Title:

Record highest mesophotic fish diversity found in Raja Ampat

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Abstract

Mesophotic coral ecosystems (MCEs; reefs 30-150 m depth) are poorly studied, with existing research heavily geographically biased away from the most species-rich reef regions. Yet, MCEs are of high interest because of their potential to act as refuges from fisheries impacts. We surveyed MCEs in Raja Ampat, West Papua using baited remote underwater video, representing the largest MCE fish community survey ever conducted in the Coral Triangle region. Here we show that Raja Ampat MCEs are exceptionally fish species rich, with 152 fish species recorded – representing the greatest fish richness of any MCE previously surveyed. We find fish communities are highly depth driven, with declines in fish abundance and biomass at increased depth. In contrast to previous studies elsewhere in the world, we found that planktivores declined as a proportion of MCE community at increased depths. While greater human population density resulted in lower reef fish biomass, we found no evidence that MCEs provide a depth refuge from fisheries impacts. Our results suggest that previously established MCE-depth patterns may not hold true for Raja Ampat and highlight the need for future MCE studies within the Coral Triangle region.

Introduction

Mesophotic coral ecosystems (MCEs)—reefs from approximately 30-150 m depth—are of increased conservation and research interest because of their potential to act as refuges from shallow reef impacts (Hinderstein et al. 2010; Loya et al. 2016). MCEs are found in tropical and sub-tropical waters globally, and contain a rich array of biodiversity including corals, fishes, sponges, and algae (Kahng et al. 2010; Baker et al. 2016). MCEs have been poorly documented compared to shallower coral reefs because of sampling limitations at greater depths. With advances in survey technology, there has been a greater understanding of MCEs, especially in regions such as the Caribbean, Red Sea, Australia, and Hawaii (Turner et al. 2017; Laverick et al. 2018). However, while the Coral Triangle region in the Indo-Pacific (Indonesia, Malaysia, Papua New Guinea, the Philippines, Timor Leste, and the Solomon Islands) hosts the greatest shallow reef biodiversity globally (Veron et al. 2009), there is comparatively little research effort in this region (Fisher et al. 2011) especially for MCEs (Turner et al. 2017; Laverick et al. 2018).

Coral reef fish species richness, abundance, and biomass has broadly been reported to decline across the depth gradient from shallow reefs to MCEs (Kahng et al. 2010; 2014). Yet MCEs may act as fish refuges because shallow reefs maybe more exposed to habitat damage and overfishing. Many small-scale fisheries gears are often highly depth specific, with differential impacts across small depth gradients (Ashworth and Ormond 2005; Tyler et al. 2009; Goetze et al. 2011). Small-scale fisheries gears that reach MCEs have additional costs and effort requirements compared to those used in the shallows (Wood et al. 2006; Lindfield et al. 2014). Greater biomass of fisheries target species has been observed on MCEs compared to adjacent shallow reefs in many locations (Bejarano et al. 2014; Lindfield et al. 2016; Andradi-Brown et al. 2017). This supports the idea that some MCEs may be exposed to lower fisheries pressures than adjacent shallow reefs. Testing this is challenging, however, as fish community composition transitions with depth (Thresher and Colin 1986; Brokovich et al. 2008) and with benthic composition and structural complexity (Boland and Parrish 2005; Gratwicke and Speight 2005; Bridge et al. 2012). Based on ecological community composition, MCEs can be divided into upper-MCEs (approximately 30-60 m depth) and lower-MCEs (approximately 60-150 m depth) (Loya et al. 2016). Despite some potential protection by virtue of their depth, MCEs are still vulnerable to many human

impacts including some fisheries, sedimentation, and global stressors such as coral bleaching (Andradi-Brown et al. 2016a; Rocha et al. 2018). However, with few MCE studies in the Coral Triangle, human impacts on Coral Triangle MCEs are poorly understood.

Raja Ampat, located in West Papua, Indonesia, and at the center of the Coral Triangle contains extensive reefs, as well as mangrove forests and seagrass beds (Mangubhai et al. 2012). Raja Ampat reefs contain the greatest richness of scleractinian corals (Veron et al. 2009) and fishes (Allen and Erdmann 2009) recorded in a single region, with over 550 scleractinian coral species and over 1,400 fish species (Mangubhai et al. 2012). Scleractinian corals have also been recorded to 160 m depth within Raja Ampat, though reefs beyond the depths of conventional scuba diving remain poorly characterized (Mangubhai et al. 2012). Unlike many reefs globally, the shallow reefs of Raja Ampat have not faced any major bleaching events and shallow reef scleractinian coral cover remained stable between 2010-2016 at approximately 30% (Ahmadia et al. 2017).

Local people living within Raja Ampat have high marine resource dependence, with approximately two-thirds reliant on marine fish for over half their dietary protein needs, and approximately a quarter reliant on marine capture fisheries as their primary occupation (Ahmadia et al. 2017). Gleaning, hand-lines, and spear guns are the dominant fishing gears used by local communities, though commercial trawlers fish in the region (Mangubhai et al. 2012; Ahmadia et al. 2017). Destructive fishing gears such as dynamite and cyanide, while present, are generally less prevenient in Raja Ampat than elsewhere in Indonesia (Mangubhai et al. 2012). Since the 1990s, several non-governmental organizations (NGOs) have worked in Raja Ampat in partnership with local communities and the district and provincial government to establish a marine protected area (MPA) network. These MPAs are zoned based on periodic harvest closure areas, no-take areas, and large sustainable fisheries areas, with the intention of allowing local communities to control their marine resources and reduce the number of commercial vessels from elsewhere in Indonesia fishing within Raja Ampat (Mangubhai et al. 2012; Ahmadia et al. 2017). In addition, the entirety of Raja Ampat regency was declared a shark and ray sanctuary in 2012, banning all shark and ray fisheries within the region[1]. Despite fisheries impacts, Raja Ampat reefs retain high fish

[1]Peraturan Daerah No. 9 Tahun 2012.

biomass including top predators compared to many reefs elsewhere in the world (Ahmadia et al. 2017).

In this study, we investigate fish communities on MCEs within Raja Ampat and compare them to adjacent shallow reefs. We specifically identify: (i) whether the high fish species richness that is known to occur on the shallow reefs of Raja Ampat extends into the mesophotic zone; (ii) which fish species are indicative of Raja Ampat MCEs; (iii) patterns in fish species richness, abundance, biomass, and trophic groups across the depth gradient; and (iv) we consider how human impacts have differentially affected fish biomass on MCEs compared to shallow reefs. Our study represents the largest MCE fish community sampling effort undertaken to date within the Coral Triangle region, and the first within Raja Ampat.

Material and methods

Study sites

Surveys were conducted in January – February 2014 by Conservation International Indonesia staff from the KM Inbekwan research vessel. The Raja Ampat archipelago contains an MPA network, of which two MPAs were sampled in this study: SAP Kepulauan Waigeo Sebelah Barat and KKPD Selat Dampier (Fig. 1). SAP Kepulauan Waigeo Sebelah Barat MPA is 271,630 ha in area and was declared in 2009[2], while KKPD Selat Dampier is 336,200 ha and was declared in 2008[3]. At the time of the surveys, provisional zonation plans were being developed and implemented for both MPAs and there was limited MPA enforcement. Sites for SAP Kepulauan Waigeo Sebelah Barat were within the provisionally designated no-take MPA zones and in areas adjacent to the MPA (henceforth grouped with the MPA sites as Waigeo). Sites in KKPD Selat Dampier were within the provisionally designated no-take and sustainable fisheries zones (henceforth Dampier) and covering both Batanta and Kri sub-areas. As these MPAs were new, and zonation implementation and MPA patrolling and enforcement were still under development, it is likely that any differences between sites inside the MPA and outside, or between different MPA zones reflect pre-MPA differences in reef condition. In this study we therefore do not compare sites inside and outside the MPAs, or between no-take and sustainable fishing zones.

[2]Kepmen-KP No. 64 Tahun 2009.
[3]Peraturan Daerah No. 27 Tahun 2008 and Peraturan Bupati No. 5 Tahun 2009.

Surveys were conducted using baited remote underwater video (BRUV) during daylight hours (07:00-16:00). At each site, surveys were conducted within three depth zones: (i) shallow (2-12 m), (ii) intermediate/mid (15-30 m), and (iii) deep/MCE (50-85 m). A minimum of two BRUV drops were conducted per depth zone at each site - see Electronic Supplementary Material (ESM) Table 1. BRUV replicates deployed a minimum of 500 m apart. Sites were located a minimum of 1.5 km apart, with 14 sites surveyed within Waigeo, and 10 sites surveyed in Dampier. In total across all sites and depths 160 BRUV surveys were completed (see ESM Table 2 for GPS locations). The BRUV consisted of a single GoPro Hero 3 camera, mounted in a frame 0.6 m above the benthos, and recording forward at the BRUV bait arm and seascape. The BRUV bait arm was 1.5 m long and was baited with 0.8-1 kg of crushed skipjack tuna. More details on the survey design and methods are available in Beer (2015). BRUVs were left for 60 min on the benthos before being recovered.

Video analysis and data processing

Video footage from each BRUV drop was analyzed for all fish species using EventMeasure (SeaGIS, Melbourne, Australia). The first 50 min of footage was analyzed from when the BRUV reached the seabed and stabilized, recording the maximum number (MaxN) for each species. MaxN is defined as the largest number of individuals of a species visible in a single video frame and therefore is a relative measure of fish abundance. MaxN is a widely used metric for static video fish analysis, as it avoids problems of counting individual fish multiple times as they leave and then re-enter the camera field of view (Watson et al. 2010). MaxN has been shown to provide reliable fish community data when compared to other conventional reef survey techniques (e.g. Watson et al. 2010; Andradi-Brown et al. 2016c). Fish identification followed Allen and Erdmann (2012), and all fish were identified to species level or the greatest taxonomic resolution possible (e.g. genus or family) if full species identification was not possible.

As our BRUV was single camera, and so only provided MaxN abundance values for each species, we assigned length estimates to each fish to allow estimated fish biomass to be calculated. Fish lengths were assigned in the following way: Both Waigeo and Dampier have an active shallow reef monitoring program which records visual fish length estimates along transects at 10 m depth (Ahmadia et al. 2017). We used these locally sourced fish

length records from 2014 visual fish surveys, and assigned the median fish species length recorded to each species within each region. Median length was used as it provides a good estimate for missing fish lengths when conducting fish biomass calculations (Wilson et al. 2018). For species that were not recorded in the 2014 shallow reef visual surveys, we instead used the 'Common Length' fish size estimates for each species from Fishbase (Froese and Pauly 2015). We sourced length-weight conversion values following the method outlined in Andradi-Brown et al. (2016b) from Fishbase, enabling us to estimate the biomass of each species at MaxN.

We categorized each fish species based on trophic group and commercial value. All fish data were filtered to remove records of manta and devil rays (Mobulidae), and eagle rays (Myliobatidae), as these are large-bodied transient species that are unlikely to be accurately recorded in our BRUV sampling. Whitetip, blacktip, and grey reef sharks (Carcharhinidae), nurse sharks (Ginglymostomatidae), bamboo sharks (Hemiscylliidae), wedgefishes (Rhinidae), and whiptail rays (Dasyatidae) were retained in our analysis alongside all other reef fishes. Trophic groups were allocated following the Fishbase 'Food Items' table, using the Food I-III hierarchical classification of food items eaten by a species, based on diet composition of >20% of recorded items accessed through rfishbase (Boettiger et al. 2012; Froese and Pauly 2015). Trophic groups were: (i) Herbivore, (ii) Herbivore and Planktivore, (iii) Planktivore, (iv) Planktivore and Mobile Invertebrate Feeder, (v) Omnivore, (vi) Corallivore, (vii) Mobile Invertebrate Feeder, (viii) Piscivore and Mobile Invertebrate Feeder, and (ix) Piscivore. High commercial value fish species were identified based on the Fishbase commercial value listing, with species listed at 'high' or 'very high' commercial value included, and sharks of the families Carcharhinidae, Ginglymostomatidae, Hemiscylliidae, and Rhinidae also included.

To explore how broad human and environmental impacts affect reef fish biomass across the depth gradient, we sourced three additional human/environmental variables from the Marine Socio-Environmental Covariates database (Yeager et al. 2017) for each BRUV drop. These variables were: (i) mean annual wave exposure (kW/m), (ii) 2015 human population within 10 km, and (iii) linear distance to major regional market – in this case Sorong on the West Papuan mainland (km). A 10 km human population buffer was used as studies in the Coral Triangle have suggested that fishers using reef gears typically fish at

distances <10 km, and fishers generally fish closer to their villages when possible (Soede et al. 2001; Teh et al. 2012).

Fish communities are highly correlated with benthic habitat cover and complexity on both shallow reefs (Gratwicke and Speight 2005) and MCEs (Brokovich et al. 2008; Bryan et al. 2013). To account for varying habitat complexity at each BRUV drop, we visually assessed from the video the Habitat Assessment Score (HAS) following Gratwicke and Speight (2005). HAS is based on six benthic components: (i) Rugosity of substratum, (ii) Variety of benthic organism growth forms, (iii) Benthic habitat architecture height, (iv) Refuge size categories present in the reef, (v) Live cover of benthic organisms, and (vi) % hard substratum present (Gratwicke and Speight 2005). Each benthic component is given a value between 1-5, with 5 representing the greatest habitat complexity/structure/cover. All raw data will be made public upon final peer-review article publication.

Data analysis

We analyzed fish communities based on both abundance and biomass. To visualize changes in benthic habitat and fish communities across the depth gradient we used a Principle Component Analysis (PCA) based on the six benthic categories (each scored between 1-5) and fourth root transformed fish abundance (MaxN) and biomass. Fourth root transformation was used to down weight the influence of highly abundant/high biomass species. PCAs were fitted using the 'prcomp' function in R (R Core Team 2013). Plots were visualized with 95% confidence ellipses using the ggbiplot package (Vu 2011).

To identify differences in the fish community based on region (Waigeo or Dampier), site, benthic habitat, and depth we used permutational multivariate analysis of variance (PERMANOVA) based on a fourth root transformed Bray-Curits dissimilarity matrix of fish abundance/biomass where each BRUV drops represented a row in the matrix. PERMANOVA was run for 99999 permutations using the 'adonis' function from vegan (Oksanen et al. 2013). As we had unbalanced data (i.e. differing number of replicates per site and depth combination), and were testing multiple factors, the interaction sums of squares model terms are not independent (Anderson et al. 2008). We therefore used Type 1—sequential—sums of squares, where each term is fitted after taking account of previous fitted terms. While this means that the order in which terms are fitted can affect our results, this is

considered appropriate for nested experimental designs where model terms exhibit a natural hierarchical ordering (Anderson et al. 2008). We fitted PERMANOVAs in the form of Region + Site + Benthic PC1 + Depth. Region represents whether the sites were in the Waigeo or Dampier. Benthic PC1 represents the first principle component axis of a PCA of the benthic data. This was used to combine the six HAS benthic components into a single explanatory variable, as the six components exhibited high collinearity.

To identify fish species indicative of different depths, we used Dufrêne and Legendre indicator species analysis (Dufrêne and Legendre 1997) on the fish abundance data across the three depth zones. Dufrêne and Legendre indicator species analysis identifies the association between fish species and a particular depth zone. Dufrêne and Legendre indicator species analysis was conducted and permutational p-values were generated using the 'indval' function from the labdsv package (Roberts 2013).

To identify how fish community trophic structure changed across the depth gradient we summed fish biomass per trophic group per BRUV for each depth zone at each site, and then conducted permutational analysis of variance (permutational-ANOVA) to test for differences with depth. Depth was coded as 1 (shallow), 2 (intermediate), 3 (MCE) and treated as a continuous variable to incorporate the gradient of depths. For trophic groups with significant effects of depth on biomass, we identified potential fish species that could be driving depth effects by: Firstly, we constructed a PCA of the untransformed fish biomass data for species belonging to that trophic group. We then tested each species within the trophic group for a correlation between the species biomass and the first and second trophic group principle component axes. Species with a Pearson's correlation coefficient >|0.4| were then tested for depth effects using permutational-ANOVA.

To identify how total and commercially valuable fish biomass across the depth gradient was affected by human and environmental conditions we used linear mixed-effect models. These models used fourth root transformed fish biomass as the response variable, and included Site and Region as random factors. Models initially had the form: fish biomass$^{(1/4)}$ ~ Depth * Benthic PC1 * Wave exposure * Human population * Distance to market + (1|Site) + (1|Region). Where '*' means the separate fixed effect and interaction between the variables. Models were fitted using 'lmer' set to optimize the log-likelihood criterion in the package lme4 (Bates et al. 2015). We first fit this full model, but then simplified by using likelihood ratio tests to remove non-significant interactions. Reported p

values were generated by likelihood ratio tests removing the variable/interaction of interest (Bolker et al. 2009). We used partial effects plots to visualize the effects of human population density and distance to market on fish biomass based on the remef package (Hohenstein and Kliegl 2019).

Results

Overall benthic and fish depth patterns

Habitat complexity declined as depth increased, from a mean total HAS per BRUV of 26 ± 3 (mean ± SE) and 27 ± 3 on shallow reefs in Dampier and Waigeo respectively, to 11 ± 2 and 13 ± 2 on MCEs (Fig. 2A). All six HAS components (rugosity, variety of growth forms, height, refuge size category, live cover, and hard substratum) strongly correlate with the first principle component axis (explaining 98% of benthic variation observed), which shows clear depth groupings (ESM Fig. 1A).

