**Table S1: Summary of the samples collected and processed in this study for Symbiodiniaceae cell density and viability (Figure 2), culturing, and community composition based on the internal transcribed spacer-2 (ITS-2) region of rDNA (Figure 3).** *Pocillopora* spp. = *Pocillopora* species complex; *Porites lobata* spp. = *Porites lobata* species complex.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sample category and type | Code | Symbiodiniaceae cell density & viability | Symbiodiniaceae culturing | Symbiodiniaceae community composition (>1,000 ITS-2 reads) |
| Back reef | Fore reef | **total** | Back reef | Fore reef | **total** | Back reef | Fore reef | **total** |
| **Obligate corallivores** |  |  |  |  |  |  |  |  |  |  |
| *Amanses scopas* | AMSC | 0 | 7 | **7** | 0 | 6 | **6** | 0 | 7 | **7** |
| *Chaetodon lunulatus* | CHLU | 7 | 1 | **8** | 5 | 1 | **6** | 7 | 1 | **8** |
| *Chaetodon ornatissimus* | CHOR | 6 | 8 | **14** | 6 | 7 | **13** | 6 | 8 | **14** |
| *Chaetodon reticulatus* | CHRE | 3 | 8 | **11** | 3 | 7 | **10** | 3 | 8 | **11** |
| Category sum |  | 16 | 24 | **40** | 14 | 21 | **35** | 16 | 24 | **40** |
|  |  |  |  |  |  |  |  |  |  |  |
| **Facultative corallivores** |  |  |  |  |  |  |  |  |  |
| *Chaetodon citrinellus* | CHCI | 6 | 0 | **6** | 6 | 0 | **6** | 6 | 0 | **6** |
| *Chaetodon pelewensis* | CHPE | 0 | 8 | **8** | 0 | 4 | **4** | 0 | 8 | **8** |
| *Chlorurus spilurus* | CHSP | 0 | 8 | **8** | 0 | 8 | **8** | 0 | 8 | **8** |
| Category sum |  | 6 | 16 | **22** | 6 | 12 | **18** | 6 | 16 | **22** |
|  |  |  |  |  |  |  |  |  |  |  |
| **Grazer/detritivores** |  |  |  |  |  |  |  |  |  |  |
| *Ctenochaetus flavicauda* | CTFL | 0 | 8 | **8** | 0 | 8 | **8** | 0 | 7 | **7** |
| *Ctenochaetus striatus* | CTST | 6 | 0 | **6** | - | - | - | 6 | 0 | **6** |
| Category sum |  | 6 | 8 | **14** | 0 | 8 | **8** | 6 | 7 | **13** |
|  |  |  |  |  |  |  |  |  |  |  |
| **Sediment and water** |  |  |  |  |  |  |  |  |  |  |
| Sediment | SED | 6 | 6 | **12** | - | - | - | 6 | 6 | **12** |
| Water | WAT | 6 | 6 | **12** | - | - | - | 3 | 4 | **7** |
| Category sum |  | 12 | 12 | **24** | - | - | **-** | 9 | 10 | **19** |
|  |  |  |  |  |  |  |  |  |  |  |
| **Corals** |  |  |  |  |  |  |  |  |  |  |
| *Acropora hyacinthus* | ACR | - | - | - | - | - | - | 6 | 5 | **11** |
| *Pocillopora* spp. | POC | - | - | - | - | - | - | 6 | 6 | **12** |
| *Porites lobata* spp. | POR | - | - | - | - | - | - | 6 | 6 | **12** |
| Category sum |  | - | - | **-** | - | - | **-** | 18 | 17 | **35** |

