

Relationships between habitat, social behaviour and diet: a case study in damselfishes from Moorea

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Models for vertebrate adaptive radiations predict that diversification occurs in the form of temporal stages. Generally, adaptive radiation happens first along the axis of habitat features and then follows a divergence related to trophic specializations. Here, we aim to test this hypothesis by investigating the relationships among habitat, social behaviour and diet in damselfishes (Pomacentridae) from coral reefs at Moorea, French Polynesia. Stable isotope ratios of carbon and nitrogen in combination with stomach contents delineated three trophic groups, as observed in other regions: pelagic feeders consuming zooplankton, benthic foragers mainly grazing on algae, and a group called intermediate that feeds on zooplankton and benthic preys in equal proportions. Stable isotope ratios of sulphur revealed a segregation between species of the outer reef, which are mostly dependent on oceanic food input, and the other species from the lagoon, which rely more on autochthonous local productivity or even on terrestrial supply. Without phylogenetic corrections, the diet of damselfishes defined with stomach contents was correlated with habitat and social behaviour, and it was also correlated based upon stable isotopes. Furthermore, with phylogenetic corrections, significant relationships were found for either dietary proxy. Overall we demonstrate a dependence between habitat and trophic diversification during the evolutionary history of damselfishes, providing no support for a model of adaptive radiation in stages.