Overall, we recorded 521 fish species across the two regions and all depth zones, with 328, 307, and 152 fish species recorded on shallow, intermediate, and mesophotic reefs respectively. Fish species richness declined as depth increased, from a mean number of fish species per BRUV drop of 49 ± 10 and 57 ± 8 on shallow reefs to 22 ± 6 and 19 ± 2 on MCEs in Dampier and Waigeo respectively (Fig. 2B). Fish abundance and biomass also typically declined with increasing depth, however, the magnitude of differences and the trends between abundance and biomass varied between locations (Fig. 2C, D). For Dampier, fish abundance only slightly declined between shallow (156 ± 41 kg/BRUV) and intermediate reefs (144 ± 30 kg/BRUV) but was much lower on MCEs (73 ± 27 kg/BRUV). The corresponding fish biomass, however, was relatively consistent across this depth gradient, from 61 ± 9 kg/BRUV in the shallows, to 51 ± 13 kg/BRUV at intermediate depths, then 49 ± 16 kg/BRUV on MCEs. For Waigeo, fish abundance declined steadily between shallow reefs and MCEs from 194 ± 26 to 53 ± 7, and for fish biomass from 59 ± 11 kg/BRUV to 22 ± 3 kg/BRUV.

Differences in fish communities based on both weighting species by fish abundance and biomass were identified between the two regions, individual sites, benthic habitat structure, and depth (Table 1). Depth was a major driver of fish communities (ESM Fig. 1B,C), and indicator species analysis identified 74 species associated with the shallows (ESM Table 3), 24 fish species associated with intermediate depths, and 13 species associated

with MCEs (Table 2). Of particular note on MCEs were the presence of three Nemipteridae species (*Pentapodus nagasakiensis*, *Pentapodus paradiseus*, and *Scolopsis vosmeri*), which were commonly recorded on MCEs. Purple sand tilefish (*Hoplolatilus purpureus*) were also indicative of MCEs, which given the lower MCE HAS score and that this species associates with sand/rubble areas is unsurprising. Overall, 99 fish species significantly changed in abundance across the depth gradient, with 82 of these fish species at lower abundant on MCEs than shallow reefs, while 17 fish species were at greater abundance on MCEs than shallow reefs (ESM Table 4). For biomass, 100 fish species changed across the depth gradient, with 83 fish species at higher biomass on shallow reefs than MCEs, and 17 fish at higher biomass on MCEs than shallow reefs (ESM Table 4).

Mobile invertebrate feeders and joint piscivore and mobile invertebrate feeders comprised the largest component of MCE fish communities (Fig. 3A,C), together accounting for 65% (Dampier) and 55% (Waigeo) of the community by abundance, and 71% (Dampier) and 64% (Waigeo) of the community by biomass (Fig. 3). The majority (83%) of indicator species associated with MCEs were also mobile invertebrate feeders (both exclusively or combined with piscivory) (Table 2). These numbers contrast with abundance-based community composition in the shallows, where herbivorous and planktivorous fishes made up 53% (Dampier) and 57% (Waigeo) of the community, and shallow reef indicator species which were 14% herbivores, 11% corallivores, and only 19% mobile invertebrate feeders and/or piscivores (ESM Table 3). The proportion of mobile invertebrate feeders and joint piscivore and mobile invertebrate feeders is, however, highly similar for biomass-based community across the depth gradient (Fig. 3C). In general, biomass weighted fish communities in general showed less extreme shifts in trophic composition that abundance weighted fish communities in general.

We tested for significant differences in overall biomass of each trophic group across the depth gradient, finding that the decline in herbivore and planktivore percentage community biomass (Fig. 3) was driven by a decline in herbivore and planktivore biomass (Table 3). To identify the species potentially responsible for these declines, we tested each species within the trophic group that correlated with the first two axes of a PCA of the trophic group (Table 4). Two herbivores were found to decline in biomass with depth: *Acanthurus maculiceps* and *Dischistodus melanotus*, and both of these species were absent from the MCE BRUV drops. For planktivores, only one species (*Odonus niger*) that correlated

with the planktivore PCA axis was identified as significantly changing across the depth gradient. *Odonus niger* increased in biomass from 229 ± 82 g/BRUV in the shallows, to 520 ± 169 g/BRUV at intermediate depths, but then declined to 60 ± 27 g/BRUV on MCEs.

Removing commercially valuable fish species altered the reef fish community trophic structure considerably (Fig. 3B, C), by disproportionately removing mobile invertebrate feeders and piscivores. This led to a shallow reef community dominated by herbivores and planktivores, and more even trophic group distribution on MCEs for abundance-weighted communities (both regions) and biomass-weighted communities (Waigeo). Surprisingly, even when commercially valuable species were removed from the analysis, mobile invertebrate feeders and piscivores dominated the Dampier MCE biomass-weighted community comprising 83% of biomass.

Our mixed-effect models investigating broader human impacts on total fish biomass identified effects of human population and distance to market, in addition to interactions between depth and benthic habitat complexity (Table 5). Total fish biomass per BRUV declined as the human population within 10 km increased (Table 5; Fig. 4A). Though there was high variation, our partial effects plot indicated approximately 8 kg/BRUV decline in total fish biomass per 100-person population increase within 10 km distance of the site after controlling for other factors (Fig. 4A). We found the interaction between human population and depth to be non-significant, suggesting that human population density was not having differential effects on fish biomass dependent on depth, so we removed the interaction from the model. Total fish biomass declined with increased distance from the main fish markets in Sorong (Table 5; Fig 4B), i.e. more remote sites had lower fish biomass than sites closer to the market. Again, while much variation was present in this relationship, our partial effects plot indicated a decline of approximately 15 kg/BRUV per 25 km increase in distance away from Sorong (Fig. 4B). We found the interaction between depth and distance to market was non-significant, suggesting distance to market effects do not vary based on depth, and so removed the interaction to simplify the model. To identify whether these relationships between human population and distance to market could be confounded by many non-fisheries target species, we also ran the model for only commercially valuable fish biomass (Table 5). Using commercially valuable fish biomass, however, did not detect any effects of human population or distance to Sorong. As expected from our earlier ecological analysis, we also found significant effects of depth, and a significant interaction between

depth and benthic habitat structure as predictors of both total fish biomass and commercially valuable fish biomass (Table 5).

Discussion

This study represents the largest in situ assessment of coral reef fish community structure across the shallow-mesophotic depth gradient within the Coral Triangle region, based on 160 BRUV drops conducted across the 2-85 m depth gradient. Our results suggest that fish community structure is strongly driven by both depth and benthic habitat complexity, and that diverse mesophotic fish communities exist within Raja Ampat. We found no evidence of differential human impacts on reef fish biomass across the depth gradient. Overall, we recorded 521 fish species across all depth zones, with 152 fish species recorded on MCEs, making Raja Ampat MCEs the most fish species rich identified globally.

Changes in benthic habitat complexity with depth

Benthic habitat structure declined consistently with depth, in a similar pattern at both Dampier and Waigeo (Fig. 2A). Unsurprisingly, all six benthic components recorded in HAS (rugosity, variety of growth forms, height, refuge size category, live cover, and hard substratum) were highly correlated, with many of the deepest BRUV drops associated with low relief reefs or even recording flat sandy benthos with soft corals. Our results contrast with the only previous shallow-MCE benthic habitat study within Indonesia, which was conducted within the Wakatobi Marine National Park (South East Sulawesi), where reef hard substrate cover was lowest in the shallows and increased down to 80 m depth (Bell et al. 2018). Of the previous MCE studies in the Coral Triangle, changes in benthic communities and complexity in Raja Ampat appear most similar to observations from Apo Island in the Philippines, where the proportion of sand/rubble increased exponentially with depth from 10-80 m depth (Abesamis et al. 2018). Differences in benthic communities across depth gradients are likely to be driven in part by previous disturbance events, such as storms (Abesamis et al. 2018), but also broad scale reef architecture. Unlike the MCE study in the Wakatobi Marine National Park, which used a remote-operated vehicle to survey along

walls and steep slopes, as we used BRUVs which had to rest on the seabed, we were unable to survey steep walls or slopes. Therefore, the areas we surveyed are likely to have differing benthic complexity, as previous studies have highlighted the role of reef slope as an important predictor of MCE benthic communities (Lesser et al. 2018).

Fish species richness and indicator species of depth

The number of fish species surveyed on Raja Ampat MCEs were the highest recorded to date, with 152 fish species recorded on MCEs. Similar BRUV studies have been completed in the Philippines, where 253 fish species were recorded from 10-80 m depth of which 92 were on reefs from 40-80 m depth (Abesamis et al. 2018) – representing 39% fewer MCE fish species. Though these results from the Philippines were based on 29 BRUV drops and so are likely under-sampling fish species richness in comparison to our 160 BRUV drops in Raja Ampat. In Kimbe Bay, Papua New Guinea, 123 fish species were recorded by diver transects across the 0-30 m depth gradient, with 61 species present at 30 m depth (MacDonald et al. 2016) – representing 60% percentage fewer MCE fish species. Our results, therefore, suggest that the exceptional fish species richness present on shallow coral reefs within Raja Ampat (Allen and Erdmann 2009) also extends into the mesophotic zone.

Our results indicate Raja Amapat MCEs have approximately 40% of the species richness of adjacent shallow reefs. Declines in mean fish species richness at increased depths are well recognized across shallow reef and MCE depth gradients at many sites globally (Kahng et al. 2010; 2014). For example, in the Caribbean (Bejarano et al. 2014; Pinheiro et al. 2016; Andradi-Brown et al. 2016b), Red Sea and Indian Ocean (Brokovich et al. 2008; Andradi-Brown et al. 2019), and Pacific (Thresher and Colin 1986; Lindfield 2015; Pyle et al. 2016; Asher et al. 2017). In the Coral Triangle, previous comparisons of whole community fish species richness have mostly been limited to smaller depth gradients. In Kimbe Bay, Papua New Guinea, mean fish species declined from 5 to 30 m depth (MacDonald et al. 2016). In the Philippines, fish species richness was lower on MCEs (30-35 m) than shallow reefs (8-20 m), though declines with depth are highly variable – ranging from relatively modest declines to species richness more than halving (Quimpo et al. 2018).

We identified 12 fish indicator species of MCEs in Raja Ampat, which were mostly piscivores and/or mobile invertebrate species. Reef fish species composition across depth

gradients are known to be driven by factors such as habitat availability (MacDonald et al. 2018), fish morphological traits (Bridge et al. 2016), and broader trophic groups (Bejarano et al. 2014; Andradi-Brown et al. 2016b). The species identified as characteristic of Raja Ampat MCEs included three species of Nemipteridae, which can have elongate trailing caudal fin filaments. This trait has been associated with reducing hydrodynamic disturbance when swimming, and believed to aid predator avoidance on deeper reefs where water turbulence is less (Bridge et al. 2016). While many of our MCE indicator species have also been identified as deep species by studies in the Philippines, such as *Hoplolatilus purpureus* and *Parupeneus heptacanthus* (Abesamis et al. 2018), there were several MCE indicator species we identified that contrast with previous studies. For example, *Sufflamen fraenatum* was found to be a depth generalist between 10-80 m in the Philippines (Abesamis et al. 2018) and *Pentapodus paradiseus* was also found to be common at 30-35 m depth in the Philippines (Quimpo et al. 2018), but our indicator species analysis clustered both as MCE species in Raja Ampat. In even greater contrast, work in the Philippines identified two of our MCE indicator species, *Lethrinus lentjan* and *Pomacentrus nagasakiensis*, as shallow water species (Abesamis et al. 2018). Our intermediate depth fish indicator species more broadly aligns with previous studies. For example, *Acanthurus thompsoni* has been reported as common in coral reef communities at intermediate depths in both Papua New Guinea (MacDonald et al. 2016) and the Philippines (Quimpo et al. 2018). Whilst *Forcipiger flavissimus* and *Pomacentrus nigromanus*, which we identified as intermediate depth species, are both common at intermediate depths in Papua New Guinea (MacDonald et al. 2016).

Fish abundance and biomass changes across the depth gradient

Raja Ampat fish abundance declined with increased depth in both Dampier and Waigeo, though biomass responded differently between regions (Fig. 2). For Waigeo, fish biomass declined with increased depth, but in Dampier there was no effect of depth. Globally, differences in fish abundance and biomass across shallow reef to MCE depth gradients are highly variable. In many locations abundance and biomass declines at increased depths, for example in Honduras (Andradi-Brown et al. 2016b), Curaçao (Pinheiro et al. 2016), Red Sea (Brokovich et al. 2008; 2010), the Chagos Archipelago (Andradi-Brown

et al. 2019), and Hawaii (Asher et al. 2017). Whereas, abundance and biomass increases with depth in some locations, for example Bermuda (Pinheiro et al. 2016) and the Mariana Islands (Lindfield et al. 2016), before reducing on lower MCEs (>70 m depth). In the Coral Triangle, fish abundance and biomass reflects this variation, with declines at increased depth in Papua New Guinea and the Philippines (MacDonald et al. 2016; Quimpo et al. 2018), but some locations where fish abundance and biomass increases from the surface to a peak at 30 m depth after which it declines (Abesamis et al. 2018; Quimpo et al. 2018). As we only recorded three broad depth groups, it is not possible to identify fine scale changes in fish abundance or biomass. However, differences in fish biomass with depth between Waigeo and Dampier could be driven by benthic complexity. Previous BRUV studies in Hawaii have found that benthic structure complexity alters fish patterns across the depth gradient, with unconsolidated substrates having similar overall densities of fish across the depth gradient, while hard bottom habitats show declines (Asher et al. 2017). Given that we detected a significant interaction between depth and habitat complexity when predicting fish biomass (Table 5), it is likely that these different patterns are affected by differences in benthic habitats.

Human impacts on MCE reef fishes

Increased human population density in areas where local communities have high marine resource dependence is well-known to be associated with lower reef fish biomass (e.g. Bellwood et al. 2012; Williams et al. 2015). Our results show that locations closer to higher population densities also have lower fish biomass (Table 5; Fig. 4A). MCEs are particularly likely to act as refuges from fisheries when spear-fishing is a dominant fishing method (Lindfield et al. 2014; Andradi-Brown et al. 2017). Community surveys in Dampier region show that people typically use simple hand gears for subsistence fishing, including spear-fishing and single hand lines, but it was not reported which was the most dominant form (Claborn et al. 2017). If MCEs were acting as fisheries refuges, we would have expected to identify a significant interaction between human population density and depth, as spear-fishers would be unable to reach the full depth range of MCEs. The lack of interaction in our ecological results suggests that hand lines are likely to be more dominant in the fishery.

Remote reefs often have greater fish biomass (Graham and McClanahan 2013), largely attributed to increased accessibility costs and efforts required for fishers (Maire et al. 2016). As Sorong is the major urban center and fish market within the Raja Ampat region (Ahmadia et al. 2017), we tested effects of distance to Sorong on fish biomass, but surprisingly found a negative relationship – i.e. reefs further away from Sorong had lower fish biomass. We controlled for region as a random effect in our model, so were testing the effect of distance from Sorong after controlling for region. Our results suggest broader seascape patterns could be driving this negative relationship between distance to Sorong and fish biomass. At a global scale, fish biomass has been found to be unchanged within 0-14 km of markets, but then increase exponentially away from the market (Cinner et al. 2013), though some studies have found no effect (e.g. Campbell et al. 2018). While linear distance strongly correlates with travel time to market at a global scale, it can be highly variable based on local context (Maire et al. 2016). For example, travel times for reefs that are 105-115 km from the nearest market can vary from 2-13 hours (Maire et al. 2016). Reefs surveyed in this study varied from 70-183 km from Sorong, with Dampier sites 70-112 km and Waigeo sites 148-183 km from Sorong. Despite Waigeo not containing any settlements within the MPA, there are several villages in close proximity to the MPA boundaries with residents who fish within the MPA. In the period up to 2014, areas around Waigeo were visited by large vessels with facilities to store fish, that purchased fish from villages, effectively creating mobile market centers. Dampier MPA is also subject to high and increasing reef tourism (Mangubhai et al. 2012; Spalding et al. 2017; Ahmadia et al. 2017). During the period 2012-2016 many residents in Dampier shifted primary occupation from wild capture fisheries to wage labor (believed to be tourism related), which was accompanied by a decline in the number of households fishing regularly (Claborn et al. 2017). Despite this decline in fisheries, Dampier residents continue to fish at the highest rate within Raja Ampat (Ahmadia et al. 2017), and demand for fish for tourist consumption is likely to be growing. These fish are likely to be harvested from reefs further away from the main tourism locations within Dampier. In Waigeo, while Sorong is the major fish market, prior to the 2012 shark fishing ban many shark fishers from other Indonesian provinces such as Maluku travelled eastwards to fish within Raja Ampat (Jaiteh et al. 2016). Therefore, reefs further from Sorong may actually have been more accessible to this historic fishing effort.

Our results provide the first overview of fish communities on MCEs in Raja Ampat and represent the most extensive MCE fish surveys conducted in the Coral Triangle to date. These results suggest that despite widespread fisheries in the region, MCEs in Raja Ampat are likely the most fish species rich globally and retain substantial biomass of higher fish trophic levels. Our findings help increase global understanding of MCE fish ecology and provide the first insight of how human interactions can shape MCEs in the center of coral reef biodiversity.

