Diversity of lionfishes (Pisces: Scorpaenidae) among remote coral reefs of the Palau Archipelago

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Fig. 1 Diversity of lionfishes collected among the southwest islands of Palau and the Helen Reef Atoll. *P. volitans* ($N = 2$) photo by J. Grubich. *P. radiata* ($N = 6$), *D. biocellatus* ($N = 2$), and *P. antennata* ($N = 5$) photos by J. Williams. Tissue loan requests and specimen collection information are available from the authors

Fig. 2 Coral and grouper diversity (Serranidae). Helen Reef Atoll coral species and habitat complexity (a) photo by H. Rall. *Plectropomus laevis* (b) photo by M. Westneat. *Aethaloperca rogaa* (c) and *Cephalopholis sexmaculata* (d) photos by M. Winterbottom

In less than a decade, the Indo-Pacific red lionfish, *Pterois volitans*, has rapidly spread throughout the Western North Atlantic (Whitfield et al. 2007). To improve understanding of the lionfish invasion, there is a pressing need for comparative knowledge on lionfishes from their native ranges.

During a 2008 rapid assessment of reef fish diversity among the Southwest Islands of the Palau Archipelago, lionfishes were collected while SCUBA diving using spears and by dispersing 4 kg of the ichthyotoxin rotenone at positions along the reef. Collection depths ranged from 2 to 36 m, and seawater temperatures varied from 26–28.2°C. A total of 15 lionfish specimens were collected from the fringing reefs of Sonsorol, Fana, and Tobi islands and the Helen Reef Atoll (Lat 2°52'N, Long 131°46' E). Four species of lionfishes were identified (Fig. 1).

Lionfishes were present in 28.9% of the sites accounting for only a small portion of the overall reef fish biodiversity. Unlike the high abundances of *P. volitans* in the Western Atlantic (i.e., ~21.2–390 individuals ha^{-1}) (Whitfield et al. 2007; Green and Cote 2009), conservative estimates from Helen Reef Atoll ($N = 28$ sites; average rotenone collection area ~13 m^2) were relatively low for all four species (i.e. *Pterois antennata* ~4.4 ind ha^{-1} , *Pterois radiata* ~13.1 ind ha^{-1} , and ~2.2 ind ha^{-1} for *Dendrochirus biocellatus* and *P. volitans*).

In contrast to the Western Atlantic, lionfish were not observed roaming in the open. They were collected hiding in the reef matrix (Fig. 2a). The lower abundances and cryptic behavior may be related to high reef fish diversity limiting resources and increasing mortality. Groupers (Serranidae) have been indicated as potential predators as well as competitors of lionfishes (Maljkovic and Van Leeuwen 2008). This expedition encountered robust grouper populations identifying over 20 species from 7 genera (Fig. 2b–d).

Since lionfishes remain popular in the aquarium trade, there is still the threat of future introductions of new *Pterois* species into the Atlantic. These data provide a snapshot of lionfish biodiversity from a remote and still pristine coral reef ecosystem in the Western Pacific.

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References

- Green SJ, Cote IM (2009) Record densities of Indo-Pacific lionfish on Bahamian coral reefs. *Coral Reefs* 28:107
- Maljkovic A, Van Leeuwen TE (2008) Predation on the invasive red lionfish, *Pterois volitans* (Pisces: Scorpaenidae), by native groupers in the Bahamas. *Coral Reefs* 27:501
- Whitfield PE, Hare JA, David AW, Harter SL, Munoz RC, Addison CM (2007) Abundance estimates of the Indo-Pacific lionfish *Pterois volitans/miles* complex in the Western North Atlantic. *Biol Invasions* 9:53–64

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Reef sites

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