Cell viability

**Figure S1:** **Hemocytometry with trypan blue stain accurately differentiates live and dead Symbiodiniaceae cells that were fixed in 10% formalin.** We conducted a replicated experiment to confirm that hemocytometry of formalin-fixed samples in conjunction with the trypan blue stain assay accurately parses dead and live Symbiodiniaceae cells. Cultures of three Symbiodiniaceae strains (*Breviolum* sp. *Mf1.5b, Symbiodinium microadriaticum,* and *Fugacium kawagutii*) were sampled and half of each sample was kept at room temperature (Control) or exposed to 80˚C for one hour (Heat) similar to (Franklin et al., 2006). The following staining and preservation methods were tested: FO\_TB+: immediately fixed in 10% formalin and stained with trypan Blue after 48 hours; TBFO: First stained with trypan blue and fixed with formalin after five minutes; FOTB: Fixed with 10% formalin and stained with trypan blue immediately afterward; TB: Stained with trypan blue and not fixed. The fraction of live Symbiodiniaceae cells differed between the heat and control treatment (two-way ANOVA: df=1, F=1263.5, p<0.001) but not between staining and preservation methods (df=3, F=0.2, p=0.889). These results indicate that preservation with 10% formalin and staining with trypan blue is an appropriate method for quantifying live and dead Symbiodiniaceae cells.

**Table S2: Results of pairwise Dunn tests on Symbiodiniaceae cell densities between species, sediment and water samples (Figure 2).** We controlled for false positives with the Benjamini-Hochberg procedure. Significant p-values (<0.05) are bolded. Overall Kruskal-Wallis test results: chi-squared=85.2132, df=10, p-value=0. Included samples (and sample sizes) for each sample type are as follows: Obligate corallivores (Obl): *Amanses scopas,* AMSC (7)*; Chaetodon lunulatus,* CHLU (8); *Chaetodon ornatissimus,* CHOR (14); *Chaetodon reticulatus,* CHRE (11). Facultative corallivores (Fac): *Chaetodon pelewensis,* CHPE (8); *Chaetodon citrinellus,* CHCI (6);and *Chlorurus spilurus* CHSP (8). Grazer/Detritivores (Gra): *Ctenochaetus flavicauda,* CTFL (8);and *Ctenochaetus striatus,* CTST (6). Sediment and water (Env): Sediment, SED (12); Water, WAT (12).

