

Text S1. Roving grazer fish abundance and ecosystem function methods

Zebrasoma veliferum (Acanthuridae), a turf remover and crevice cleaner, was omitted from this functional group due to its rarity and for being from a different family to the rabbitfishes (its maximum abundance per reef across times of day, for reefs labelled 1, 2, 5, 8, 10, 12, 17, was $n = 1, 2, 1, 1, 1, 3, 2$ respectively). Several rare unidentified Acanthuridae were omitted (reefs 8, 19, 12, 17, $n = 1, 1, 3, 2$). Three macroalgal removers were rare in our study and omitted (Table S2): *Naso tonganus* (reef 7, $n = 1$); *N. unicornis* (reef 2, 13, 17; $n = 1, 1, 2$); and *Platax teira* (reef 13, $n = 1$).

Text S2. Supplementary statistical methods

R code to test for overdispersion of territorial grazers

Library (lme4),

```
overdisp_fun <- function(model) {  
  ## number of variance parameters in  
  ## an n-by-n variance-covariance matrix  
  vpars <- function(m) {  
    nrow(m)*(nrow(m)+1)/2  
  }  
  model.df <- sum(sapply(VarCorr(model), vpars))+length(fixef(model))  
  rdf <- nrow(model.frame(model))-model.df  
  rp <- residuals(model)  
  Pearson.chisq <- sum(rp^2)  
  prat <- Pearson.chisq/rdf  
  pval <- pchisq(Pearson.chisq, df=rdf, lower.tail=FALSE)  
  c(chisq=Pearson.chisq, ratio=prat, rdf=rdf, p=pval)
```

Supplementary tables

Table S1. All territorial grazer fishes from underwater count survey, categorized as algal farming functional group.

Family	Species	Grazer feeding group	Farming functional group	Reference/source
Pomacentridae	<i>Amblyglyphidodon curacao</i>	herbivore/invert	no	(Myers 1999)
Pomacentridae	<i>Dascyllus aruanus</i>	invert /herbivore	no	www.fishbase.org
Pomacentridae	<i>Dischistodus melanotus</i>	herbivore	intensive	(Emslie et al. 2012)
Pomacentridae	<i>Dischistodus prosopotaenia</i>	herbivore	extensive	(Hoey & Bellwood 2010)
Pomacentridae	<i>Dischistodus pseudochrysopeocilus</i>	herbivore	intensive	(Hoey & Bellwood 2010)
Pomacentridae	<i>Hemiglyphidodon plagiometopon</i>	herbivore	extensive	(Ceccarelli 2007), (Hoey & Bellwood 2010)
Pomacentridae	<i>Neoglyphidodon melas</i>	corallivore/herbivore	no	www.fishbase.org
Pomacentridae	<i>Neoglyphidodon nigroris</i>	herbivore	indeterminate	(Ceccarelli 2007)
Pomacentridae	<i>Plectroglyphidodon lacrymatus</i>	herbivore	extensive	(Hoey & Bellwood 2010)
Pomacentridae	<i>Pomacentrus adelus</i>	herbivore	indeterminate	(Ceccarelli 2007)
Pomacentridae	<i>Pomacentrus australis</i>	herbivore	no	(Allen 1991)
Pomacentridae	<i>Pomacentrus bankanensis</i>	herbivore	indeterminate	(Ceccarelli 2007)
Pomacentridae	<i>Pomacentrus grammarhynchus?</i>	herbivore	indeterminate	(Emslie et al. 2012)
Pomacentridae	<i>Pomacentrus simsiang</i>	herbivore	no	(Allen 1991)
Pomacentridae	<i>Stegastes apicalis</i>	herbivore	intensive	(Ceccarelli 2007)
Pomacentridae	<i>Stegastes fasciolatus</i>	herbivore	extensive	(Hixon & Brostoff 1996)
Tetraodontidae	<i>Canthigaster papua</i>	herbivore/invert	no	(Frisch 2006)
Tetraodontidae	<i>Canthigaster valentini</i>	herbivore/invert	no	www.fishbase.org

Table S2. All roving grazer fishes from snorkel survey, categorized into ecosystems functional groups (Siqueira et al. 2019). NA = species excluded from analyses (see methods and materials for justifications).*(Green & Bellwood 2009)

