through tactile communication (see Karplus and Thompson 2011 for review).

The importance of gobies as food providers to shrimps has been rarely discussed. Diet analyses of shrimp associates indicate copepods, interstitial matter, and seagrass as main food items. Incidental observations revealed a more varied diet, facilitated by goby associates. *Cryptocentrus cinctus* and *C. singapurensis* [= *C. leptocephalus*] were previously reported to introduce items such as algae and bivalves into burrows for associate shrimps. We observed the goby, *Amblyeleotris latifasciata*, capturing a small crab near the burrow entrance and carrying this prey item toward the burrow entrance. Upon arrival, it rapidly moved up and down, a characteristic behavior we can best describe as 'jumping'. The shrimp emerged from the burrow and proceeded to remove the entire prey item from the mouth of the goby, without resistance or struggle from the latter, before retreating into the burrow (Fig. 1).

Shrimps (*Alpheus* spp.) have also been observed to feed on ectoparasites gleaned while cleaning goby associates both in the laboratory (*Myersina macrostoma*; Hou et al. 2013) and in the wild (*Stonogobiops yasha*; Senou and Mori 2001). We photographed *C. sericus* being cleaned at the burrow entrance by its shrimp associate at Lembeh Straits in Indonesia (Fig. 2). In another instance, the shrimp *Alpheus randalli* was observed feeding on fecal matter of its associate goby, *S. nematodes* (Fig. 3). Although hypothesized previously for a *S. nematodes* and *Alpheus* sp. pair observed at Minna-jima Island, in Okinawa, Japan, this behavior was never confirmed (Senou and Mori 2001).

A wide variety of food sources are made available to these shrimps by their goby associates such as prey items, ectoparasites and fecal matter. Collectively, these incidental observations demonstrate the complexities within this association type not yet fully understood by scientists. Interactions between associated organisms provide insights into the demography and fitness within populations. Studies on behaviors such as these can greatly aid in understanding ecological functions present in coral reef ecosystems.

References

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