|  |  |  |  |
| --- | --- | --- | --- |
| Species comparison | Species diets | Z statistic | Adjusted p-value |
| AMSC - CHLU | Obl - Obl | -1.67 | 0.0771 |
| AMSC - CHOR | Obl - Obl | -1.52 | 0.0978 |
| AMSC - CHRE | Obl - Obl | -2.10 | **0.0363** |
| CHLU - CHOR | Obl - Obl | 0.36 | 0.3961 |
| CHLU - CHRE | Obl - Obl | -0.33 | 0.4005 |
| CHOR - CHRE | Obl - Obl | -0.77 | 0.2880 |
| AMSC - CHCI | Obl - Fac | 0.19 | 0.4494 |
| AMSC - CHPE | Obl - Fac | -0.46 | 0.3640 |
| AMSC - CHSP | Obl - Fac | 1.75 | 0.0683 |
| CHLU - CHPE | Obl - Fac | 1.25 | 0.1516 |
| CHLU - CHSP | Obl - Fac | 3.54 | **0.0007** |
| CHOR - CHPE | Obl - Fac | 1.06 | 0.1996 |
| CHOR - CHSP | Obl - Fac | 3.64 | **0.0005** |
| CHRE - CHSP | Obl - Fac | 4.14 | **0.0001** |
| AMSC - WAT | Obl - Env | 3.09 | **0.0032** |
| AMSC - SED | Obl - Env | 2.39 | **0.0213** |
| CHLU - WAT | Obl - Env | 5.11 | **0.0000** |
| CHLU - SED | Obl - Env | 4.38 | **0.0000** |
| CHOR - WAT | Obl - Env | 5.53 | **0.0000** |
| CHOR - SED | Obl - Env | 4.68 | **0.0000** |
| CHRE - WAT | Obl - Env | 5.95 | **0.0000** |
| CHRE - SED | Obl - Env | 5.15 | **0.0000** |
| AMSC - CTFL | Obl - Gra | 2.20 | **0.0306** |
| AMSC - CTST | Obl - Gra | 2.16 | **0.0323** |
| CHLU - CTFL | Obl - Gra | 4.00 | **0.0002** |
| CHLU - CTST | Obl - Gra | 3.83 | **0.0003** |
| CHOR - CTFL | Obl - Gra | 4.16 | **0.0001** |
| CHOR - CTST | Obl - Gra | 3.91 | **0.0002** |
| CHRE - CTFL | Obl - Gra | 4.64 | **0.0000** |
| CHRE - CTST | Obl - Gra | 4.37 | **0.0000** |
| CHCI - CHLU | Fac - Obl | -1.79 | 0.0646 |
| CHCI - CHOR | Fac - Obl | -1.66 | 0.0762 |
| CHCI - CHRE | Fac - Obl | -2.21 | **0.0311** |
| CHPE - CHRE | Fac - Obl | -1.68 | 0.0777 |
| CHCI - CHPE | Fac - Fac | -0.63 | 0.3296 |
| CHCI - CHSP | Fac - Fac | 1.49 | 0.1021 |
| CHPE - CHSP | Fac - Fac | 2.29 | **0.0265** |
| CHCI - WAT | Fac - Env | 2.73 | **0.0088** |
| CHCI - SED | Fac - Env | 2.06 | **0.0388** |
| CHPE - WAT | Fac - Env | 3.74 | **0.0004** |
| CHPE - SED | Fac - Env | 3.00 | **0.0041** |
| CHSP - WAT | Fac - Env | 1.23 | 0.1543 |
| CHSP - SED | Fac - Env | 0.50 | 0.3619 |
| CHCI - CTFL | Fac - Gra | 1.91 | 0.0528 |
| CHCI - CTST | Fac - Gra | 1.90 | 0.0524 |
| CHPE - CTFL | Fac - Gra | 2.75 | **0.0086** |
| CHPE - CTST | Fac - Gra | 2.66 | **0.0101** |
| CHSP - CTFL | Fac - Gra | 0.46 | 0.3691 |
| CHSP - CTST | Fac - Gra | 0.55 | 0.3570 |
| WAT - SED | Env - Env | -0.82 | 0.2772 |
| CTFL - WAT | Gra - Env | 0.72 | 0.3000 |
| CTFL - SED | Gra - Env | -0.01 | 0.4968 |
| CTST - WAT | Gra - Env | 0.53 | 0.3557 |
| CTST - SED | Gra - Env | -0.14 | 0.4625 |
| CTFL - CTST | Gra - Gra | 0.12 | 0.4608 |

**Table S3:** **Mean relative abundances of genes associated with five Symbiodiniaceae genera identified in this study per sample type (e.g., *Amanses scopas* feces) and overall sample category (e.g., obligate corallivores) (Figure 3).** Included samples (and sample sizes) for each sample category are as follows: Corals: *Acropora hyacinthus*, ACR (11); *Pocillopora* spp. = *Pocillopora* species complex, POC (12); *Porites lobata* spp. = *Porites lobata* species complex, POR (12). Obligate corallivores: *Amanses scopas,* AMSC (7)*; Chaetodon lunulatus,* CHLU (8); *Chaetodon ornatissimus,* CHOR (14); *Chaetodon reticulatus,* CHRE (11). Facultative corallivores: *Chaetodon pelewensis,* CHPE (8); *Chaetodon citrinellus,* CHCI (6);and *Chlorurus spilurus* CHSP (8). Grazer/Detritivores: *Ctenochaetus flavicauda,* CTFL (6);and *Ctenochaetus striatus,* CTST (6). Sediment and water: Sediment, SED (12); Water, WAT (7).

