Functional Ecology
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The feeding rate of reef fishes

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Many reef fishes feed constantly at the bottom of the reef from where they garner different types of food such as detritus, algae and invertebrates. Food consumption is extremely important for fish to achieve their energy targets, grow and reproduce. Unfortunately, quantifying fish food consumption in the field is challenging because they are highly mobile organisms. Consequently, scientists often have to rely on a proxy for consumption rates by counting how many bites per unit time (a.k.a. bite rates) a fish allocates to different food items. There is extensive theory on how consumption rates should change with varying body size and the surrounding environmental temperature. However, we still lack a framework to mathematically link consumption rates to bite rates. In our study, we propose a mathematical framework to link bite rates to consumption rates, and in doing so we establish predictions about how bite rates should change with the size of the individual and environmental temperature. Using our model as a point of departure, we quantified how body size, water temperature and diet influence the bite rates of small cryptic marine fishes from the genus *Ophioblennius* (redlip blennies). We then used these estimates to simulate how climate change might affect consumption rates.

We tallied the bite rates of four *Ophioblennius* species in eight locations across the Atlantic Ocean. We found that fishes speed up their bite rates with increasing water temperature—more so than expected by our model; moreover, at a given temperature, smaller individuals exhibited faster bite rates than larger individuals. We found that detritus made up most of the diet of multiple *Ophioblennius* populations (belonging to two species) by sampling the stomach contents of individuals. Algae and animals were also found but in much smaller quantities, probably suggesting accidental ingestion.

(*Ophioblennius macclurei*—Caribbean red lip blenny; photo: Carlos Estape)

In testing our predictions with laboratory data and field observations from a broad geographical range we can better understand the effects of environmental change on consumers' feeding pressure. Based on our results, we simulated how ocean warming might affect consumption rates, and discovered that the combined effects of smaller sizes and higher temperatures will considerably increase the consumption rates of these animals, which means that each individual will require much more food. Because these abundant cryptic fish are prey to many predators on the reef, our study suggests that climate change will limit the amount of food (energy) that moves from algae to predators in marine food webs.