Family	Species	Ecosystem functional group	Group analysed
Acanthuridae	<i>Naso tonganus</i>	Macroalgae_removal	NA
Acanthuridae	<i>Naso unicornis</i>	Macroalgae_removal	NA
Ephippidae	<i>Platax teira</i>	Macroalgae_removal*	NA
Acanthuridae	<i>Ctenochaetus striatus</i>	Sediment removal	<i>C. striatus</i>
Acanthuridae	<i>Acanthurus auranticavus/bl ochii/dussumieri/nigricauda/xant hopterus</i>	Turf_removal+Sediment_removal	<i>Acanthurus</i> spp.
Acanthuridae	<i>Zebrasoma veliferum</i>	Turf_removal+Crevice_cleaning	NA
Acanthuridae	spp.		NA
Siganidae	<i>Siganus argenteus</i>	Turf_removal	Rabbitfishes
Siganidae	<i>Siganus corallinus</i>	Turf_removal+Crevice_cleaning	Rabbitfishes
Siganidae	<i>Siganus doliatus</i>	Turf_removal+Crevice_cleaning	Rabbitfishes
Siganidae	<i>Siganus lineatus</i>	Turf_removal+Sediment_removal	Rabbitfishes
Siganidae	<i>Siganus puellus</i>	Turf_removal+Crevice_cleaning+Spongivory	Rabbitfishes
Siganidae	<i>Siganus punctatissimus</i>	Turf_removal+Crevice_cleaning	Rabbitfishes

Siganidae	<i>Siganus vulpinus</i>	Turf_removal+Crevice_cleaning	Rabbitfishes
Labridae	<i>Chlorurus bleekeri</i>	Turf_removal+Sediment_removal+Bioerosion	Parrotfishes
Labridae	<i>Chlorurus spirulus</i>	Turf_removal+Sediment_removal+Bioerosion	Parrotfishes
Labridae	<i>Hipposcarus longiceps</i>	Turf_removal+Sediment_removal	Parrotfishes
Labridae	<i>Scarus altipinnus</i>	Turf_removal+Sediment_removal	Parrotfishes
Labridae	<i>Scarus chameleon</i>	Turf_removal+Sediment_removal	Parrotfishes
Labridae	<i>Scarus flavipectoralis</i>	Turf_removal+Sediment_removal	Parrotfishes
Labridae	<i>Scarus frenatus</i>	Turf_removal+Sediment_removal	Parrotfishes
Labridae	<i>Scarus ghobban</i>	Turf_removal+Sediment_removal+Bioerosion	Parrotfishes
Labridae	<i>Scarus niger</i>	Turf_removal+Sediment_removal	Parrotfishes
Labridae	<i>Scarus schlegeli</i>	Turf_removal+Sediment_removal	Parrotfishes
Labridae	<i>Scarus rivulatus</i>	Turf_removal+Sediment_removal	Parrotfishes
Labridae	<i>Scarus</i> spp.	Turf_removal+Sediment_removal	Parrotfishes

Table S3. Statistical results of linear mixed effect (LME) simplified model with restricted maximum likelihood estimation for the number of feeding bites by visiting roving grazer fish individuals, standardised to 1 min (\log_{10}) per maximum 5 min observation. The factors Cleaners, Site, and Species are fixed, Size (\log_{10}) is a covariate, and Reef is included as a random factor. P values in bold are ones presented in main text. * = $P < 0.05$. Cleaners = cleaner fish present or absent, Site = Casuarina Beach or Lagoon. Size is the total length of fish individuals.

	numDF	denDF	F	P
Size	1	61	4.70	0.034*
Cleaners	1	9	2.00	0.190
Site	1	9	1.87	0.205

Table S4. Results of permutational multivariate analysis of variance, testing the effect of cleaner fish presence and site on the proportion of cover of reef benthos categories (turf algae, live coral, soft coral, dead coral, and other). The factors Cleaners and Site are fixed and Reef is included as a random factor. Cleaners = cleaner fish present or absent, Site = Casuarina Beach or Lagoon. P values in bold are ones presented in main text. Significance codes: ‘**’ = $P < 0.01$.

