Stable isotope ratios reveal trophic niche partitioning among hermit crabs from tropical polyspecific seagrass meadows

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Context, objectives & methods

- Tropical polyspecific seagrass meadows provide many ecological and socio-economical services
- These ecosystems undergo multiple anthropogenic threats (eutrophication, overfishing, invertebrate overharvesting)
- Data about functional ecology of meadows and structure of the associated food webs are needed to understand how they could react to human impacts
- As part of a larger study: examination of resource segregation between two common, co-occurring, supposedly omnivore Diogenidae hermit crabs

- Sampling of Dardanus scutellatus (n=28) and Ciliopagurus tricolor (n=17) on the Toliara Great Reef (SW Madagascar, see map on left) in July 2014
- Analysis of stable isotope ratios of C, N and S of their abdominal muscle using CF-EA-IRMS
- Exploration of data using statistical hypothesis testing and isotopic niche modeling (SIBER: Stable Isotope Bayesian Ellipses in R) (Jackson et al. 2011, J Anim Ecol 80: 595-602)

Isotopic ratios of consumers

Significant differences in the isotopic composition of all 3 elements ➔

The two species do not feed on the same items

According to literature from the area:


1. Both species are primary consumers.
2. C. tricolor mostly relies on algal production, while some D. scutellatus could assimilate seagrass-derived matter. Pelagic inputs to hermit crab diet are likely weak.

Isotopic niche modeling

No overlap of standard ellipses (solid lines on the figure on the left) of the two species ➔ they are supported by different core resources

The area of the standard ellipse of D. scutellatus is larger than the one of C. tricolor in 97.46% of 10^5 model estimates ➔ D. scutellatus exploits more food items than C. tricolor.

Conclusions & perspectives

- Differences in foraging ecology of these two hermit crabs ➔ could limit interspecific competition and facilitate coexistence of D. scutellatus and C. tricolor in Malagasy seagrass beds
- Analysis of food items sampled at the same time and location will enable use of a mixing model and ultimately reveal which producers actually support hermit crabs populations

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