|  |  |  |
| --- | --- | --- |
| Species | Code | Symbiodiniaceae genus |
| *Symbiodinium* | *Breviolum* | *Cladocopium* | *Durusdinium* | *Fugacium* |
| **Corals** |  |  |  |  |  |  |
| *Acropora hyacinthus* | ACR | 0.53 | 0.00 | 0.08 | 0.39 | 0.00 |
| *Pocillopora* spp. | POC | 0.00 | 0.00 | 0.89 | 0.11 | 0.00 |
| *Porites lobata* spp. | POR | 0.00 | 0.00 | 0.98 | 0.02 | 0.00 |
|  |  |  |  |  |  |  |
| **Obligate corallivores** |  |  |  |  |  |  |
| *Amanses scopas* | AMSC | 0.01 | 0.00 | 0.72 | 0.27 | 0.00 |
| *Chaetodon lunulatus* | CHLU | 0.00 | 0.00 | 0.87 | 0.13 | 0.00 |
| *Chaetodon ornatissimus* | CHOR | 0.00 | 0.00 | 0.96 | 0.04 | 0.00 |
| *Chaetodon reticulatus* | CHRE | 0.00 | 0.00 | 0.98 | 0.02 | 0.00 |
| Category average |  | 0.00 | 0.00 | 0.91 | 0.09 | 0.00 |
|  |  |  |  |  |  |  |
| **Facultative corallivores** |  |  |  |  |  |  |
| *Chaetodon citrinellus* | CHCI | 0.08 | 0.00 | 0.81 | 0.11 | 0.00 |
| *Chaetodon pelewensis* | CHPE | 0.00 | 0.00 | 0.72 | 0.28 | 0.00 |
| *Chlorurus spilurus* | CHSP | 0.01 | 0.00 | 0.26 | 0.73 | 0.00 |
| Category average |  | 0.03 | 0.00 | 0.58 | 0.39 | 0.00 |
|  |  |  |  |  |  |  |
| **Grazer/detritivores** |  |  |  |  |  |  |
| *Ctenochaetus flavicauda* | CTFL | 0.03 | 0.00 | 0.08 | 0.89 | 0.00 |
| *Ctenochaetus striatus* | CTST | 0.18 | 0.00 | 0.14 | 0.66 | 0.02 |
| Category average |  | 0.10 | 0.00 | 0.11 | 0.78 | 0.01 |
|  |  |  |  |  |  |  |
| **Sediment and seawater** |  |  |  |  |  |  |
| Sediment | SED | 0.15 | 0.02 | 0.66 | 0.13 | 0.04 |
| Water | WAT | 0.19 | 0.02 | 0.70 | 0.08 | 0.00 |
| Category average |   | 0.17 | 0.02 | 0.68 | 0.11 | 0.02 |

**Table S4**: **Results from pairwise PERMANOVA tests on Symbiodiniaceae community composition at the genus level, based on Bray-Curtis distances (Figure 3).** Samples were randomly subsampled from each sample category (n=12 each, see **Supplementary Materials** for sample names). We controlled for false positives with the Benjamini-Hochberg procedure. Significant p-values (<0.05) are bolded. Overall test results: df=6, F=17.3, R2=0.58, p=0.001 (PERMANOVA). *Acropora*: *Acropora hyacinthus*; *Pocillopora* spp. *=* *Pocillopora* species complex; *Porites lobata* spp. = *Porites lobata* species complex.