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Figures

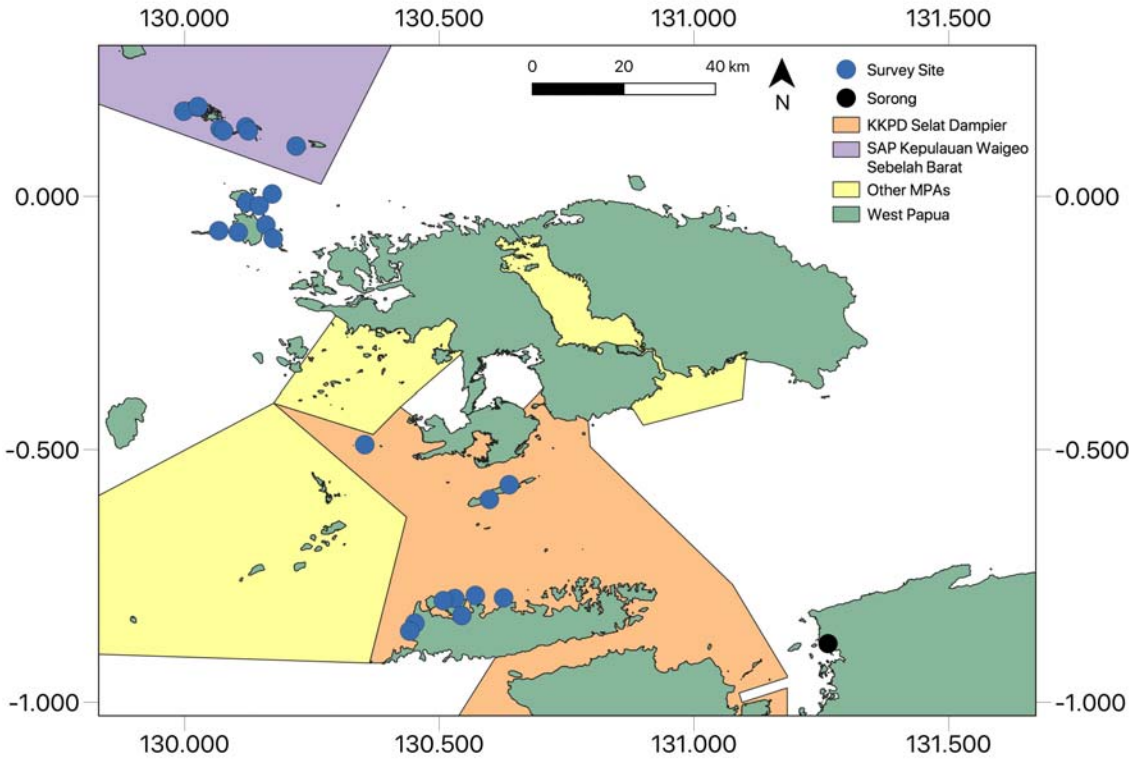


Figure 1. Study sites and marine protected areas within Raja Ampat.

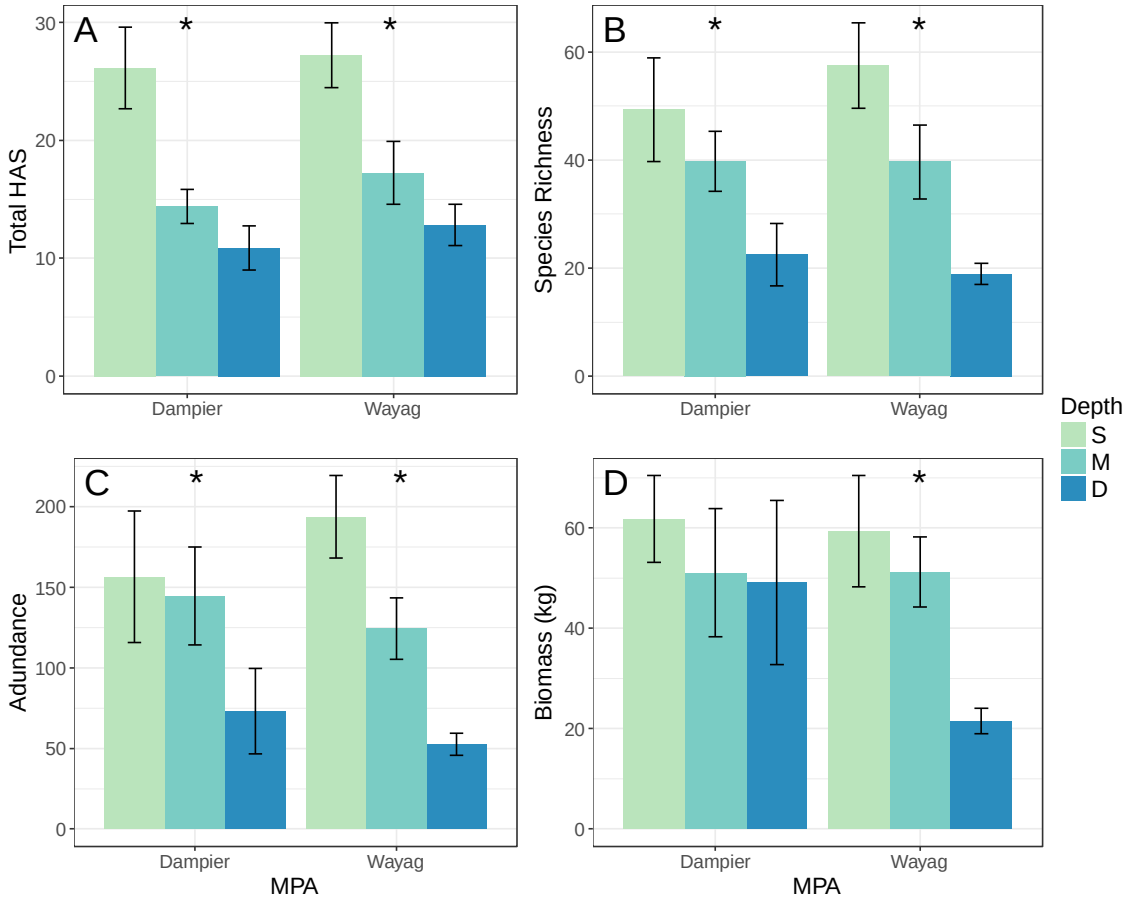


Figure 2. Overall benthic and fish community differences with depth. (A) Habitat assessment score (HAS), (B) fish species richness, (C) fish abundance, and (D) fish biomass for each depth within each region. (A) shows the mean total HAS per BRUV drop, with values per BRUV potentially ranging between 6-30 based on scoring a value of 1-5 for each of: rugosity, variety of growth forms, height, refuge size category, live cover, and hard substratum. Error bars show 1 standard error above and below the mean. Asterix (*) signified a significant ($p < 0.05$) difference with depth.

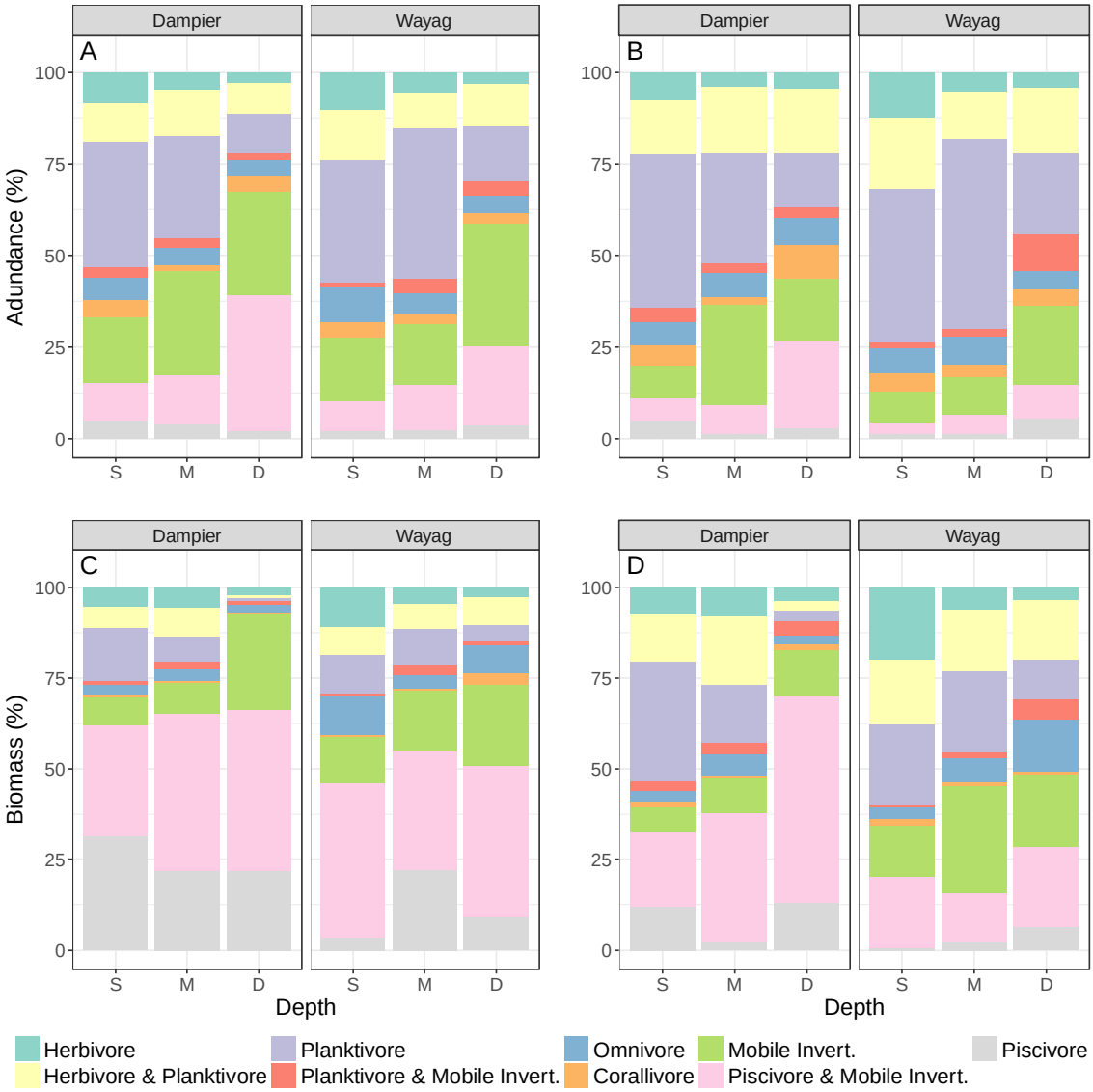


Figure 3. Community composition of each trophic group by depth. (A) abundance of all fish, (B) abundance of all fish excluding high/very high value fish and sharks, (C) biomass of all fish, and (D) biomass of all fish excluding high/very high value fish and sharks.

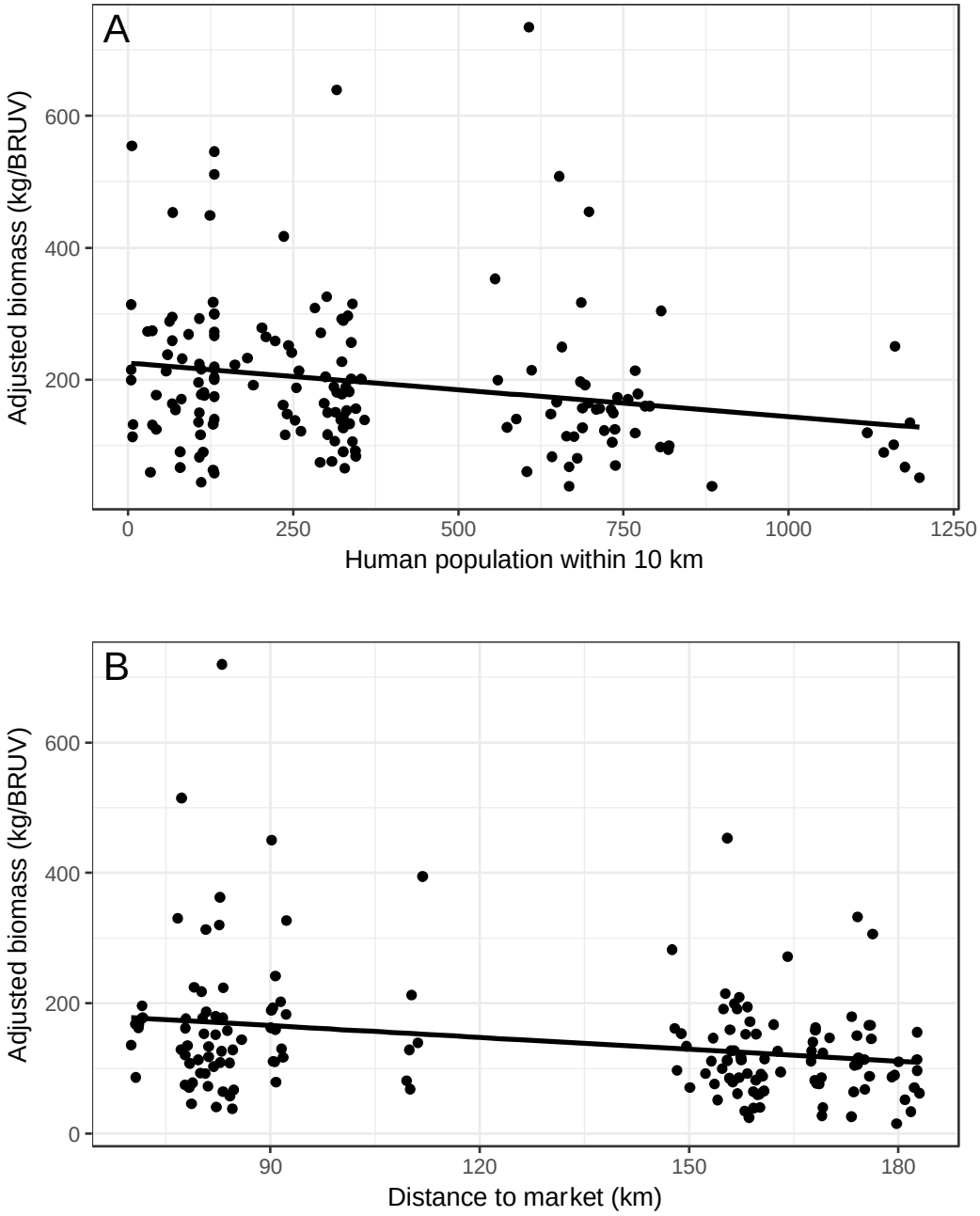


Figure 4. Partial effects plots for (A) human population and (B) distance to market based on total fish biomass per BRUV. Partial effect plots adjust fish biomass for all model fixed (Depth, Benthic PC1, Wave exposure, the Depth:Benthic PC1 interaction, and either human population or distance to market) and random effects (area, Site) with the exception of the plotted fixed effect (human population or distance to market). Adjusted biomass, therefore, allows the relationship between the fixed effect of interest and fish biomass to be examined after controlling for all other fixed and random parts of the model. See Table 5 for full model.

Tables

Table 1. PERMANOVA testing effects of region, site, benthic principle component 1, and depth on fish community structure. Fish community structure is calculated by both species abundance (MaxN) and species biomass (g). Analysis conducted based on fourth-root transformed abundance/biomass per BRUV drop using Bray-Curtis dissimilarities. Degrees of freedom (DF), sum of squares (SS), and mean square (MS) are shown.

	DF	**SS**	**MS**	**Pseudo-F**	**p(perm)**
Abundance					
Region	1	0.92	0.92	2.52	<0.001
Site	22	10.51	0.48	1.31	<0.001
Benthic PC1	1	4.16	4.16	11.40	<0.001
Depth	1	1.38	1.38	3.78	<0.001
Residuals	134	48.92	0.37		
Total	159	65.89			
Biomass					
Region	1	1.06	1.06	2.90	<0.001
Site	22	10.38	0.47	1.29	<0.001
Benthic PC1	1	3.94	3.94	10.74	<0.001
Depth	1	1.26	1.26	3.44	<0.001
Residuals	134	49.13	0.37		
Total	159	65.78			

Table 2. Dufrêne and Legendre indicator species analysis showing fish species indicative of intermediate and MCE depth zones. Analysis is based on fish abundance with results showing the Dufrêne and Legendre indicator value (measuring the association between the fish species and the depth group) and the associated permutational p-value (based on 99999 permutations). Only fish species with a $p<0.05$ association for the depth band are shown. See ESM Table 4 for an expanded version of this table including fish species indicative of the shallow depth zone.

Depth/Family	**Species**	**Indicator Value**	**p(perm)**	**Trophic Group**
Intermediate				
Acanthuridae	*Acanthurus thompsoni*	0.22	0.008	Planktivore
	Naso thynnoides	0.32	<0.001	Omnivore
Balistidae	*Odonus niger*	0.33	0.032	Planktivore
	Sufflamen bursa	0.39	0.001	Mobile Invert.
Caesionidae	*Pterocaesio digramma*	0.17	0.028	Planktivore
Carcharhinidae	*Triaenodon obesus*	0.18	0.042	Piscivore & Mobile Invert.
Chaetodontidae	*Coradion chrysozonus*	0.22	0.033	Omnivore
	Forcipiger flavissimus	0.17	0.030	Mobile Invert.
	Forcipiger longirostris	0.19	0.015	Mobile Invert.
Labridae	*Bodianus diana*	0.19	0.009	Mobile Invert.
	Bodianus dictynna	0.22	0.010	Mobile Invert.
	Choerodon zosterophorus	0.22	0.012	Mobile Invert.
	Halichoeres chrysus	0.39	<0.001	Mobile Invert.
	Halichoeres prosopeion	0.33	0.002	Mobile Invert.
Lethrinidae	*Monotaxis grandoculis*	0.22	0.020	Mobile Invert.
Lutjanidae	*Macolor macularis*	0.29	0.004	Piscivore & Mobile Invert.
Monacanthidae	*Paraluteres prionurus*	0.17	0.031	Omnivore
Pomacanthidae	*Centropyge bicolor*	0.3	0.002	Mobile Invert.
	Genicanthus lamarck	0.29	0.001	Planktivore
Pomacentridae	*Pomacentrus amboinensis*	0.36	<0.001	Herbivore & Planktivore
	Pomacentrus nigromanus	0.27	0.007	Planktivore
Serranidae	*Plectropomus oligacanthus*	0.19	0.016	Piscivore & Mobile Invert.
	Variola albimarginata	0.19	0.034	Piscivore
Tetraodontidae	*Canthigaster valentini*	0.17	0.031	Omnivore

MCE				
Balistidae	*Abalistes stellatus*	0.41	<0.001	Piscivore & Mobile Invert.
	Sufflamen fraenatum	0.23	0.023	Mobile Invert.
Carangidae	*Carangoides ferdau*	0.35	0.011	Piscivore & Mobile Invert.
Labridae	*Choerodon jordani*	0.25	0.003	Mobile Invert.
Lethrinidae	*Lethrinus amboinensis*	0.25	0.017	Piscivore & Mobile Invert.
	Lethrinus lentjan	0.17	0.031	Piscivore & Mobile Invert.
Malacanthidae	*Hoplolatilus purpureus*	0.25	0.002	Planktivore
Mullidae	*Parupeneus heptacanthus*	0.20	0.027	Piscivore & Mobile Invert.
Nemipteridae	*Pentapodus nagasakiensis*	0.36	0.004	Mobile Invert.
	Pentapodus paradiseus	0.39	<0.001	Piscivore & Mobile Invert.
	Scolopsis vosmeri	0.25	0.003	Mobile Invert.
Pomacentridae	*Pomacentrus nagasakiensis*	0.17	0.031	Herbivore & Planktivore

Table 3. Fish trophic group species richness and comparison of biomass across the depth gradient for all families. Species richness represents the number of unique species recorded for a trophic grouping within a depth zone. Biomass represents the mean biomass per BRUV drop within a depth zone. Changes in biomass across the depth gradient were tested with a permutational-ANOVA of the form Trophic Group Biomass ~ Region + Depth. As permutational-ANOVA uses sequential sums of squares, the biomass depth effects represent the effect of depth on trophic group biomass after controlling for the effect of region. Depth was treated as continuous coded as 1 (shallow), 2 (intermediate), 3 (MCE) to incorporate the gradient of depths. Significant p-values at the $p<0.05$ level are shown in bold.