Source	df	SS	MS	Pseudo-F	P(perm)	Unique permutations
Cleaners	1	2015	2015	0.90962	0.444	998
Site	1	21292	21292	9.2846	0.001**	999
Cleaners × Site	1	2859	2859	1.2763	0.342	999
Reef(Cleaners × Site)	12	24655	2054	3.1577	0.001	999

Supplementary figures

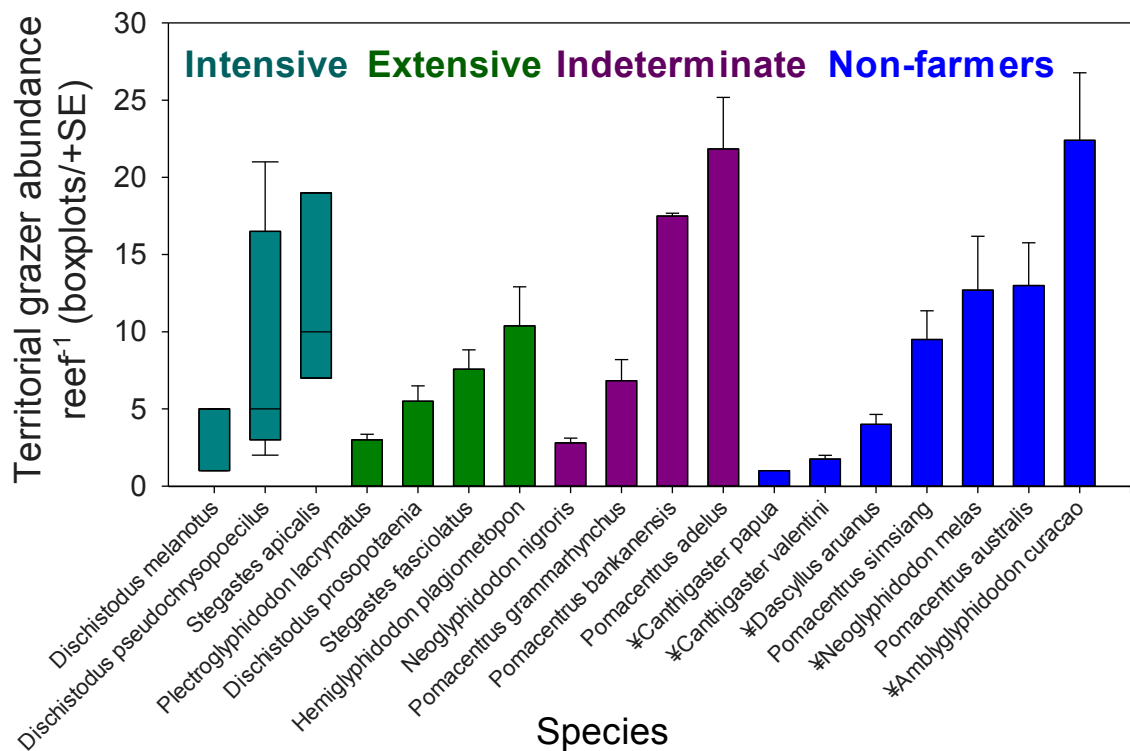


Figure S1. Boxplots or mean (SE) of abundance of territorial grazer species per reef arranged by farming functional group, following Emslie et al. (2010). Reefs with and without cleaners were combined for simplicity. ‡ species that also feed on invertebrates (Randall et al. 1997). Boxplots show the median, 25th and 75th quantiles, and 90th quantiles.