|  |  |  |
| --- | --- | --- |
| Comparisons | R2 | Adjusted p-value |
| Obligate corallivore vs Facultative corallivore | 0.20 | **0.025** |
| Obligate corallivore vs Grazer/detritivore | 0.80 | **0.002** |
| Obligate corallivore vs Sediment and water | 0.14 | **0.020** |
| Obligate corallivore vs *Acropora hyacinthus* | 0.49 | **0.002** |
| Obligate corallivore vs *Pocillopora* spp. | 0.03 | 0.431 |
| Obligate corallivore vs *Porites lobata* spp. | 0.11 | 0.129 |
| Facultative corallivore vs Grazer/detritivore | 0.50 | **0.002** |
| Facultative corallivore vs Sediment and water | 0.09 | 0.117 |
| Facultative corallivore vs *Acropora hyacinthus* | 0.32 | **0.002** |
| Facultative corallivore vs *Pocillopora* spp. | 0.16 | **0.049** |
| Facultative corallivore vs *Porites lobata* spp. | 0.39 | **0.002** |
| Grazer/detritivore vs Sediment and water | 0.51 | **0.002** |
| Grazer/detritivore vs *Acropora hyacinthus* | 0.26 | **0.014** |
| Grazer/detritivore vs *Pocillopora* spp. | 0.82 | **0.002** |
| Grazer/detritivore vs *Porites lobata* spp. | 0.90 | **0.002** |
| Sediment and water vs *Acropora hyacinthus* | 0.28 | **0.002** |
| Sediment and water vs *Pocillopora* spp. | 0.14 | **0.006** |
| Sediment and water vs *Porites lobata* spp. | 0.25 | **0.002** |
| *Acropora* *hyacinthus* vs *Pocillopora* spp. | 0.49 | **0.002** |
| *Acropora* *hyacinthus* vs *Porites lobata* spp. | 0.57 | **0.002** |
| *Pocillopora* spp. vs *Porites lobata* spp. | 0.33 | **0.009** |

**Figure S2: The communities of Symbiodiniaceae in obligate corallivore (coral-eating animal) feces are most similar to the communities of Symbiodiniaceae in two locally abundant coral species.** Relative abundance of hits to a given Symbiodiniaceae genus in corals, obligate corallivore feces, facultative corallivore feces, grazer/detritivore feces, and reef-associated sediment and water (all included samples had >1,000 reads). Each bar represents one fecal sample from one fish or coral individual, or a separate sediment or water sample. Included samples (and sample sizes) for each sample category in the figure are as follows: Corals: *Acropora hyacinthus*, Acropora (11); *Pocillopora* species complex, Pocillopora (12); *Porites lobata* species complex, Porites (12). Obligate corallivores: *Amanses scopas,* AMSC (7)*; Chaetodon lunulatus,* CHLU (8); *Chaetodon ornatissimus,* CHOR (14); *Chaetodon reticulatus,* CHRE (11). Facultative corallivores: *Chaetodon pelewensis,* CHPE (8); *Chaetodon citrinellus,* CHCI (6);and *Chlorurus spilurus* CHSP (8). Grazer/Detritivores: *Ctenochaetus flavicauda,* CTFL (6);and *Ctenochaetus striatus,* CTST (6). Sediment and water: Sediment, SED (12); Water, WAT (7). For data used see **Additional file 2**.

**Table S5: Overview of values used in bootstrap estimate of reef-scale Symbiodiniaceae dispersal (Figure 4).** Fecal samples were used to calculate mean densities of live Symbiodiniaceae cells and mean fecal densities.Fish densities were calculated from the MCR LTER dataset (<http://mcrlter.msi.ucsb.edu/cgi-bin/showDataset.cgi?docid=knb-lter-mcr.6> accessed February 14, 2020). Data on fecal pellet sizes and egestion rates were collected during *in situ* fish follows. Obl: obligate corallivore; Fac: facultative corallivore. See **Supplementary Methods** for additional details.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Species | Diet | Live Symbiodiniaceae density (cells g-1) | Fecal pelletsize (cm) | Fecal sampledensity (g cm-1) | Fish density (individuals 250 m-2) | Egestion rate (h-1) |
|  |
| N | mean | sd | N | mean | sd | N | mean | sd | N | mean | sd | Estimate |   |  |
| CHOR | Obl | 8 | 4.56E+06 | 3.08E+06 | 6 | 5.08 | 2.59 | 3 | 0.14 | 0.02 | 8 | 9.88 | 3.52 | 1.34 |  |  |
| CHRE | Obl | 8 | 9.22E+06 | 1.94E+06 | 2 | 4.50 | 0.50 | 3 | 0.18 | 0.03 | 8 | 5.25 | 2.66 | 1.08 |  |  |
| CHCI | Fac | 6 | 1.22E+06 | 1.78E+06 | 4 | 2.75 | 1.03 | 4 | 0.04 | 0.06 | 8 | 1.13 | 1.54 | 0.97 |   |  |