Trophic Group	**Shallow**		**Intermediate**		**MCE**		**Biomass depth effect**	
	Richness	**Biomass (kg/BRUV)**	**Richness**	**Biomass (kg/BRUV)**	**Richness**	**Biomass (kg/BRUV)**	**Pseudo-F**	**p(perm)**
Herbivore	50	4.04 ± 0.61	37	2.72 ± 0.37	9	0.98 ± 0.33	5.88	**0.005**
Herbivore & Planktivore	36	4.23 ± 1.59	35	3.66 ± 0.92	10	1.27 ± 0.52	1.36	0.270
Planktivore	55	5.9 ± 1.38	58	4.81 ± 1.15	25	0.78 ± 0.25	5.81	**0.003**
Planktivore & Mobile Invert.	13	0.45 ± 0.11	15	1.33 ± 0.71	8	0.5 ± 0.19	1.10	0.362
Omnivore	42	3.19 ± 1.82	30	1.9 ± 0.24	18	1.54 ± 0.42	0.58	0.867
Corallivore	22	0.37 ± 0.03	20	0.39 ± 0.14	7	0.72 ± 0.42	0.96	0.418
Piscivore & Mobile Invert.	94	16.88 ± 2.27	94	17.1 ± 2.19	65	13.19 ± 2.0	1.08	0.350
Piscivore	16	7.6 ± 4	18	9.93 ± 3.71	10	6.78 ± 4.35	0.19	0.835

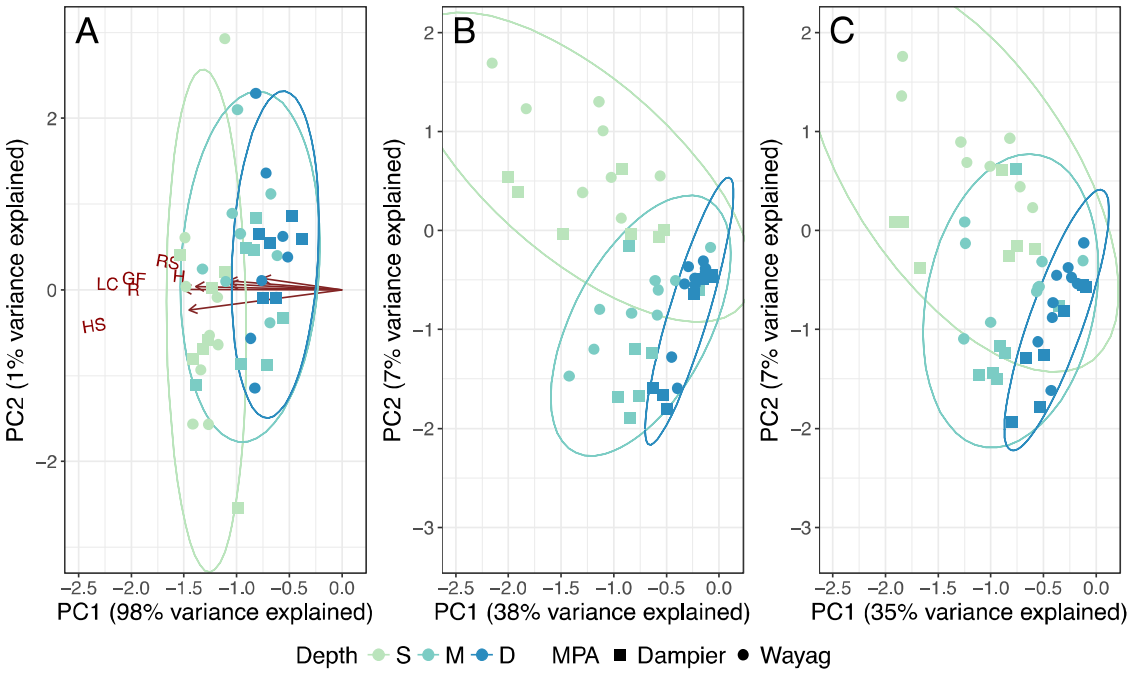
Table 4. Species of fish potentially driving changes in herbivore and planktivore biomass across the depth gradient. Biomass represents the mean biomass per BRUV drop within a depth zone. Changes in biomass across the depth gradient were tested with a permutational-ANOVA of the form Species Biomass ~ Region + Depth. As permutational-ANOVA uses sequential sums of squares, the biomass depth effects represent the effect of depth on species biomass after controlling for the effect of region. Depth was treated as continuous coded as 1 (shallow), 2 (intermediate), 3 (MCE) to incorporate the gradient of depths. Significant p-values at the p<0.05 level are shown in bold.

Species	**Biomass (g/BRUV)**			**Biomass depth effect**	
	Shallow	**Intermediate**	**MCE**	**Pseudo-F**	**p(perm)**
Herbivore					
Acanthurus blochii	114.13 ± 93.56	61.14 ± 23.29	0 ± 0	1.05	0.391
Acanthurus maculiceps	230.31 ± 107.53	28.53 ± 15.82	0 ± 0	3.99	**0.002**
Acanthurus nigricans	2.86 ± 2.11	0.95 ± 0.95	0 ± 0	1.20	0.295
Centropyge tibicen	1.87 ± 1.22	1.50 ± 1.17	0 ± 0	1.01	0.482
Centropyge vrolikii	0.11 ± 0.08	0 ± 0	0 ± 0	2.04	0.326
Chlorurus microrhinos	21.59 ± 12.91	0 ± 0	0 ± 0	2.79	0.063
Dischistodus melanotus	7.55 ± 4.36	0.5 ± 0.5	0 ± 0	2.80	**0.010**
Dischistodus pseudochrysopoecilus	7.05 ± 5.37	2.01 ± 1.58	0 ± 0	1.24	0.323
Naso vlamingii	34.13 ± 26.4	7.88 ± 5.8	7.88 ± 7.88	0.87	0.546
Scarus niger	2.33 ± 2.33	0 ± 0	0 ± 0	1.00	1.000
Scarus psittacus	7.28 ± 4.35	3.64 ± 3.64	0 ± 0	1.21	0.374
Toxotes jaculatrix	3.29 ± 2.42	0 ± 0	0 ± 0	1.83	0.326
Planktivore					
Caesio cuning	310.42 ± 198.38	304.4 ± 142.45	0 ± 0	1.58	0.204
Chanos chanos	362.98 ± 362.98	0 ± 0	0 ± 0	1.00	1.000
Chromis scotochiloptera	5.25 ± 2.91	1.6 ± 1.13	0 ± 0	2.28	0.090
Crenimugil crenilabis	64.29 ± 64.29	0 ± 0	0 ± 0	1.00	1.000
Odonus niger	228.71 ± 82.15	519.92 ± 168.84	59.99 ± 26.77	4.83	**0.005**
Pterocaesio marri	126.31 ± 102.72	141.07 ± 84.19	68.89 ± 58.9	0.20	0.870

Table 5. Linear mixed-effect model of the effects of depth, benthic cover, wave exposure, human population within 10 km, and the distance to major market on fourth root transformed fish biomass. Results are shown for total fish biomass, and for high/very high value species and sharks. Biomass (g) was fourth root transformed prior to analysis. Sharks included in commercially valuable biomass were all individuals of the families: Carcharhinidae, Ginglymostomatidae, Hemiscylliidae, and Rhinidae. Benthic PC1 indicates the first principle components axis from a PCA of each component of the benthic HAS per BRUV drop.

	Estimate	**SE**	**t-value**	**χ2**	**p**
Total fish biomass					
Intercept	21.354	2.823	7.57		
Depth	-2.884	0.865	-3.33	10.74	**0.001**
Benthic PC1	0.549	0.285	1.92	3.65	0.056
Wave exposure	-0.719	0.580	-1.24	1.47	0.225
Human population	-0.003	0.001	-2.07	4.19	**0.041**
Distance to market	-0.020	0.009	-2.28	4.91	**0.027**
Depth:Benthic PC1	-0.407	0.132	-3.08	9.22	**0.002**
Commercially valuable fish biomass					
Intercept	19.867	3.175	6.26		
Depth	-3.235	0.974	-3.32	10.63	**0.001**
Benthic PC1	0.551	0.227	2.43	5.74	**0.017**
Wave exposure	-0.584	0.652	-0.90	0.79	0.374
Human population	-0.003	0.001	-1.89	3.48	0.062
Distance to market	-0.017	0.010	-1.69	2.81	0.094
Depth:Benthic PC1	-0.372	0.105	-3.54	11.99	**0.001**

Electronic Supplementary Material



ESM Figure 1. PCA of benthic and fish community structure differences based on depth and region. (A) Benthic communities based on mean HAS per depth at each site. Fish communities are shown weighed on (B) abundance and (C) biomass. 95% confidence ellipses are shown. Variable labels on (A) are: rugosity (R), variety of growth forms (GF), height (H), refuge size category (RS), live cover (LC), and hard substratum (HS).

ESM Table 1. Number of BRUV drops per site and depth for both regions.

Region/Site	Number of replicate BRUV drops per depth		
	Shallow	Intermediate	MCE
Dampier (DNTZ)			
1	3	2	3
2	3	2	2
3	3	2	3
4	2	2	2
5	2	2	2
Dampier (DUZ)			
1	3	3	2
2	3	2	2
3	3	2	2
4	2	2	3
5	2	2	3
Waigeo (WNTZ)			
1	2	2	3
2	2	3	2
3	2	2	2
4	2	2	2
5	2	4	2
6	2	2	2
7	2	2	1
Waigeo (WUZ)			
1	2	2	2
2	2	2	2
3	2	2	2
4	2	2	2
5	2	2	2
6	2	4	2
7	2	2	2

ESM Table 2. GPS coordinates for each BRUV drop. 'Region' indicates both the region and fisheries type as follows: DNTZ – Dampier no-take zone, DUZ – Dampier use zone (sustainable fisheries zone within the MPA), WNTZ – Waigeo no-take zone, and WUZ – Waigeo use area (area open to fisheries outside the MPA). Depth represents depth zone as follows: S – Shallow, M – Mid (intermediate), and D – Deep (MCE). 'Site number' refers to the site number as used in the manuscript. The 'Raw data site number' and 'Replicate numbers' represent the original Conservation International survey site and replicate numbers, which are used in the raw data. Not all sites/replicates surveyed were analyzed in this study, hence the numbers are not continuous. All GPS points are given in WGS84 format decimal degrees.

Region	Site number	Raw data site number	Depth	Replicate number	Longitude	Latitude
DNTZ	1	1	D	1	130.530697	-0.794603
DNTZ	1	1	D	2	130.526488	-0.7905658
DNTZ	1	1	D	3	130.523987	-0.783556
DNTZ	1	1	M	1	130.524713	-0.795062
DNTZ	1	1	M	3	130.52132	-0.7972476
DNTZ	1	1	S	1	130.523	-0.794309
DNTZ	1	1	S	2	130.520595	-0.798318
DNTZ	1	1	S	3	130.532855	-0.7987367
DNTZ	2	2	D	1	130.508027	-0.7989828
DNTZ	2	2	D	2	130.513062	-0.7867608
DNTZ	2	2	M	3	130.509315	-0.7927859
DNTZ	2	2	M	4	130.515608	-0.7952866
DNTZ	2	2	S	1	130.507272	-0.793176
DNTZ	2	2	S	2	130.497068	-0.794196
DNTZ	2	2	S	3	130.511291	-0.8056208
DNTZ	3	3	D	1	130.452206	-0.843469
DNTZ	3	3	D	2	130.454281	-0.851093
DNTZ	3	3	D	3	130.448862	-0.855004
DNTZ	3	3	M	1	130.455182	-0.847037
DNTZ	3	3	M	2	130.449541	-0.839482
DNTZ	3	3	S	1	130.449029	-0.83451
DNTZ	3	3	S	2	130.453843	-0.855849
DNTZ	3	3	S	3	130.452008	-0.859498
DNTZ	4	4	D	2	130.434489	-0.863857
DNTZ	4	4	D	3	130.440475	-0.8744669
DNTZ	4	4	M	1	130.441935	-0.8590817
DNTZ	4	4	M	2	130.449238	-0.8638667
DNTZ	4	4	S	1	130.439157	-0.857953
DNTZ	4	4	S	2	130.434941	-0.860401
DNTZ	5	8	D	1	130.353733	-0.49002
DNTZ	5	8	D	2	130.34567	-0.488285
DNTZ	5	8	M	1	130.357852	-0.487746
DNTZ	5	8	M	3	130.338402	-0.4898128

DNTZ	5	8	S	1	130.362512	-0.486074
DNTZ	5	8	S	3	130.358208	-0.483863
DUZ	1	1	D	2	130.635423	-0.788386
DUZ	1	1	D	3	130.641301	-0.788727
DUZ	1	1	M	1	130.626402	-0.793261
DUZ	1	1	M	2	130.625086	-0.796811
DUZ	1	1	M	4	130.631527	-0.791067
DUZ	1	1	S	1	130.626423	-0.794241
DUZ	1	1	S	2	130.630811	-0.791413
DUZ	1	1	S	3	130.635497	-0.790103
DUZ	2	2	D	1	130.544367	-0.82834
DUZ	2	2	D	3	130.527688	-0.827546
DUZ	2	2	M	1	130.541011	-0.824919
DUZ	2	2	M	2	130.536438	-0.826965
DUZ	2	2	S	1	130.540425	-0.824592
DUZ	2	2	S	2	130.536746	-0.826036
DUZ	2	2	S	3	130.537214	-0.830708
DUZ	3	4	D	1	130.570988	-0.788506
DUZ	3	4	D	2	130.575959	-0.787782
DUZ	3	4	M	1	130.575876	-0.795152
DUZ	3	4	M	3	130.563995	-0.797067
DUZ	3	4	S	1	130.570746	-0.792993
DUZ	3	4	S	2	130.579564	-0.797969
DUZ	3	4	S	3	130.561255	-0.802375
DUZ	4	7	D	1	130.637406	-0.569417
DUZ	4	7	D	2	130.632069	-0.570607
DUZ	4	7	D	3	130.626858	-0.571275
DUZ	4	7	M	2	130.623917	-0.572667
DUZ	4	7	M	3	130.638624	-0.569266
DUZ	4	7	S	2	130.634321	-0.5711356
DUZ	4	7	S	3	130.61781	-0.573148
DUZ	5	9	D	1	130.598434	-0.598411
DUZ	5	9	D	2	130.603696	-0.594229
DUZ	5	9	D	3	130.607279	-0.589442
DUZ	5	9	M	1	130.576687	-0.609784
DUZ	5	9	M	3	130.594597	-0.599805
DUZ	5	9	S	1	130.566139	-0.61247
DUZ	5	9	S	2	130.571207	-0.610765
WNTZ	1	1	D	1	130.069786	0.134305
WNTZ	1	1	D	2	130.06853	0.15673002
WNTZ	1	1	D	3	130.070163	0.14955629
WNTZ	1	1	M	2	130.061787	0.15101625
WNTZ	1	1	M	3	130.065415	0.15681
WNTZ	1	1	S	2	130.060455	0.153615
WNTZ	1	1	S	3	130.065935	0.15262331
WNTZ	2	2	D	2	130.120479	0.137607