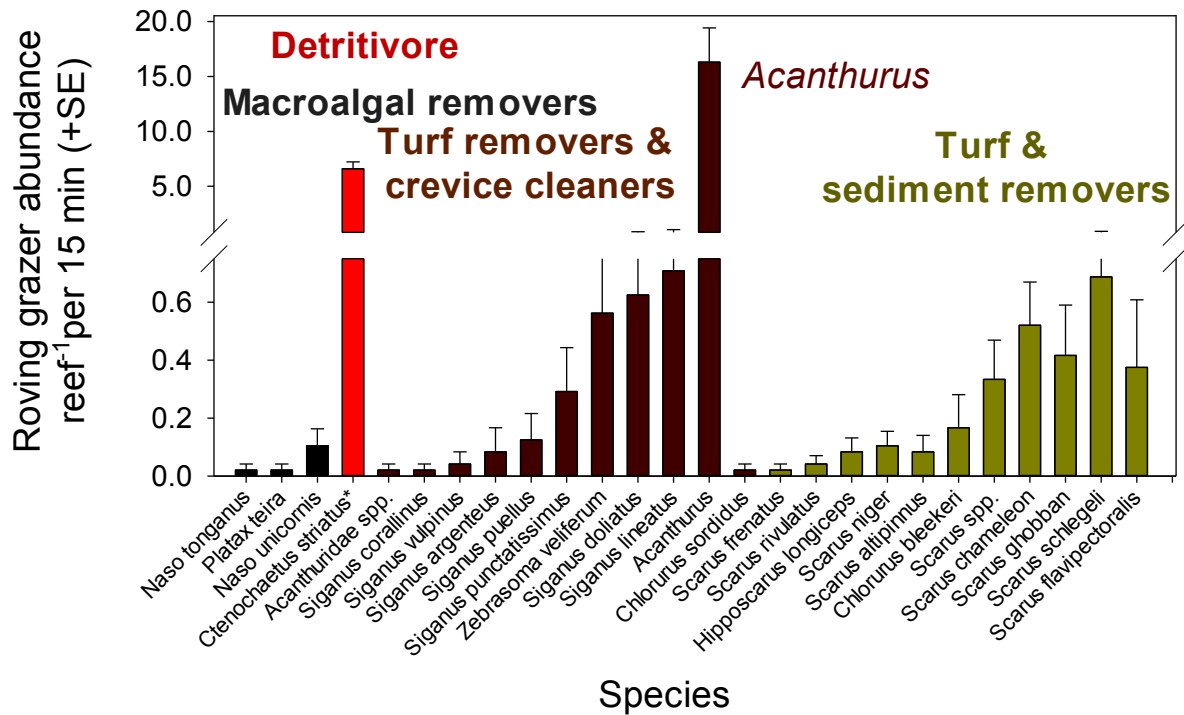


Figure S2. Mean (SE) abundance of roving grazer species per reef, arranged by grazing functional group, following Siqueira et al. (2019). Reefs with and without cleaners were combined for simplicity. **Ctenochaetus striatus* were counted in 2012. Break in Y axis is between 0.75 and 0.8 fish per observation.

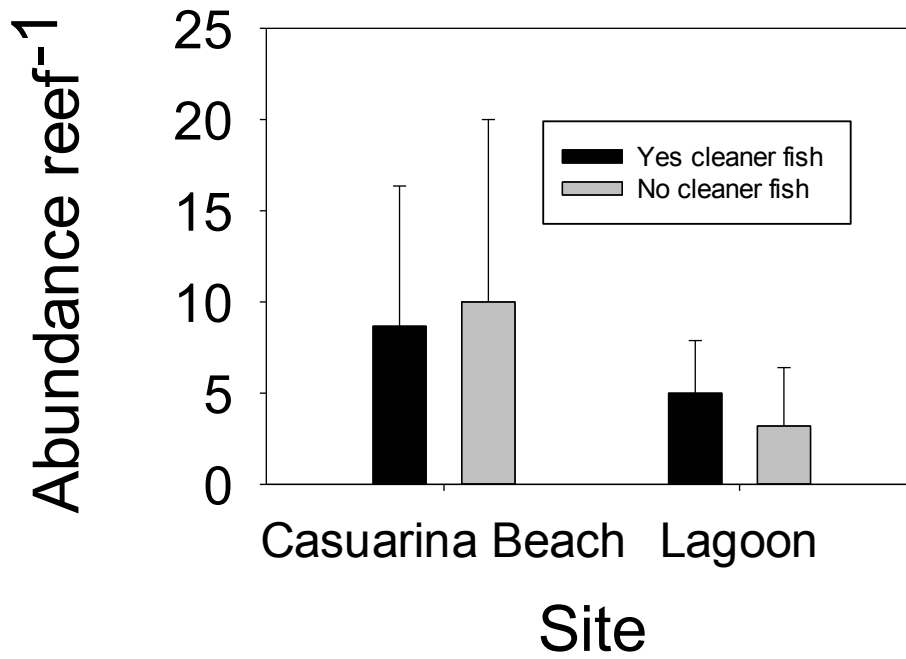


Figure S3. Mean (SE) abundance of other (Non-*Acanthurus* spp.) “turf removers and crevice cleaners”, all belonging to the family Siganidae (rabbitfishes), per reef at each site.

