

Overwintering tropical herbivores accelerate detritus production on temperate reefs

Salvador Zarco-Perello¹, Tim J. Langlois¹, Thomas Holmes², Mathew A. Vanderklift³, Thomas Wernberg^{1,4}.

¹ School of Biological Sciences and UWA Oceans Institute, The University of Western Australia, Crawley (Perth), 6009, Western Australia, Australia. ² Marine Science Program, Department of Biodiversity, Conservation and Attractions, Kensington, WA, Australia. ³ Commonwealth Scientific and Industrial Research Organization (CSIRO), Oceans and Atmosphere Flagship, Indian Ocean Marine Research Centre, Crawley, Western Australia, 6009, Australia. ⁴ Department of Science and Environment, Roskilde University, 4000 Roskilde, Denmark.

Correspondence and requests for materials should be addressed to S.Z. (email: salvador.zarco.perello@gmail.com) or T.W. (email: thomas.wernberg@uwa.edu.au)

Supplementary Information

Herbivory rates

Table S1. Number of bites, bite rates and standardized consumption rates by bite size of tropical (*Siganus fuscescens* and temperate herbivorous fish (*Kyphosus sydneyanus* and *Olisthops cyanomelas*) on different herbivory categories.

		Total herbivory	Browsing herbivory	Kelp herbivory	Drifting herbivory
<i>Siganus fuscescens</i>	Summer	18092 bites 426 bites hr ⁻¹ 244 ± 65 cm ² hr ⁻¹	16150 bites 389 ± 107 bites hr ⁻¹ 223 ± 64 cm ² hr ⁻¹	13020 bites 314 ± 102 bites hr ⁻¹ 182 ± 62 cm ² hr ⁻¹	1942 bites 37.5 ± 12 bites hr ⁻¹ 21.4 ± 7 cm ² hr ⁻¹
	Winter	979 bites 15.3 bites hr ⁻¹ 7.4 ± 7.4 cm ² hr ⁻¹	777 bites 12 ± 12 bites hr ⁻¹ 6 ± 5.9 cm ² hr ⁻¹	757 bites 12 ± 12 bites hr ⁻¹ 5.7 ± 5.6 cm ² hr ⁻¹	202 bites 3.1 ± 3.1 bites hr ⁻¹ 1.5 ± 1.5 cm ² hr ⁻¹
<i>Kyphosus Sydneyanus</i>	Summer	715 bites 21.2 bites hr ⁻¹ 45.6 ± 22 cm ² hr ⁻¹	628 19.7 ± 10.4 bites hr ⁻¹ 42 ± 22 cm ² hr ⁻¹	616 bites 19.4 ± 10 bites hr ⁻¹ 41 ± 23.5 cm ² hr ⁻¹	87 bites 1.4 ± 0.8 bites hr ⁻¹ 3.4 ± 2 cm ² hr ⁻¹
	Winter	69 bites 1.1 bites hr ⁻¹ 1.7 ± 1.6 cm ² hr ⁻¹	69 1 ± 1 bites hr ⁻¹ 1.7 ± 1.6 cm ² hr ⁻¹	69 1 ± 1 bites hr ⁻¹ 1.7 ± 1.6 cm ² hr ⁻¹	0
<i>Olisthops cyanomelas</i>	Summer	83 bites 1.6 bites hr ⁻¹	83 bites 1.6 bites hr ⁻¹	35 bites 0.75 bites hr ⁻¹	0
	Winter	0	0	0	0

Herbivorous fish body and bite sizes

On average rabbitfish were 60% smaller than temperate silver drummer. Rabbitfish average fork length was 28.5 ± 1.5 cm, with a minimum observed size of 20.5 cm and a maximum of 38.5 cm, while silver drummer average length was 43.2 ± 9.1 cm, with a minimum size of 18 cm and a maximum of 72.5 cm. Bite size of both species followed a power relationship with weight but silver drummers had larger bite area than rabbitfish by 3 times within their comparable weight range (*i.e.* 200-400 g) and 6 times larger at bigger sizes (~ 7300 g) (Fig. S1).

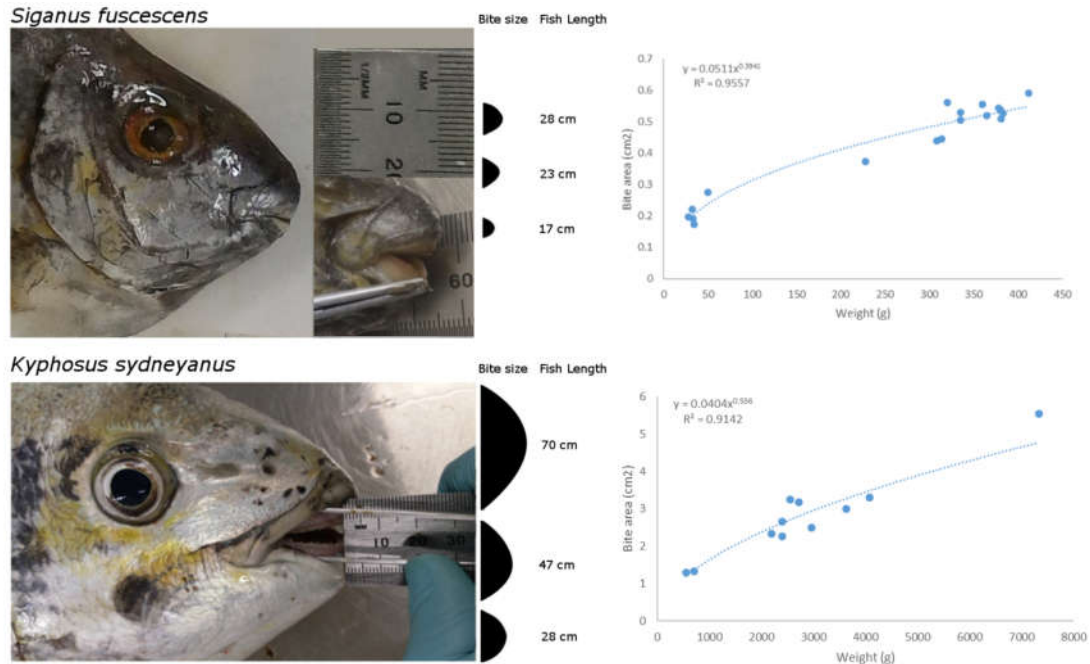


Figure S1. Dentition photographs, bite size per fish length diagrams and bite area per fish weight relationships of the tropical *Siganus fuscescens* and the temperate herbivore *Kyphosus sydneyanus*.

Recruitment of Rabbitfish in Temperate Western Australia



Figure S2. School of juvenile *Siganus fuscescens* in a temperate reef of Western Australia during summer of 2016.