WNTZ	2	2	D	3	130.13899	0.133177
WNTZ	2	2	M	2	130.130658	0.134857
WNTZ	2	2	M	3	130.136195	0.13559832
WNTZ	2	2	M	4	130.147438	0.133255
WNTZ	2	2	S	2	130.128722	0.134322
WNTZ	2	2	S	3	130.142698	0.13507001
WNTZ	3	3	D	1	130.223638	0.09694
WNTZ	3	3	D	3	130.210911	0.105589
WNTZ	3	3	M	2	130.216657	0.1027
WNTZ	3	3	M	3	130.212705	0.10462
WNTZ	3	3	S	1	130.219081	0.099818
WNTZ	3	3	S	2	130.228548	0.095535
WNTZ	4	5	D	1	130.125093	0.12996401
WNTZ	4	5	D	3	130.129542	0.120686
WNTZ	4	5	M	2	130.132819	0.12261601
WNTZ	4	5	M	3	130.138764	0.12245701
WNTZ	4	5	S	1	130.123098	0.125012
WNTZ	4	5	S	2	130.133877	0.120297
WNTZ	5	6	D	1	130.076229	0.129769
WNTZ	5	6	D	2	130.067475	0.13330202
WNTZ	5	6	M	1	130.062805	0.13976103
WNTZ	5	6	M	2	130.080999	0.147264
WNTZ	5	6	M	3	130.079717	0.13855998
WNTZ	5	6	M	4	130.078602	0.13337703
WNTZ	5	6	S	1	130.072124	0.13152597
WNTZ	5	6	S	3	130.07027	0.13389001
WNTZ	6	7	D	1	129.998199	0.16885721
WNTZ	6	7	D	2	130.004007	0.163066
WNTZ	6	7	M	1	130.002036	0.17793842
WNTZ	6	7	M	2	130.002848	0.17372911
WNTZ	6	7	S	1	130.006936	0.17944406
WNTZ	6	7	S	2	130.010678	0.178129
WNTZ	7	9	D	3	130.030903	0.17054901
WNTZ	7	9	M	2	130.040895	0.17433504
WNTZ	7	9	M	3	130.030178	0.165611
WNTZ	7	9	S	1	130.02632	0.178
WNTZ	7	9	S	2	130.039838	0.167497
WUZ	1	2	D	1	130.171925	0.004977
WUZ	1	2	D	2	130.177582	0.006271
WUZ	1	2	M	1	130.168195	-0.003426
WUZ	1	2	M	2	130.166462	0.001249
WUZ	1	2	S	2	130.176871	0.00416229
WUZ	1	2	S	3	130.1771	-0.000226
WUZ	2	3	D	2	130.143002	0.004364
WUZ	2	3	D	3	130.118273	0.001968
WUZ	2	3	M	2	130.12406	0.000755

WUZ	2	3	M	3	130.137578	0.00481004
WUZ	2	3	S	1	130.121792	-0.0110666
WUZ	2	3	S	2	130.124705	-0.0037417
WUZ	3	4	D	2	130.123823	-0.026527
WUZ	3	4	D	3	130.128838	-0.025605
WUZ	3	4	M	1	130.146495	-0.018221
WUZ	3	4	M	3	130.141314	-0.021141
WUZ	3	4	S	1	130.134777	-0.025737
WUZ	3	4	S	3	130.126522	-0.036198
WUZ	4	5	D	1	130.159497	-0.056352
WUZ	4	5	D	2	130.160028	-0.05167
WUZ	4	5	M	1	130.165126	-0.061347
WUZ	4	5	M	3	130.157356	-0.045629
WUZ	4	5	S	2	130.154767	-0.0556245
WUZ	4	5	S	3	130.15199	-0.0405267
WUZ	5	6	D	1	130.174079	-0.0831957
WUZ	5	6	D	2	130.188744	-0.091517
WUZ	5	6	M	1	130.178132	-0.085585
WUZ	5	6	M	3	130.184552	-0.102447
WUZ	5	6	S	1	130.191393	-0.098528
WUZ	5	6	S	3	130.179898	-0.094061
WUZ	6	8	D	1	130.10519	-0.0707138
WUZ	6	8	D	3	130.11609	-0.09311
WUZ	6	8	M	1	130.109248	-0.068807
WUZ	6	8	M	2	130.113974	-0.089298
WUZ	6	8	M	3	130.114045	-0.084448
WUZ	6	8	M	4	130.114045	-0.084448
WUZ	6	8	S	1	130.111878	-0.0725609
WUZ	6	8	S	2	130.097381	-0.06316
WUZ	7	9	D	1	130.067343	-0.067851
WUZ	7	9	D	2	130.043359	-0.073457
WUZ	7	9	M	3	130.048681	-0.074707
WUZ	7	9	M	4	130.027712	-0.073842
WUZ	7	9	S	2	130.067135	-0.072522
WUZ	7	9	S	3	130.038239	-0.074227

ESM Table 3. Dufrêne and Legendre indicator species analysis showing fish species indicative of intermediate and MCE depth zones. Analysis is based on fish abundance with results showing the Dufrêne and Legendre indicator value (measuring the association between the fish species and the depth group) and the associated permutational p-value (based on 99999 permutations). Only fish species with a p<0.05 association for the depth band are shown.

Family / Depth group	**Species**	**Indicator value**	**P(perm)**	**Trophic Group**
Shallow				
Acanthuridae	*Acanthurus lineatus*	0.38	<0.001	Herbivore
Acanthuridae	*Acanthurus maculiceps*	0.53	<0.001	Herbivore
Acanthuridae	*Acanthurus nigricauda*	0.16	0.044	Omnivore
Acanthuridae	*Acanthurus xanthopterus*	0.19	0.009	Planktivore
Acanthuridae	*Ctenochaetus striatus*	0.54	<0.001	Planktivore
Acanthuridae	*Naso brevirostris*	0.32	0.001	Herbivore
Acanthuridae	*Naso lituratus*	0.33	0.002	Herbivore_Planktivore
Acanthuridae	*Naso unicornis*	0.18	0.044	Herbivore
Acanthuridae	*Zebrasoma scopas*	0.49	<0.001	Herbivore
Balistidae	*Balistapus undulatus*	0.59	<0.001	Mobile.Invert
Caesionidae	*Caesio lunaris*	0.28	0.017	Planktivore
Caesionidae	*Pterocaesio tile*	0.26	0.004	Planktivore
Carangidae	*Scomberoides lysan*	0.17	0.031	Piscivore_Mobile.Invert
Carcharhinidae	*Carcharhinus melanopterus*	0.37	0.011	Piscivore_Mobile.Invert
Chaetodontidae	*Chaetodon baronessa*	0.44	<0.001	Corallivore
Chaetodontidae	*Chaetodon citrinellus*	0.21	0.009	Omnivore
Chaetodontidae	*Chaetodon ephippium*	0.21	0.021	Omnivore
Chaetodontidae	*Chaetodon lineolatus*	0.26	0.004	Corallivore
Chaetodontidae	*Chaetodon lunula*	0.23	0.011	Mobile.Invert
Chaetodontidae	*Chaetodon lunulatus*	0.48	<0.001	Corallivore
Chaetodontidae	*Chaetodon rafflesii*	0.46	<0.001	Corallivore
Chaetodontidae	*Chaetodon semeion*	0.25	0.003	Omnivore
Chaetodontidae	*Chaetodon*	0.25	0.005	Corallivore

	speculum			
Chaetodontidae	*Chaetodon trifascialis*	0.46	<0.001	Corallivore
Chaetodontidae	*Chaetodon vagabundus*	0.4	<0.001	Corallivore
Chaetodontidae	*Heniochus varius*	0.21	0.022	Mobile.Invert
Cirrhitidae	*Paracirrhites forsteri*	0.21	0.009	Piscivore
Labridae	*Choerodon anchorago*	0.31	0.001	Mobile.Invert
Labridae	*Diproctacanthus xanthurus*	0.44	<0.001	Corallivore
Labridae	*Halichoeres hortulanus*	0.3	0.002	Mobile.Invert
Labridae	*Halichoeres melanurus*	0.25	0.003	Mobile.Invert
Labridae	*Halichoeres podostigma*	0.17	0.031	Mobile.Invert
Labridae	*Hemigymnus melapterus*	0.37	<0.001	Mobile.Invert
Labridae	*Hologymnosus annulatus*	0.24	0.014	Piscivore
Labridae	*Labroides dimidiatus*	0.38	0.013	Piscivore_Mobile.Invert
Labridae	*Thalassoma hardwicke*	0.87	<0.001	Mobile.Invert
Labridae	*Thalassoma lunare*	0.75	<0.001	Mobile.Invert
Lutjanidae	*Lutjanus bohar*	0.4	0.002	Mobile.Invert
Lutjanidae	*Lutjanus carponotatus*	0.23	0.006	Piscivore_Mobile.Invert
Lutjanidae	*Lutjanus decussatus*	0.33	0.001	Piscivore_Mobile.Invert
Lutjanidae	*Lutjanus fulvus*	0.25	0.003	Piscivore_Mobile.Invert
Lutjanidae	*Lutjanus rivulatus*	0.2	0.033	Piscivore_Mobile.Invert
Lutjanidae	*Lutjanus russellii*	0.19	0.014	Piscivore_Mobile.Invert
Lutjanidae	*Lutjanus semicinctus*	0.61	<0.001	Piscivore_Mobile.Invert
Mullidae	*Parupeneus crassilabris*	0.42	<0.001	Mobile.Invert
Muraenidae	*Gymnothorax javanicus*	0.18	0.048	Piscivore_Mobile.Invert
Nemipteridae	*Pentapodus trivittatus*	0.36	0.001	Piscivore_Mobile.Invert
Nemipteridae	*Scolopsis bilineata*	0.45	<0.001	Mobile.Invert
Nemipteridae	*Scolopsis trilineata*	0.19	0.033	Piscivore_Mobile.Invert
Pomacentridae	*Amblyglyphidodon*	0.2	0.015	Herbivore_Planktivore

	curacao			
Pomacentridae	*Amblyglyphidodon ternatensis*	0.17	0.031	Herbivore_Planktivore
Pomacentridae	*Chromis margaritifer*	0.45	<0.001	Herbivore_Planktivore
Pomacentridae	*Chromis ternatensis*	0.29	0.003	Planktivore
Pomacentridae	*Chromis weberi*	0.27	0.006	Planktivore
Pomacentridae	*Chrysiptera cyanea*	0.25	0.004	Herbivore_Planktivore
Pomacentridae	*Dascyllus reticulatus*	0.18	0.022	Planktivore
Pomacentridae	*Dischistodus melanotus*	0.2	0.023	Herbivore
Pomacentridae	*Neoglyphidodon melas*	0.25	0.003	Omnivore
Pomacentridae	*Plectroglyphidodon dickii*	0.21	0.009	Piscivore
Pomacentridae	*Pomacentrus bankanensis*	0.34	<0.001	Herbivore_Planktivore
Pomacentridae	*Pomacentrus chrysurus*	0.22	0.008	Omnivore
Pomacentridae	*Pomacentrus coelestis*	0.21	0.009	Mobile.Invert_Planktivore
Pomacentridae	*Pomacentrus moluccensis*	0.58	<0.001	Omnivore
Scaridae	*Chlorurus bleekeri*	0.17	0.030	Herbivore
Scaridae	*Chlorurus sordidus*	0.29	0.002	Herbivore
Scaridae	*Scarus dimidiatus*	0.17	0.031	Herbivore
Serranidae	*Aethaloperca rogaa*	0.24	0.016	Piscivore_Mobile.Invert
Serranidae	*Cephalopholis argus*	0.31	0.004	Piscivore
Serranidae	*Cephalopholis boenak*	0.31	0.001	Piscivore_Mobile.Invert
Siganidae	*Siganus argenteus*	0.19	0.035	Omnivore
Siganidae	*Siganus doliatus*	0.17	0.032	Herbivore
Siganidae	*Siganus puellus*	0.21	0.008	Omnivore
Siganidae	*Siganus vulpinus*	0.31	0.001	Herbivore_Planktivore
Zanclidae	*Zanclus cornutus*	0.37	0.023	Omnivore
Intermediate				
Acanthuridae	*Acanthurus thompsoni*	0.22	0.008	Planktivore
Acanthuridae	*Naso thynnoides*	0.32	<0.001	Omnivore
Balistidae	*Odonus niger*	0.33	0.032	Planktivore
Balistidae	*Sufflamen bursa*	0.39	0.001	Mobile.Invert
Caesionidae	*Pterocaesio*	0.17	0.028	Planktivore

	digramma			
Carcharhinidae	*Triaenodon obesus*	0.18	0.042	Piscivore_Mobile.Invert
Chaetodontidae	*Coradion chrysozonus*	0.22	0.033	Omnivore
Chaetodontidae	*Forcipiger flavissimus*	0.17	0.030	Mobile.Invert
Chaetodontidae	*Forcipiger longirostris*	0.19	0.015	Mobile.Invert
Labridae	*Bodianus diana*	0.19	0.009	Mobile.Invert
Labridae	*Bodianus dictynna*	0.22	0.010	Mobile.Invert
Labridae	*Choerodon zosterophorus*	0.22	0.012	Mobile.Invert
Labridae	*Halichoeres chrysus*	0.39	<0.001	Mobile.Invert
Labridae	*Halichoeres prosopeion*	0.33	0.002	Mobile.Invert
Lethrinidae	*Monotaxis grandoculis*	0.22	0.020	Mobile.Invert
Lutjanidae	*Macolor macularis*	0.29	0.004	Piscivore_Mobile.Invert
Monacanthidae	*Paraluteres prionurus*	0.17	0.031	Omnivore
Pomacanthidae	*Centropyge bicolor*	0.3	0.002	Mobile.Invert
Pomacanthidae	*Genicanthus lamarck*	0.29	0.001	Planktivore
Pomacentridae	*Pomacentrus amboinensis*	0.36	<0.001	Herbivore_Planktivore
Pomacentridae	*Pomacentrus nigromanus*	0.27	0.007	Planktivore
Serranidae	*Plectropomus oligacanthus*	0.19	0.016	Piscivore_Mobile.Invert
Serranidae	*Variola albimarginata*	0.19	0.034	Piscivore
Tetraodontidae	*Canthigaster valentini*	0.17	0.031	Omnivore
MCE				
Balistidae	*Abalistes stellatus*	0.41	<0.001	Piscivore_Mobile.Invert
Balistidae	*Sufflamen fraenatum*	0.23	0.023	Mobile.Invert
Carangidae	*Carangoides ferdau*	0.35	0.011	Piscivore_Mobile.Invert
Labridae	*Choerodon jordani*	0.25	0.003	Mobile.Invert
Lethrinidae	*Lethrinus amboinensis*	0.25	0.017	Piscivore_Mobile.Invert
Lethrinidae	*Lethrinus lentjan*	0.17	0.031	Piscivore_Mobile.Invert
Malacanthidae	*Hoplolatilus purpureus*	0.25	0.002	Planktivore

Mullidae	*Parupeneus heptacanthus*	0.2	0.027	Piscivore_Mobile.Invert
Nemipteridae	*Pentapodus nagasakiensis*	0.36	0.004	Mobile.Invert
Nemipteridae	*Pentapodus paradiseus*	0.39	<0.001	Piscivore_Mobile.Invert
Nemipteridae	*Scolopsis vosmeri*	0.25	0.003	Mobile.Invert
Pomacentridae	*Pomacentrus nagasakiensis*	0.17	0.031	Herbivore_Planktivore

ESM Table 4. Change in fish species abundance and biomass with depth across all sites. Abundance represents the mean MaxN per BRUV drop within a depth zone. Biomass represents the mean biomass per BRUV drop within a depth zone. 'Mid' represents intermediate depths. Changes in abundance and biomass across the depth gradient were tested with a permutational-ANOVA (9999 permutations) of the form Abundance/Biomass ~ Depth. Pseudo-F and p(perm) values represent F and p values associated with the depth effect. Depth was treated as continuous coded as 1 (shallow), 2 (intermediate), 3 (MCE) to incorporate the gradient of depths. Abundance/biomass data with significant depth effects (p<0.05) are shown in bold.

		Abundance (MaxN)					Biomass (g/BRUV)				
Family	Species	Shallow	Mid	Deep	Pseudo-F	p(perm)	Shallow	Mid	Deep	Pseudo-F	p(perm)
Acanthuridae	*Acanthurus bariene*	0.03 ± 0.03	0.02 ± 0.02	0 ± 0	0.97	0.441	8.65 ± 8.65	6.49 ± 6.49	0 ± 0	0.97	0.442
Acanthuridae	*Acanthurus blochii*	0.8 ± 0.64	0.56 ± 0.22	0 ± 0	2.15	0.150	234.38 ± 186.42	163.05 ± 63.93	0 ± 0	2.15	0.145
Acanthuridae	*Acanthurus fowleri*	0.33 ± 0.1	0.56 ± 0.33	0.02 ± 0.02	1.17	0.367	163.85 ± 49.8	276.5 ± 164.28	10.24 ± 10.24	1.17	0.350
Acanthuridae	*Acanthurus leucocheilus*	**0.15 ± 0.07**	**0.13 ± 0.06**	**0 ± 0**	**4.66**	**0.039**	**27.76 ± 11.94**	**23.97 ± 10.31**	**0 ± 0**	**4.66**	**0.038**
Acanthuridae	*Acanthurus lineatus*	**0.87 ± 0.31**	**0 ± 0**	**0 ± 0**	**11.63**	**<0.001**	**219.72 ± 77.23**	**0 ± 0**	**0 ± 0**	**11.63**	**<0.001**
Acanthuridae	*Acanthurus maculiceps*	**2.31 ± 1.07**	**0.24 ± 0.12**	**0 ± 0**	**6.84**	**<0.001**	**678.69 ± 314.98**	**71.33 ± 34.83**	**0 ± 0**	**6.84**	**<0.001**
Acanthuridae	*Acanthurus mata*	0.29 ± 0.27	0.44 ± 0.37	0.06 ± 0.06	0.37	0.614	52.99 ± 49.19	79.49 ± 67.93	11.36 ± 11.36	0.37	0.618
Acanthuridae	*Acanthurus nigricans*	0.13 ± 0.09	0.03 ± 0.03	0 ± 0	2.59	0.140	8.59 ± 6.29	1.91 ± 1.91	0 ± 0	2.59	0.140
Acanthuridae	*Acanthurus nigricauda*	**0.75 ± 0.39**	**0.04 ± 0.03**	**0 ± 0**	**5.35**	**0.011**	**263.26 ± 138.55**	**14.63 ± 10.11**	**0 ± 0**	**5.35**	**0.012**
Acanthuridae	*Acanthurus nigrofuscus*	0.16 ± 0.09	0.13 ± 0.07	0 ± 0	2.86	0.095	22.11 ± 12.84	17.78 ± 9.67	0 ± 0	2.86	0.092
Acanthuridae	*Acanthurus nubilus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	6.11 ± 6.11	0 ± 0	0.00	1.000
Acanthuridae	*Acanthurus olivaceus*	0.25 ± 0.16	0.15 ± 0.0	0.04 ± 0.0	2.18	0.178	59.86 ± 38.13	34.92 ± 13.44	9.98 ± 9.98	2.18	0.153