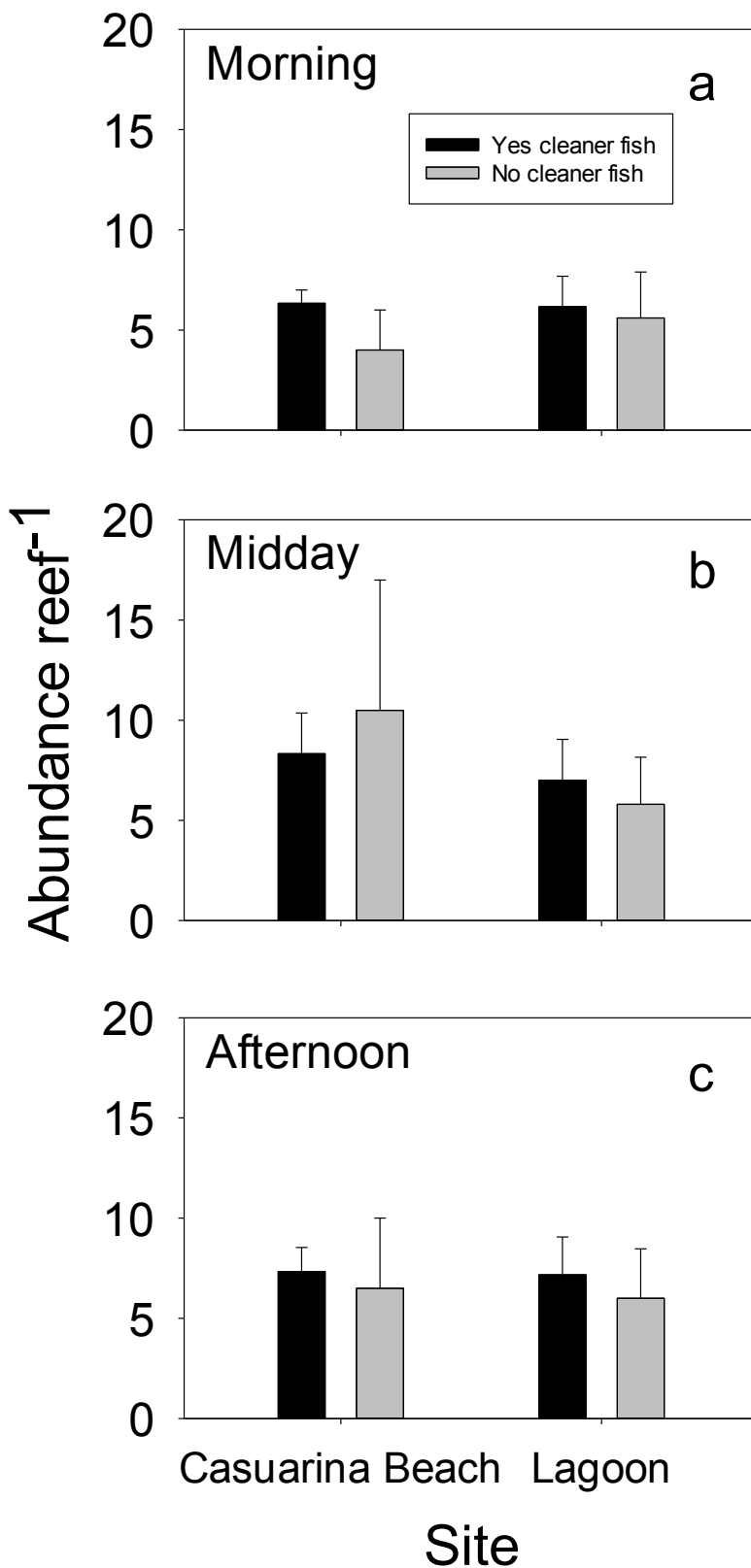


Figure S4. Mean (SE) abundance of “sediment removers”, belonging to the species *Ctenochaetus striatus* (Acanthuridae), per reef at each site. Fish were counted in 2012.

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