

Characteristics of nocturnal ventilation of corals by the damselfish

Dascyllus marginatus

By

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Branching corals substantially block the flow of water through the colony, creating inner regions of reduced water replenishment. At night, due to a lack of photosynthesis and enhanced respiration, hypoxia often occurs. Branching corals are frequently inhabited by social groups of mutualistic damselfish *Dascyllus marginatus*. At night, unlike crevice-dwelling fish, *D. marginatus* exhibits a unique ventilation swimming behavior, characterized by energetic, high frequency fin motions. This behavior significantly increases water exchange, thereby augments the supply of oxygen to the inner branches of the coral. Our findings indicate that ventilation swimming is an innate behavior, displayed by the fish whenever it enters the space between a coral or a coral skeleton branches, during both day and night, even displayed when the fish is forced to sleep out of shelter. On the other hand, this behavior is plastic, modulated by ambient conditions. Flume experiments show that under conditions of elevated oxygen, the fish reduces its fin motion frequency and vice versa under reduced oxygen concentration. Moreover, when the size of the fish group in a coral is reduced by removing 40-50% of the fish in situ, the remaining fish increase their fin motion frequency, resulting in water motion similar in intensity to that occurring prior to the fish removal. The modulation of the fish ventilation motion is a unique negative feedback mechanism which governs the oxygen concentration between the coral branches.