			6	4							
Acanthuridae	*Acanthurus pyroferus*	0.16 ± 0.08	0.23 ± 0.07	0 ± 0	3.20	0.081	2.31 ± 1.13	3.32 ± 1.07	0 ± 0	3.20	0.086
Acanthuridae	*Acanthurus thompsoni*	0.04 ± 0.04	0.34 ± 0.15	0 ± 0	0.10	0.785	3.04 ± 3.04	24.82 ± 10.99	0 ± 0	0.10	0.776
Acanthuridae	*Acanthurus triostegus*	0.17 ± 0.15	0 ± 0	0 ± 0	1.95	0.223	21.94 ± 19.27	0 ± 0	0 ± 0	1.95	0.213
Acanthuridae	*Acanthurus xanthopterus*	**0.13 ± 0.06**	**0.01 ± 0.01**	**0 ± 0**	**7.75**	**0.004**	**186.28 ± 80.1**	**14.71 ± 14.71**	**0 ± 0**	**7.75**	**0.004**
Acanthuridae	*Ctenochaetus binotatus*	0 ± 0	0.04 ± 0.03	0 ± 0	0.00	1.000	0 ± 0	2.42 ± 1.67	0 ± 0	0.00	1.000
Acanthuridae	*Ctenochaetus cyanocheilus*	0.08 ± 0.05	0.08 ± 0.06	0 ± 0	1.59	0.256	4.83 ± 2.98	5.27 ± 3.65	0 ± 0	1.59	0.229
Acanthuridae	*Ctenochaetus striatus*	**1.14 ± 0.25**	**0.52 ± 0.21**	**0.02 ± 0.02**	**18.14**	**<0.001**	**69.93 ± 15.19**	**31.77 ± 12.76**	**1.28 ± 1.28**	**18.14**	**<0.001**
Acanthuridae	*Ctenochaetus tominiensis*	0 ± 0	0.08 ± 0.06	0 ± 0	0.00	1.000	0 ± 0	4.41 ± 3.05	0 ± 0	0.00	1.000
Acanthuridae	*Naso annulatus*	0.3 ± 0.17	0.21 ± 0.15	0.06 ± 0.05	1.57	0.236	166.49 ± 93.59	118.09 ± 85.61	34.85 ± 25.52	1.57	0.231
Acanthuridae	*Naso brachycentron*	0.35 ± 0.2	0.3 ± 0.27	0 ± 0	1.68	0.215	444.25 ± 251.77	370.21 ± 339.06	0 ± 0	1.68	0.216
Acanthuridae	*Naso brevirostris*	**0.63 ± 0.24**	**0.02 ± 0.02**	**0 ± 0**	**9.88**	**<0.001**	**284.76 ± 109.05**	**9.49 ± 9.49**	**0 ± 0**	**9.88**	**0.001**
Acanthuridae	*Naso caeruleacauda*	0.35 ± 0.27	0.08 ± 0.08	0.1 ± 0.1	0.98	0.395	435.54 ± 340.67	104.53 ± 104.53	130.66 ± 130.66	0.98	0.395
Acanthuridae	*Naso caesius*	0.46 ± 0.19	0.39 ± 0.22	0.02 ± 0.02	3.40	0.076	280.28 ± 115.47	235.69 ± 135.24	12.74 ± 12.74	3.40	0.073
Acanthuridae	*Naso hexacanthus*	0.51 ± 0.25	0.43 ± 0.16	0.13 ± 0.11	2.18	0.150	222.92 ± 111.56	189.33 ± 70.85	54.97 ± 46.32	2.18	0.148
Acanthuridae	*Naso lituratus*	**0.46 ± 0.12**	**0.17 ± 0.06**	**0 ± 0**	**17.59**	**<0.001**	**152.86 ± 40.18**	**57.9 ± 19.93**	**0 ± 0**	**17.59**	**<0.001**
Acanthuridae	*Naso lopezi*	0.03 ±	0 ± 0	0 ± 0	3.01	0.214	34.96 ± 24.7	0 ± 0	0 ± 0	3.01	0.216

		0.02									
Acanthuridae	*Naso mcdadei*	0.03 ± 0.03	0 ± 0	0 ± 0	1.51	0.680	34.84 ± 34.84	0 ± 0	0 ± 0	1.51	0.670
Acanthuridae	*Naso minor*	0.65 ± 0.62	0.14 ± 0.11	0.2 ± 0.19	0.69	0.544	114.84 ± 111.03	24.7 ± 18.77	35.81 ± 33.32	0.69	0.553
Acanthuridae	*Naso thynnoides*	0.04 ± 0.04	2.11 ± 0.84	0.02 ± 0.02	0.00	0.982	7.41 ± 7.41	376 ± 149.27	3.7 ± 3.7	0.00	0.981
Acanthuridae	*Naso tonganus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	36.42 ± 36.42	0 ± 0	0.00	1.000
Acanthuridae	*Naso unicornis*	**0.2 ± 0.1**	**0.03 ± 0.02**	**0 ± 0**	**5.42**	**0.010**	**239.71 ± 122.93**	**41.33 ± 29.2**	**0 ± 0**	**5.42**	**0.012**
Acanthuridae	*Naso vlamingii*	0.27 ± 0.21	0.06 ± 0.05	0.06 ± 0.06	1.33	0.354	102.4 ± 78.82	23.63 ± 17.3	23.63 ± 23.63	1.33	0.308
Acanthuridae	*Paracanthurus hepatus*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.675	4.66 ± 4.66	0 ± 0	0 ± 0	1.51	0.661
Acanthuridae	*Zebrasoma scopas*	**0.47 ± 0.08**	**0.13 ± 0.08**	**0.04 ± 0.04**	**18.43**	**<0.001**	**26.56 ± 4.76**	**7.14 ± 4.3**	**2.38 ± 2.38**	**18.43**	**<0.001**
Acanthuridae	*Zebrasoma velifer*	0.06 ± 0.05	0.08 ± 0.08	0 ± 0	0.65	0.592	16.63 ± 12.18	22.18 ± 22.18	0 ± 0	0.65	0.513
Antennariidae	*Antennatus rosaceus*	0 ± 0	0 ± 0	0.02 ± 0.02	1.51	0.667	0 ± 0	0 ± 0	0.02 ± 0.02	1.51	0.667
Apogonidae	*Cheilodipterus nigrotaeniatus*	0.02 ± 0.02	0.01 ± 0.01	0 ± 0	1.22	0.436	0.13 ± 0.13	0.06 ± 0.06	0 ± 0	1.22	0.451
Apogonidae	*Cheilodipterus parazonatus*	0.08 ± 0.05	0.04 ± 0.03	0.13 ± 0.07	0.58	0.490	0.47 ± 0.29	0.25 ± 0.18	0.81 ± 0.43	0.58	0.471
Apogonidae	*Ostorhinchus cavitensis*	0.1 ± 0.1	0 ± 0	0 ± 0	1.51	0.669	0.69 ± 0.69	0 ± 0	0 ± 0	1.51	0.673
Apogonidae	*Ostorhinchus hoevenii*	0 ± 0	0 ± 0	0.04 ± 0.04	1.51	0.663	0 ± 0	0 ± 0	0.28 ± 0.28	1.51	0.669
Apogonidae	*Pristiapogon exostigma*	0.27 ± 0.27	0 ± 0	0 ± 0	1.51	0.665	8.05 ± 8.05	0 ± 0	0 ± 0	1.51	0.673
Apogonidae	*Rhabdamia spilota*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.1 ± 0.1	0 ± 0	0.00	1.000
Apogonidae	*Taeniamia fucata*	0 ± 0	0.08 ±	0 ± 0	0.00	1.000	0 ± 0	0.26 ± 0.26	0 ± 0	0.00	1.000

			0.08								
Atherinidae	*Atherinomorus lacunosus*	0.19 ± 0.19	0 ± 0	0 ± 0	1.51	0.666	0.72 ± 0.72	0 ± 0	0 ± 0	1.51	0.665
Aulostomidae	*Aulostomus chinensis*	0.1 ± 0.05	0.04 ± 0.04	0 ± 0	3.72	0.086	9.77 ± 4.87	3.91 ± 3.91	0 ± 0	3.72	0.093
Balistidae	*Abalistes stellatus*	**0.01 ± 0.01**	**0.08 ± 0.05**	**0.45 ± 0.13**	**14.93**	**<0.001**	**15.75 ± 15.75**	**94.5 ± 55.74**	**511.89 ± 144.57**	**14.93**	**<0.001**
Balistidae	*Balistapus undulatus*	**2.24 ± 0.37**	**0.81 ± 0.16**	**0.28 ± 0.07**	**33.84**	**<0.001**	**340.43 ± 56.25**	**122.26 ± 24.06**	**42.16 ± 10.94**	**33.84**	**<0.001**
Balistidae	*Balistoides conspicillum*	0.04 ± 0.03	0.08 ± 0.05	0.08 ± 0.04	0.55	0.590	35.7 ± 24.69	71.4 ± 42.11	71.4 ± 33.29	0.55	0.563
Balistidae	*Balistoides viridescens*	0.03 ± 0.02	0.08 ± 0.04	0.03 ± 0.02	0.00	1.000	43.63 ± 30.82	95.98 ± 45.41	43.63 ± 30.82	0.00	1.000
Balistidae	*Canthidermis maculata*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	22.21 ± 22.21	0 ± 0	0.00	1.000
Balistidae	*Melichthys niger*	0 ± 0	1.01 ± 1.01	0 ± 0	0.00	1.000	0 ± 0	293.35 ± 293.35	0 ± 0	0.00	1.000
Balistidae	*Melichthys vidua*	**0.31 ± 0.1**	**0.2 ± 0.07**	**0.04 ± 0.03**	**6.70**	**0.011**	**88.41 ± 28.54**	**58.27 ± 20.93**	**12.06 ± 8.34**	**6.70**	**0.010**
Balistidae	*Odonus niger*	3.65 ± 1.3	7.51 ± 2.39	1 ± 0.43	1.27	0.279	656.15 ± 233.76	1351.66 ± 429.84	179.97 ± 77.93	1.27	0.268
Balistidae	*Pseudobalistes flavimarginatus*	0.04 ± 0.03	0.08 ± 0.04	0.06 ± 0.05	0.15	0.851	106.08 ± 73.36	212.17 ± 98.92	159.13 ± 116.52	0.15	0.855
Balistidae	*Pseudobalistes fuscus*	0.21 ± 0.21	0.48 ± 0.46	0.07 ± 0.04	0.11	0.883	843.63 ± 843.63	1940.35 ± 1854.24	281.21 ± 181.3	0.11	0.884
Balistidae	*Rhinecanthus rectangulus*	0.01 ± 0.01	0.08 ± 0.05	0 ± 0	0.11	0.834	1.29 ± 1.29	7.73 ± 4.56	0 ± 0	0.11	0.842
Balistidae	*Rhinecanthus verrucosus*	0.08 ± 0.07	0.01 ± 0.01	0.02 ± 0.02	1.23	0.357	10.37 ± 8.09	1.3 ± 1.3	2.59 ± 2.59	1.23	0.361
Balistidae	*Sufflamen bursa*	0.04 ± 0.03	0.41 ± 0.08	0.25 ± 0.09	3.71	0.058	4.76 ± 3.29	46.83 ± 9.37	28.57 ± 10.38	3.71	0.055
Balistidae	*Sufflamen*	0.27	0.2	0.1	1.34	0.258	137.6	142.9	59.99	1.34	0.248

	chrysopterum	± 0.1	8 ± 0.09	2 ± 0.09			1 ± 50.93	1 ± 47.94	± 43.4		
Balistidae	*Sufflamen fraenatum*	**0 ± 0**	**0.14 ± 0.06**	**0.22 ± 0.07**	**9.04**	**0.003**	**0 ± 0**	**63.67 ± 28.6**	**101.88 ± 30.39**	**9.04**	**0.004**
Balistidae	*Xanthichthys auromarginatus*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.661	17.85 ± 17.85	0 ± 0	0 ± 0	1.51	0.671
Belonidae	*Tylosurus crocodilus*	0.04 ± 0.03	0 ± 0	0 ± 0	3.13	0.218	8.46 ± 5.85	0 ± 0	0 ± 0	3.13	0.223
Blenniidae	*Aspidontus taeniatus*	0.06 ± 0.04	0.02 ± 0.02	0.01 ± 0.01	1.05	0.385	0.22 ± 0.17	0.08 ± 0.08	0.05 ± 0.05	1.05	0.390
Blenniidae	*Ecsenius midas*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.27 ± 0.27	0 ± 0	0.00	1.000
Blenniidae	*Meiacanthus atrodorsalis*	0 ± 0	0.03 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.11 ± 0.08	0 ± 0	0.00	1.000
Blenniidae	*Meiacanthus crinitus*	0 ± 0	0.02 ± 0.02	0.08 ± 0.08	1.43	0.440	0 ± 0	0.31 ± 0.31	1.25 ± 1.25	1.43	0.435
Blenniidae	*Meiacanthus grammistes*	0.01 ± 0.01	0.12 ± 0.06	0.03 ± 0.02	0.14	0.727	0.06 ± 0.06	0.55 ± 0.27	0.16 ± 0.11	0.14	0.734
Blenniidae	*Plagiotremus rhinorhynchos*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	0.03 ± 0.03	0 ± 0	0.00	1.000
Caesionidae	*Caesio caerulaurea*	2.83 ± 2.15	0.08 ± 0.06	0 ± 0	2.60	0.061	321.98 ± 244.79	8.7 ± 7.23	0 ± 0	2.60	0.059
Caesionidae	*Caesio cuning*	3.89 ± 2.28	5.27 ± 2.4	0 ± 0	2.04	0.174	673.78 ± 395.34	913.21 ± 416.14	0 ± 0	2.04	0.173
Caesionidae	*Caesio lunaris*	**4.85 ± 1.92**	**1.52 ± 1.01**	**0.17 ± 0.13**	**7.03**	**0.008**	**787.36 ± 311.91**	**246.68 ± 163.19**	**27.03 ± 20.52**	**7.03**	**0.007**
Caesionidae	*Caesio teres*	2.63 ± 1.51	1.94 ± 1.77	0.01 ± 0.01	1.91	0.186	126.16 ± 72.79	93.12 ± 84.99	0.67 ± 0.67	1.91	0.178
Caesionidae	*Gymnocaesio gymnoptera*	0.1 ± 0.1	0.04 ± 0.04	0 ± 0	1.29	0.439	8.3 ± 8.3	3.56 ± 3.56	0 ± 0	1.29	0.449
Caesionidae	*Pterocaesio digramma*	0.14 ± 0.14	0.68 ± 0.39	0 ± 0	0.16	0.713	8.89 ± 8.89	43.36 ± 24.92	0 ± 0	0.16	0.709
Caesionidae	*Pterocaesio*	2.36	3.0	1.7	0.06	0.805	278.8	364.9	206.6	0.06	0.806

	marri	± 1.79	9 ± 1.82	5 ± 1.49			6 ± 211.84	7 ± 215.46	8 ± 176.23		
Caesionidae	*Pterocaesio pisang*	0.02 ± 0.02	0.97 ± 0.69	0 ± 0	0.00	0.989	0.22 ± 0.22	10.2 ± 7.22	0 ± 0	0.00	0.990
Caesionidae	*Pterocaesio randalli*	0 ± 0	0 ± 0	0.04 ± 0.04	1.51	0.665	0 ± 0	0 ± 0	2.45 ± 2.45	1.51	0.658
Caesionidae	*Pterocaesio tile*	**3.11 ± 1.36**	**0.31 ± 0.31**	**0.04 ± 0.04**	**7.19**	**0.004**	**373.51 ± 163.22**	**37.52 ± 37.52**	**5 ± 5**	**7.19**	**0.005**
Carangidae	*Alectis ciliaris*	0.05 ± 0.03	0 ± 0	0.01 ± 0.01	1.33	0.364	811.53 ± 567.43	0 ± 0	231.86 ± 231.86	1.33	0.363
Carangidae	*Alepes kleinii*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.76 ± 0.76	0 ± 0	0.00	1.000
Carangidae	*Atule mate*	0.01 ± 0.01	0.08 ± 0.05	0 ± 0	0.11	0.840	3.05 ± 3.05	18.31 ± 10.8	0 ± 0	0.11	0.810
Carangidae	*Carangoides bajad*	0.33 ± 0.17	0.42 ± 0.28	0.41 ± 0.35	0.05	0.841	97.59 ± 49.88	125.62 ± 85.07	122.51 ± 103.91	0.05	0.839
Carangidae	*Carangoides ferdau*	**0.17 ± 0.08**	**0.17 ± 0.07**	**0.81 ± 0.3**	**5.98**	**0.008**	**61.06 ± 28.71**	**62.33 ± 25.76**	**297.66 ± 111.13**	**5.98**	**0.009**
Carangidae	*Carangoides fulvoguttatus*	0.08 ± 0.06	0.04 ± 0.04	0.04 ± 0.03	0.30	0.660	856.87 ± 655.97	467.38 ± 467.38	467.38 ± 342.26	0.30	0.645
Carangidae	*Carangoides gymnostethus*	0.06 ± 0.03	0.04 ± 0.03	0 ± 0	2.94	0.158	662.73 ± 365.61	441.82 ± 305.55	0 ± 0	2.94	0.158
Carangidae	*Carangoides oblongus*	0.05 ± 0.03	0.06 ± 0.05	0.14 ± 0.1	0.90	0.409	64.7 ± 36.52	83.19 ± 60.92	184.86 ± 138.55	0.90	0.374
Carangidae	*Carangoides plagiotaenia*	0.06 ± 0.04	0.21 ± 0.12	0.02 ± 0.02	0.10	0.794	27.83 ± 21.71	104.35 ± 62	10.44 ± 10.44	0.10	0.770
Carangidae	*Caranx ignobilis*	0.38 ± 0.29	0.1 ± 0.07	0.04 ± 0.04	1.84	0.221	1393.47 ± 1085.73	387.08 ± 249.55	154.83 ± 154.83	1.84	0.158
Carangidae	*Caranx melampygus*	1.15 ± 0.4	1.25 ± 0.48	0.29 ± 0.08	2.77	0.101	440.77 ± 152.58	482.18 ± 183.76	112.2 ± 30.69	2.77	0.099
Carangidae	*Caranx papuensis*	0.1 ± 0.06	0.02 ± 0.0	0.02 ± 0.0	1.92	0.253	282.64 ± 177.2	60.57 ± 60.57	60.57 ± 60.57	1.92	0.253

