Orientation from open water to settlement habitats by coral reef fish: behavioral flexibility in the use of multiple reliable cues

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Abstract

Most coastal marine organisms have a dispersive oceanic larval stage, during which they must be able to distinguish and respond to relevant environmental cues when settling into their first benthic habitat. Chemical stimuli emanating from settlement habitats and being dispersed by water plumes could enable long-distance navigation by larval reef fish, but we know little about the cues responsible and their interactive effects. In the present study, we tested this by conducting several ex situ choice experiments in which the response of the coral reef fish Lutjanus fulviflamma towards different chemical cues from coastal habitats was tested close to their settlement stage. Fish preferred seagrass habitat water over that from coral reef and mangrove habitats. Furthermore, fish were attracted to chemical cues from their own species (conspecifics) and other fish species, as well as vegetation of 4 different seagrass species, when offered in isolation (i.e. soaked in neutral water), but a strong response remained only towards cues from conspecifics and seagrass leaves when these cues were mixed with seagrass habitat water that naturally contains other cues. Hierarchical effects were observed as fish preferred chemical cues from seagrass leaves over those from conspecifics when both were offered at the same time. The importance of visual habitat cues only overruled that of chemical cues when it concerned preferred cues (i.e. seagrass as opposed to mangrove cues). Our findings indicate that pelagic fish and settlers possess the ability to use multiple reliable chemical cues to locate suitable early life stage habitats, although the importance of these cues is context-dependent. Nevertheless, this flexibility in choice behavior is probably an adaptive strategy to enhance fitness by increasing successful orientation towards preferred settlement habitats.

Key Word coral reef, reliable cues