The Calculation of Prey Size Selection

To account for the visual acuity of zooplanktivorous fishes affecting patterns of prey size-selection by limiting their detection of small items (O’Brien 1979, Wankowski 1979, Li et al. 1985) the selection of *Atypichthys strigatus* for different size prey items was calculated as:

\[
Sel_i = \frac{P_i}{P_{\text{max}}} \quad \text{when } P_i < P_{\text{max}}
\]

\[
= 1 \quad \text{when } P_i \geq P_{\text{max}}
\]

where \(Sel_i\) is the observed prey size-selection by *A. strigatus* for a zooplankton size class \(i\), \(P_i\) is the proportion by count of a zooplankton size class \(i\) observed within the stomachs of *A. strigatus*, and \(P_{\text{max}}\) is the largest proportion of a single zooplankton size class (Fig. S3A). For size classes larger than that at \(P_{\text{max}}\), the pattern of prey size-selection was assumed equal (i.e. consumption was in proportion to environmental supply). The decline in selection for zooplankton size classes smaller than that at \(P_{\text{max}}\) is likely to reflect a decline in catchability by *A. strigatus*, as zooplankton was observed to be most abundant in smaller size classes (Fig. S3A). The \(Sel_i\) values for the 9 size bins in order of ascending size were: 0, 0.02, 0.46, 1, 1, 1, 1, 1, 1.

Given that not all zooplankton size classes were consumed in proportion to their supply, the total biomass of zooplankton estimated from the laser optical plankton counter (LOPC) would overestimate the biomass available to *A. strigatus*. Thus, selection by *A. strigatus* for different sized prey previously estimated (\(Sel_i\)) was combined with total zooplankton biomass data from the LOPC to estimate the available biomass:
\[ Ba_i = Sel_i \times Bb_i \]  
(S2)

where \( Ba_i \) is the zooplankton biomass (mg m\(^{-3}\)) of size class \( i \) that is available to \( A. \ strigatus \) based on observed prey size-selection (\( Sel_i \)) and \( Bb_i \) is the total zooplankton biomass (mg m\(^{-3}\)) in size class \( i \) before predation at the reef. The \( Bb_i \) values were approximated using a log-normal distribution (Table 1 in the main article), with the following parameters (mean \( \mu_i \), standard deviation \( \sigma_i \)) for the 9 size bins in ascending size order (derived from raw data): ln(11.2), 0.5; ln(104.9), 0.6; ln(221.1), 0.5; ln(197.1), 0.4; ln(100.2), 0.35; ln(53.2), 0.35; ln(38.6), 0.35; ln(31.0), 0.25; ln(113.7), 0.35.

SUPPLEMENT LITERATURE CITED


SUPPLEMENT FIGURES

Fig. S1. Quantile boxplots of wet weight (mg; left axis) of *A. strigatus* stomach contents (n = 55), including unidentified crustacean (Un. Crust.). The ‘Unidentifiable’ group (Table 2) is included in total wet weight of all contents (mg; right axis) but not reported as an individual prey group. Grey crosses denote mean values.
Fig. S2. Relationship between foraging distance from the reef and the volume (m³) of water available to be foraged (here reef volume is included in foraging volume). The volumes ($V_p$; m³) for the 9 foraging bins ($p$) were 664 (within reef), 151 (0–0.5 m), 188 (0.5–1 m), 232 (1–1.5 m), 282 (1.5–2 m), 249 (2–2.5 m), 328 (2.5–3 m), 371 (3–3.5 m), 417 (3.5–4 m).

Fig. S3. (A) Size distribution of total zooplankton assemblage sampled (dark grey; n = 27 plankton tows) and size-specific zooplankton consumed by A. strigatus at the artificial reef (light grey; n = 55). (B) Biomass of the total zooplankton assemblage at the artificial reef, and the biomass available to A. strigatus given the pattern of prey size-selection observed in (A). Error bars are ± 1 SE. ESD: equivalent spherical diameter.
Fig. S4. Results of the sensitivity analyses, for Model 1 (A) and Model 2 (B). The 2 response variables were % depletion of total zooplankton biomass (A); and the reef length (m) at which the food supplied:food required ratio = 1 (B). See Table 1 in main article for parameter information.