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Carangidae	*Caranx sexfasciatus*	0.06 ± 0.05	0 ± 0	2.6 ± 2.58	1.46	0.592	61.24 ± 44.84	0 ± 0	2551.66 ± 2530.44	1.46	0.593
Carangidae	*Elagatis bipinnulata*	0 ± 0	0 ± 0	0.06 ± 0.05	2.80	0.212	0 ± 0	0 ± 0	45.85 ± 33.57	2.80	0.213
Carangidae	*Gnathanodon speciosus*	0.03 ± 0.02	0.25 ± 0.23	0.03 ± 0.03	0.00	0.979	0.53 ± 0.37	3.8 ± 3.49	0.42 ± 0.42	0.00	0.980
Carangidae	*Scomberoides commersonnianus*	0 ± 0	0.13 ± 0.09	0 ± 0	0.00	1.000	0 ± 0	20.89 ± 14.45	0 ± 0	0.00	1.000
Carangidae	*Scomberoides lysan*	**0.12 ± 0.06**	**0 ± 0**	**0 ± 0**	**5.62**	**0.024**	**177.06 ± 90.87**	**0 ± 0**	**0 ± 0**	**5.62**	**0.020**
Carangidae	*Scomberoides tol*	0.4 ± 0.4	0 ± 0	0 ± 0	1.51	0.665	266.24 ± 266.24	0 ± 0	0 ± 0	1.51	0.670
Carangidae	*Selar boops*	0 ± 0	0 ± 0	0.23 ± 0.23	1.51	0.668	0 ± 0	0 ± 0	40.74 ± 40.74	1.51	0.667
Carangidae	*Trachinotus blochii*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.663	33.52 ± 33.52	0 ± 0	0 ± 0	1.51	0.664
Carcharhinidae	*Carcharhinus albimarginatus*	0 ± 0	0 ± 0	0.01 ± 0.01	1.51	0.666	0 ± 0	0 ± 0	123.48 ± 123.48	1.51	0.671
Carcharhinidae	*Carcharhinus amblyrhynchos*	0.02 ± 0.02	0.02 ± 0.02	0.02 ± 0.02	0.00	1.000	401.57 ± 401.57	401.57 ± 401.57	401.57 ± 401.57	0.00	1.000
Carcharhinidae	*Carcharhinus melanopterus*	**0.5 ± 0.1**	**0.28 ± 0.06**	**0.18 ± 0.07**	**8.95**	**0.004**	**6374.06 ± 1233.34**	**3585.41 ± 761.5**	**2301.74 ± 837.83**	**8.95**	**0.003**
Carcharhinidae	*Carcharhinus obscurus*	0 ± 0	0.03 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	3135.06 ± 2295.74	0 ± 0	0.00	1.000
Carcharhinidae	*Triaenodon obesus*	0 ± 0	0.11 ± 0.04	0.04 ± 0.03	0.91	0.385	0 ± 0	1787.64 ± 663.17	650.05 ± 449.55	0.91	0.385
Chaetodontidae	*Chaetodon auriga*	0.06 ± 0.05	0.08 ± 0.04	0.03 ± 0.03	0.44	0.560	3.28 ± 2.4	4.01 ± 1.9	1.46 ± 1.46	0.44	0.567
Chaetodontidae	*Chaetodon baronessa*	**0.35 ± 0.1**	**0.01 ± 0.01**	**0 ± 0**	**16.78**	**<0.001**	**19.68 ± 5.68**	**0.59 ± 0.59**	**0 ± 0**	**16.78**	**<0.001**
Chaetodontidae	*Chaetodon bennetti*	0 ± 0	0.01 ± 0.0	0 ± 0	0.00	1.000	0 ± 0	0.71 ± 0.71	0 ± 0	0.00	1.000

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Chaetodontidae	*Chaetodon citrinellus*	**0.18 ± 0.08**	**0 ± 0**	**0 ± 0**	**7.33**	**0.005**	**6.34 ± 2.84**	**0 ± 0**	**0 ± 0**	**7.33**	**0.005**
Chaetodontidae	*Chaetodon ephippium*	**0.26 ± 0.1**	**0.1 ± 0.06**	**0 ± 0**	**7.38**	**0.004**	**12.77 ± 5.01**	**4.83 ± 2.9**	**0 ± 0**	**7.38**	**0.006**
Chaetodontidae	*Chaetodon kleinii*	1.03 ± 0.25	0.8 ± 0.17	0.51 ± 0.18	3.29	0.074	58.24 ± 14.43	45.45 ± 9.8	28.73 ± 9.92	3.29	0.068
Chaetodontidae	*Chaetodon lineolatus*	**0.28 ± 0.09**	**0.07 ± 0.05**	**0 ± 0**	**11.08**	**0.001**	**51.59 ± 16.94**	**13.54 ± 8.61**	**0 ± 0**	**11.08**	**<0.001**
Chaetodontidae	*Chaetodon lunula*	**0.17 ± 0.06**	**0.05 ± 0.03**	**0 ± 0**	**9.42**	**0.003**	**11.76 ± 4.1**	**3.29 ± 2.3**	**0 ± 0**	**9.42**	**0.002**
Chaetodontidae	*Chaetodon lunulatus*	**0.48 ± 0.11**	**0.02 ± 0.02**	**0 ± 0**	**25.64**	**<0.001**	**32.46 ± 7.36**	**1.41 ± 1.41**	**0 ± 0**	**25.64**	**<0.001**
Chaetodontidae	*Chaetodon melannotus*	0.03 ± 0.03	0.04 ± 0.03	0 ± 0	0.72	0.508	1.69 ± 1.69	2.53 ± 1.75	0 ± 0	0.72	0.527
Chaetodontidae	*Chaetodon meyeri*	0.04 ± 0.04	0.04 ± 0.04	0 ± 0	0.76	0.669	2.82 ± 2.82	2.82 ± 2.82	0 ± 0	0.76	0.667
Chaetodontidae	*Chaetodon ocellicaudus*	0.01 ± 0.01	0.09 ± 0.08	0 ± 0	0.04	0.811	0.94 ± 0.94	6.35 ± 5.66	0 ± 0	0.04	0.809
Chaetodontidae	*Chaetodon octofasciatus*	0.09 ± 0.05	0.03 ± 0.02	0 ± 0	3.82	0.060	8.77 ± 5.06	3.04 ± 2.22	0 ± 0	3.82	0.063
Chaetodontidae	*Chaetodon ornatissimus*	0.04 ± 0.04	0.08 ± 0.04	0 ± 0	0.84	0.426	2.82 ± 2.82	5.17 ± 2.45	0 ± 0	0.84	0.402
Chaetodontidae	*Chaetodon oxycephalus*	0.11 ± 0.06	0.04 ± 0.03	0.04 ± 0.04	1.13	0.321	10.8 ± 6.06	4.05 ± 2.8	4.05 ± 4.05	1.13	0.340
Chaetodontidae	*Chaetodon punctatofasciatus*	0.03 ± 0.03	0 ± 0	0 ± 0	1.51	0.664	2.7 ± 2.7	0 ± 0	0 ± 0	1.51	0.665
Chaetodontidae	*Chaetodon rafflesii*	**0.5 ± 0.13**	**0 ± 0**	**0 ± 0**	**19.48**	**<0.001**	**33.87 ± 9.02**	**0 ± 0**	**0 ± 0**	**19.48**	**<0.001**
Chaetodontidae	*Chaetodon selene*	0 ± 0	0 ± 0	0.04 ± 0.04	1.51	0.665	0 ± 0	0 ± 0	19.95 ± 19.95	1.51	0.667
Chaetodontidae	*Chaetodon semeion*	**0.16 ± 0.07**	**0 ± 0**	**0 ± 0**	**7.52**	**0.002**	**10.82 ± 4.78**	**0 ± 0**	**0 ± 0**	**7.52**	**0.002**
Chaetodontidae	*Chaetodon speculum*	**0.22 ±**	**0.04 ±**	**0 ± 0**	**10.47**	**0.001**	**15.05 ± 5.34**	**2.82 ± 1.95**	**0 ± 0**	**10.47**	**0.002**

		0.08	**0.03**								
Chaetodontidae	*Chaetodon trifascialis*	**0.32 ± 0.09**	**0 ± 0**	**0 ± 0**	**18.31**	**<0.001**	**15.85 ± 4.36**	**0 ± 0**	**0 ± 0**	**18.31**	**<0.001**
Chaetodontidae	*Chaetodon ulietensis*	0.1 ± 0.07	0.1 ± 0.06	0.01 ± 0.01	1.37	0.285	7.06 ± 4.99	6.59 ± 3.96	0.94 ± 0.94	1.37	0.292
Chaetodontidae	*Chaetodon unimaculatus*	0.04 ± 0.04	0.02 ± 0.02	0 ± 0	1.22	0.434	2.82 ± 2.82	1.41 ± 1.41	0 ± 0	1.22	0.439
Chaetodontidae	*Chaetodon vagabundus*	**0.63 ± 0.14**	**0.18 ± 0.09**	**0.1 ± 0.07**	**11.96**	**0.001**	**42.34 ± 9.5**	**12.47 ± 6.25**	**7.06 ± 4.99**	**11.96**	**0.001**
Chaetodontidae	*Chelmon muelleri*	0 ± 0	0 ± 0	0.02 ± 0.02	1.51	0.672	0 ± 0	0 ± 0	2.08 ± 2.08	1.51	0.661
Chaetodontidae	*Chelmon rostratus*	0.04 ± 0.04	0 ± 0	0 ± 0	1.51	0.660	4.17 ± 4.17	0 ± 0	0 ± 0	1.51	0.661
Chaetodontidae	*Coradion altivelis*	0.01 ± 0.01	0.11 ± 0.05	0.08 ± 0.05	1.29	0.293	0.97 ± 0.97	7.78 ± 3.83	5.84 ± 3.44	1.29	0.282
Chaetodontidae	*Coradion chrysozonus*	0.03 ± 0.02	0.27 ± 0.11	0.1 ± 0.06	0.49	0.538	1.95 ± 1.35	18.97 ± 7.91	7.3 ± 4.21	0.49	0.521
Chaetodontidae	*Coradion melanopus*	0.02 ± 0.02	0 ± 0	0.02 ± 0.02	0.00	1.000	1.46 ± 1.46	0 ± 0	1.46 ± 1.46	0.00	1.000
Chaetodontidae	*Forcipiger flavissimus*	0 ± 0	0.07 ± 0.04	0 ± 0	0.00	1.000	0 ± 0	2.46 ± 1.19	0 ± 0	0.00	1.000
Chaetodontidae	*Forcipiger longirostris*	0.02 ± 0.02	0.17 ± 0.07	0 ± 0	0.10	0.800	0.78 ± 0.78	6.51 ± 2.75	0 ± 0	0.10	0.797
Chaetodontidae	*Hemitaurichthys polylepis*	0 ± 0	0.17 ± 0.17	0 ± 0	0.00	1.000	0 ± 0	8.95 ± 8.95	0 ± 0	0.00	1.000
Chaetodontidae	*Heniochus acuminatus*	0 ± 0	0.06 ± 0.06	0.02 ± 0.02	0.15	0.894	0 ± 0	3.86 ± 3.86	1.29 ± 1.29	0.15	0.886
Chaetodontidae	*Heniochus chrysostomus*	0.03 ± 0.02	0.03 ± 0.03	0 ± 0	1.33	0.362	4.2 ± 2.97	3.36 ± 3.36	0 ± 0	1.33	0.367
Chaetodontidae	*Heniochus monoceros*	0 ± 0	0.06 ± 0.05	0 ± 0	0.00	1.000	0 ± 0	6.51 ± 4.77	0 ± 0	0.00	1.000
Chaetodontidae	*Heniochus singularius*	0.12 ±	0.04 ±	0 ± 0	3.92	0.061	11.68 ± 6	4.12 ± 4.12	0 ± 0	3.92	0.063

		0.06	0.04								
Chaetodontidae	*Heniochus varius*	**0.23 ± 0.09**	**0.09 ± 0.06**	**0 ± 0**	**7.47**	**0.009**	**6.23 ± 2.33**	**2.55 ± 1.57**	**0 ± 0**	**7.47**	**0.006**
Chaetodontidae	*Parachaetodon ocellatus*	0 ± 0	0.06 ± 0.04	0 ± 0	0.00	1.000	0 ± 0	4.7 ± 3.67	0 ± 0	0.00	1.000
Chanidae	*Chanos chanos*	0.1 ± 0.1	0 ± 0	0 ± 0	1.51	0.662	1088.94 ± 1088.94	0 ± 0	0 ± 0	1.51	0.665
Cirrhitidae	*Cirrhitichthys aprinus*	0 ± 0	0.02 ± 0.02	0.04 ± 0.04	1.22	0.448	0 ± 0	3.04 ± 3.04	6.07 ± 6.07	1.22	0.439
Cirrhitidae	*Cirrhitichthys falco*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.14 ± 0.14	0 ± 0	0.00	1.000
Cirrhitidae	*Paracirrhites forsteri*	**0.1 ± 0.04**	**0 ± 0**	**0 ± 0**	**8.82**	**0.006**	**3.94 ± 1.6**	**0 ± 0**	**0 ± 0**	**8.82**	**0.007**
Dasyatididae	*Pastinachus sephen*	0 ± 0	0 ± 0	0.03 ± 0.02	3.01	0.218	0 ± 0	0 ± 0	253.13 ± 178.83	3.01	0.213
Dasyatididae	*Taeniura lymma*	0 ± 0	0.03 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	37.72 ± 26.65	0 ± 0	0.00	1.000
Diodontidae	*Diodon hystrix*	0.03 ± 0.02	0.02 ± 0.02	0 ± 0	1.77	0.290	59.97 ± 42.37	35.98 ± 35.98	0 ± 0	1.77	0.294
Echeneidae	*Echeneis naucrates*	0.11 ± 0.07	0.09 ± 0.04	0.02 ± 0.02	2.00	0.172	109.81 ± 65.52	85.79 ± 36.25	20.59 ± 20.59	2.00	0.174
Ephippidae	*Platax batavianus*	0 ± 0	0.02 ± 0.02	0.01 ± 0.01	0.46	0.669	0 ± 0	21.96 ± 21.96	14.64 ± 14.64	0.46	0.670
Ephippidae	*Platax boersii*	0.03 ± 0.03	0.24 ± 0.12	0.04 ± 0.03	0.02	0.915	37.15 ± 37.15	320.4 ± 165.32	55.72 ± 38.54	0.02	0.918
Ephippidae	*Platax orbicularis*	0.11 ± 0.11	0.09 ± 0.07	0.43 ± 0.42	0.81	0.542	148.59 ± 148.59	125.38 ± 100.24	575.8 ± 556.73	0.81	0.540
Ephippidae	*Platax pinnatus*	0.01 ± 0.01	0 ± 0	0 ± 0	1.51	0.663	12.44 ± 12.44	0 ± 0	0 ± 0	1.51	0.668
Fistulariidae	*Fistularia commersonii*	0.1 ± 0.05	0.08 ± 0.04	0.06 ± 0.03	0.58	0.485	52.5 ± 24.78	45 ± 20.98	30 ± 16.84	0.58	0.489
Gerreidae	*Gerres erythrourus*	0 ± 0	0 ± 0	0.02 ± 0.0	1.51	0.670	0 ± 0	0 ± 0	7.73 ± 7.73	1.51	0.666

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Ginglymostomatidae	*Nebrius ferrugineus*	0.04 ± 0.03	0.02 ± 0.02	0 ± 0	2.09	0.293	2072.79 ± 1433.47	1036.4 ± 1036.4	0 ± 0	2.09	0.286
Gobiidae	*Amblyeleotris steinitzi*	0 ± 0	0.04 ± 0.04	0 ± 0	0.00	1.000	0 ± 0	0.2 ± 0.2	0 ± 0	0.00	1.000
Gobiidae	*Valenciennea strigata*	0.02 ± 0.02	0.02 ± 0.02	0 ± 0	0.76	0.669	1.59 ± 1.59	1.59 ± 1.59	0 ± 0	0.76	0.664
Gobiidae	*Valenciennea wardii*	0 ± 0	0 ± 0	0.02 ± 0.02	1.51	0.660	0 ± 0	0 ± 0	1.59 ± 1.59	1.51	0.658
Haemulidae	*Diagramma pictum*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.659	5.45 ± 5.45	0 ± 0	0 ± 0	1.51	0.670
Haemulidae	*Plectorhinchus albovittatus*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.665	156.88 ± 156.88	0 ± 0	0 ± 0	1.51	0.661
Haemulidae	*Plectorhinchus gibbosus*	0 ± 0	0.04 ± 0.03	0 ± 0	0.00	1.000	0 ± 0	84.21 ± 58.23	0 ± 0	0.00	1.000
Haemulidae	*Plectorhinchus lessonii*	0.04 ± 0.03	0 ± 0	0 ± 0	3.13	0.222	24.16 ± 16.71	0 ± 0	0 ± 0	3.13	0.209
Haemulidae	*Plectorhinchus lineatus*	0.04 ± 0.04	0.08 ± 0.08	0.01 ± 0.01	0.13	0.892	54.03 ± 54.03	108.07 ± 108.07	18.01 ± 18.01	0.13	0.891
Haemulidae	*Plectorhinchus polytaenia*	0.02 ± 0.02	0.09 ± 0.06	0.02 ± 0.02	0.00	1.000	15.11 ± 15.11	68 ± 42.01	15.11 ± 15.11	0.00	1.000
Haemulidae	*Plectorhinchus schotaf*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	84.02 ± 84.02	0 ± 0	0.00	1.000
Hemiscylliidae	*Chiloscyllium punctatum*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	164.69 ± 164.69	0 ± 0	0.00	1.000
Holocentridae	*Myripristis berndti*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	2.25 ± 2.25	0 ± 0	0.00	1.000
Holocentridae	*Myripristis botche*	0.07 ± 0.05	0.04 ± 0.04	0 ± 0	1.77	0.297	8.6 ± 6.08	5.16 ± 5.16	0 ± 0	1.77	0.288
Holocentridae	*Sargocentron caudimaculatum*	0.06 ± 0.05	0.02 ± 0.02	0 ± 0	2.35	0.214	19.15 ± 14.02	6.38 ± 6.38	0 ± 0	2.35	0.214
Holocentridae	*Sargocentron violaceum*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.661	4.33 ± 4.33	0 ± 0	0 ± 0	1.51	0.666

Kyphosidae	*Kyphosus bigibbus*	0.46 ± 0.46	0 ± 0	0 ± 0	1.51	0.668	17.62 ± 17.62	0 ± 0	0 ± 0	1.51	0.670
Kyphosidae	*Kyphosus cinerascens*	0.76 ± 0.73	0 ± 0	0 ± 0	1.66	0.070	1252.64 ± 1193.9	0 ± 0	0 ± 0	1.66	0.070
Kyphosidae	*Kyphosus vaigiensis*	1.26 ± 1.19	0 ± 0	0 ± 0	1.69	0.219	486.9 ± 459.62	0 ± 0	0 ± 0	1.69	0.220
Labridae	*Anampses caeruleopunctatus*	0.02 ± 0.02	0.06 ± 0.03	0 ± 0	0.39	0.761	0.59 ± 0.59	1.78 ± 0.98	0 ± 0	0.39	0.756
Labridae	*Anampses geographicus*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.671	0.59 ± 0.59	0 ± 0	0 ± 0	1.51	0.669
Labridae	*Anampses meleagrides*	0.09 ± 0.07	0.08 ± 0.07	0 ± 0	1.41	0.288	2.57 ± 1.91	2.37 ± 1.85	0 ± 0	1.41	0.289
Labridae	*Anampses neoguinaicus*	0.06 ± 0.03	0.02 ± 0.02	0.04 ± 0.04	0.09	0.835	10.37 ± 5.82	3.89 ± 3.89	7.78 ± 7.78	0.09	0.754
Labridae	*Bodianus axillaris*	0.06 ± 0.03	0.02 ± 0.02	0 ± 0	3.66	0.117	2.45 ± 1.35	0.82 ± 0.82	0 ± 0	3.66	0.116
Labridae	*Bodianus bilunulatus*	0.02 ± 0.02	0.01 ± 0.01	0 ± 0	1.22	0.439	10.91 ± 10.91	5.45 ± 5.45	0 ± 0	1.22	0.439
Labridae	*Bodianus bimaculatus*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	9.79 ± 9.79	0 ± 0	0.00	1.000
Labridae	*Bodianus diana*	0.01 ± 0.01	0.13 ± 0.05	0 ± 0	0.08	0.844	0.54 ± 0.54	4.89 ± 2.12	0 ± 0	0.08	0.816
Labridae	*Bodianus dictynna*	0.02 ± 0.02	0.16 ± 0.06	0 ± 0	0.14	0.765	14.68 ± 14.68	110.13 ± 42.18	0 ± 0	0.14	0.724
Labridae	*Bodianus mesothorax*	0.08 ± 0.05	0.09 ± 0.04	0 ± 0	2.77	0.107	3.26 ± 1.92	3.4 ± 1.44	0 ± 0	2.77	0.104
Labridae	*Cheilinus chlorourus*	0.02 ± 0.02	0.02 ± 0.02	0 ± 0	0.76	0.671	22.36 ± 22.36	22.36 ± 22.36	0 ± 0	0.76	0.670
Labridae	*Cheilinus fasciatus*	0.15 ± 0.05	0.21 ± 0.08	0 ± 0	3.88	0.058	50.13 ± 15.54	71.62 ± 26.09	0 ± 0	3.88	0.057
Labridae	*Cheilinus trilobatus*	0.05 ± 0.03	0.06 ± 0.03	0 ± 0	2.05	0.190	19.35 ± 10.92	22.11 ± 12.42	0 ± 0	2.05	0.199

Labridae	*Cheilinus undulatus*	0.1 ± 0.07	0.04 ± 0.03	0.06 ± 0.03	0.40	0.672	85.07 ± 54.85	34.03 ± 23.53	51.04 ± 28.16	0.40	0.574
Labridae	*Cheilio inermis*	0.04 ± 0.03	0.09 ± 0.04	0.02 ± 0.02	0.23	0.697	7.79 ± 5.71	16.88 ± 7.01	3.9 ± 3.9	0.23	0.695
Labridae	*Choerodon anchorago*	**0.17 ± 0.05**	**0.01 ± 0.01**	**0 ± 0**	**12.61**	**0.001**	**45.9 ± 15.13**	**3.83 ± 3.83**	**0 ± 0**	**12.61**	**<0.001**
Labridae	*Choerodon jordani*	**0 ± 0**	**0 ± 0**	**0.24 ± 0.15**	**4.07**	**0.002**	**0 ± 0**	**0 ± 0**	**66.94 ± 40.51**	**4.07**	**0.001**
Labridae	*Choerodon monostigma*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	5.74 ± 5.74	0 ± 0	0.00	1.000
Labridae	*Choerodon schoenleinii*	0.03 ± 0.02	0 ± 0	0 ± 0	3.01	0.216	9.26 ± 6.54	0 ± 0	0 ± 0	3.01	0.220
Labridae	*Choerodon zamboangae*	0 ± 0	0.04 ± 0.04	0.11 ± 0.07	2.87	0.117	0 ± 0	11.48 ± 11.48	30.6 ± 19.08	2.87	0.093
Labridae	*Choerodon zosterophorus*	0 ± 0	0.31 ± 0.13	0.04 ± 0.03	0.13	0.762	0 ± 0	84.15 ± 35.56	11.48 ± 7.94	0.13	0.719
Labridae	*Cirrhilabrus beauperryi*	0 ± 0	0.33 ± 0.31	0 ± 0	0.00	1.000	0 ± 0	1.01 ± 0.96	0 ± 0	0.00	1.000
Labridae	*Cirrhilabrus condei*	0 ± 0	0 ± 0	0.29 ± 0.29	1.51	0.665	0 ± 0	0 ± 0	0.9 ± 0.9	1.51	0.672
Labridae	*Cirrhilabrus cyanopleura*	0.1 ± 0.1	0.29 ± 0.29	0 ± 0	0.17	0.895	0.73 ± 0.73	2.06 ± 2.06	0 ± 0	0.17	0.896
Labridae	*Cirrhilabrus exquisitus*	0 ± 0	0.1 ± 0.1	0 ± 0	0.00	1.000	0 ± 0	0.73 ± 0.73	0 ± 0	0.00	1.000
Labridae	*Cirrhilabrus flavidorsalis*	0.96 ± 0.84	0 ± 0	0 ± 0	1.97	0.220	2.95 ± 2.58	0 ± 0	0 ± 0	1.97	0.223
Labridae	*Cirrhilabrus lubbocki*	0.42 ± 0.42	0 ± 0	0 ± 0	1.51	0.666	1.28 ± 1.28	0 ± 0	0 ± 0	1.51	0.671
Labridae	*Cirrhilabrus tonozukai*	0.15 ± 0.15	0 ± 0	0 ± 0	1.51	0.671	0.45 ± 0.45	0 ± 0	0 ± 0	1.51	0.668
Labridae	*Coris batuensis*	0.01 ± 0.01	0.07 ± 0.03	0 ± 0	0.21	0.751	0.39 ± 0.39	1.93 ± 0.92	0 ± 0	0.21	0.748
Labridae	*Coris dorsomacula*	0 ± 0	0 ± 0	0.02 ± 0.0	1.51	0.662	0 ± 0	0 ± 0	2.43 ± 2.43	1.51	0.664

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Labridae	*Coris gaimard*	0.02 ± 0.02	0.04 ± 0.03	0.01 ± 0.01	0.05	0.864	1.21 ± 1.21	2.22 ± 1.7	0.81 ± 0.81	0.05	0.863
Labridae	*Coris pictoides*	0.68 ± 0.36	1.18 ± 0.64	0.69 ± 0.29	0.00	0.997	79.24 ± 42.2	137.46 ± 74.72	80.05 ± 33.98	0.00	0.995
Labridae	*Diproctacanthus xanthurus*	**0.92 ± 0.36**	**0.15 ± 0.08**	**0.05 ± 0.03**	**8.44**	**<0.001**	**3.66 ± 1.42**	**0.61 ± 0.3**	**0.19 ± 0.13**	**8.44**	**0.001**
Labridae	*Epibulus brevis*	0.06 ± 0.05	0.02 ± 0.02	0 ± 0	2.35	0.226	12.38 ± 9.07	4.13 ± 4.13	0 ± 0	2.35	0.210
Labridae	*Epibulus insidiator*	0.01 ± 0.01	0 ± 0	0 ± 0	1.51	0.665	2.45 ± 2.45	0 ± 0	0 ± 0	1.51	0.663
Labridae	*Gomphosus varius*	0.2 ± 0.09	0.13 ± 0.09	0 ± 0	4.00	0.050	**3.48 ± 1.54**	**2.16 ± 1.49**	**0 ± 0**	**4.00**	**0.046**
Labridae	*Halichoeres bicolor*	0.52 ± 0.38	0.1 ± 0.07	0.04 ± 0.03	2.32	0.094	70.04 ± 51.11	13.07 ± 8.84	5.6 ± 3.87	2.32	0.092
Labridae	*Halichoeres biocellatus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.13 ± 0.13	0 ± 0	0.00	1.000
Labridae	*Halichoeres chloropterus*	0.12 ± 0.05	0.04 ± 0.04	0.01 ± 0.01	3.50	0.075	12.18 ± 5.43	4.3 ± 4.3	1.43 ± 1.43	3.50	0.058
Labridae	*Halichoeres chrysus*	0.02 ± 0.02	0.74 ± 0.29	0.03 ± 0.03	0.00	0.991	0.12 ± 0.12	4.21 ± 1.66	0.16 ± 0.16	0.00	0.982
Labridae	*Halichoeres hortulanus*	**0.23 ± 0.06**	**0.09 ± 0.07**	**0 ± 0**	**9.89**	**0.001**	**6.4 ± 1.72**	**2.62 ± 1.82**	**0 ± 0**	**9.89**	**0.001**
Labridae	*Halichoeres margaritaceus*	0.06 ± 0.06	0 ± 0	0 ± 0	1.51	0.667	6.71 ± 6.71	0 ± 0	0 ± 0	1.51	0.658
Labridae	*Halichoeres marginatus*	0.04 ± 0.03	0 ± 0	0 ± 0	3.13	0.219	1.23 ± 0.85	0 ± 0	0 ± 0	3.13	0.222
Labridae	*Halichoeres melanochir*	0.01 ± 0.01	0.02 ± 0.02	0.02 ± 0.02	0.07	0.885	1.87 ± 1.87	2.8 ± 2.8	2.8 ± 2.8	0.07	0.886
Labridae	*Halichoeres melanurus*	**0.13 ± 0.05**	**0 ± 0**	**0 ± 0**	**10.56**	**0.002**	**1.35 ± 0.5**	**0 ± 0**	**0 ± 0**	**10.56**	**0.002**
Labridae	*Halichoeres melasmapomus*	0.01 ± 0.01	0 ± 0	0 ± 0	1.51	0.669	1.87 ± 1.87	0 ± 0	0 ± 0	1.51	0.676
Labridae	*Halichoeres miniatus*	0.04 ±	0 ± 0	0 ± 0	1.51	0.661	5.6 ± 5.6	0 ± 0	0 ± 0	1.51	0.671

		0.04									
Labridae	*Halichoeres nigrescens*	0.01 ± 0.01	0.02 ± 0.02	0 ± 0	0.46	0.660	1.87 ± 1.87	2.8 ± 2.8	0 ± 0	0.46	0.666
Labridae	*Halichoeres papilionaceus*	0.03 ± 0.02	0 ± 0	0 ± 0	3.01	0.223	4.67 ± 3.3	0 ± 0	0 ± 0	3.01	0.216
Labridae	***Halichoeres podostigma***	**0.12 ± 0.07**	**0 ± 0**	**0 ± 0**	**4.53**	**0.021**	**15.88 ± 9.1**	**0 ± 0**	**0 ± 0**	**4.53**	**0.023**
Labridae	*Halichoeres prosopeion*	0.06 ± 0.03	0.38 ± 0.12	0.03 ± 0.02	0.06	0.845	1.68 ± 0.8	10.09 ± 3.28	0.93 ± 0.66	0.06	0.804
Labridae	*Halichoeres richmondi*	0.06 ± 0.05	0 ± 0	0 ± 0	2.80	0.222	0.36 ± 0.26	0 ± 0	0 ± 0	2.80	0.221
Labridae	*Halichoeres scapularis*	0.16 ± 0.11	0 ± 0	0.08 ± 0.07	0.56	0.526	25.81 ± 17.19	0 ± 0	13.47 ± 10.51	0.56	0.523
Labridae	***Halichoeres solorensis***	**0.76 ± 0.68**	**0.03 ± 0.02**	**0 ± 0**	**1.91**	**0.037**	**20.56 ± 18.29**	**0.93 ± 0.66**	**0 ± 0**	**1.91**	**0.038**
Labridae	*Halichoeres trimaculatus*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.663	0.56 ± 0.56	0 ± 0	0 ± 0	1.51	0.669
Labridae	*Hemigymnus fasciatus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	4.2 ± 4.2	0 ± 0	0.00	1.000
Labridae	***Hemigymnus melapterus***	**0.46 ± 0.15**	**0.11 ± 0.05**	**0 ± 0**	**12.43**	**<0.001**	**171.81 ± 56.57**	**40.35 ± 18.85**	**0 ± 0**	**12.43**	**<0.001**
Labridae	***Hologymnosus annulatus***	**0.32 ± 0.16**	**0.07 ± 0.05**	**0 ± 0**	**5.77**	**0.003**	**29.02 ± 14.23**	**6.62 ± 4.21**	**0 ± 0**	**5.77**	**0.003**
Labridae	*Hologymnosus doliatus*	0.02 ± 0.02	0.06 ± 0.05	0 ± 0	0.25	0.821	4.04 ± 4.04	12.12 ± 8.87	0 ± 0	0.25	0.671
Labridae	*Iniistius aneitensis*	0.02 ± 0.02	0 ± 0	0.17 ± 0.09	3.79	0.075	4.55 ± 4.55	0 ± 0	36.36 ± 19.33	3.79	0.072
Labridae	*Iniistius twistii*	0 ± 0	0 ± 0	0.02 ± 0.02	1.51	0.657	0 ± 0	0 ± 0	4.55 ± 4.55	1.51	0.671
Labridae	*Labrichthys unilineatus*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.660	0.66 ± 0.66	0 ± 0	0 ± 0	1.51	0.663
Labridae	*Labroides bicolor*	0.08 ± 0.04	0.03 ± 0.02	0.02 ± 0.02	2.07	0.171	0.26 ± 0.12	0.1 ± 0.08	0.07 ± 0.07	2.07	0.164
Labridae	***Labroides dimidiatus***	**1 ± 0.26**	**0.71 ±**	**0.25 ±**	**8.57**	**0.002**	**3.34 ± 0.85**	**2.37 ± 0.55**	**0.84 ± 0.28**	**8.57**	**0.003**

			0.16	**0.09**							
Labridae	*Labroides pectoralis*	0.06 ± 0.05	0.01 ± 0.01	0 ± 0	2.59	0.144	0.21 ± 0.15	0.05 ± 0.05	0 ± 0	2.59	0.139
Labridae	*Labropsis manabei*	0.04 ± 0.04	0 ± 0	0.02 ± 0.02	0.30	0.895	0.13 ± 0.13	0 ± 0	0.07 ± 0.07	0.30	0.898
Labridae	*Leptojulis cyanopleura*	0.18 ± 0.12	0 ± 0	0 ± 0	3.67	0.067	39.39 ± 25.14	0 ± 0	0 ± 0	3.67	0.071
Labridae	*Macropharyngodon negrosensis*	0.02 ± 0.02	0.15 ± 0.11	0 ± 0	0.05	0.911	4.94 ± 4.94	34.6 ± 25.22	0 ± 0	0.05	0.912
Labridae	*Novaculichthys taeniourus*	0 ± 0	0.06 ± 0.04	0 ± 0	0.00	1.000	0 ± 0	19.73 ± 15.4	0 ± 0	0.00	1.000
Labridae	*Oxycheilinus arenatus*	0.03 ± 0.02	0 ± 0	0 ± 0	3.01	0.211	8.98 ± 6.34	0 ± 0	0 ± 0	3.01	0.223
Labridae	*Oxycheilinus celebicus*	0.04 ± 0.04	0.15 ± 0.13	0.02 ± 0.02	0.04	0.940	2.73 ± 2.73	9.54 ± 8.23	1.36 ± 1.36	0.04	0.938
Labridae	*Oxycheilinus digramma*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.673	1.62 ± 1.62	0 ± 0	0 ± 0	1.51	0.670
Labridae	*Oxycheilinus orientalis*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	3.1 ± 3.1	0 ± 0	0.00	1.000
Labridae	*Oxycheilinus unifasciatus*	0.06 ± 0.03	0.17 ± 0.11	0.01 ± 0.01	0.27	0.705	5.65 ± 3.12	15.7 ± 9.62	1.26 ± 1.26	0.27	0.694
Labridae	*Paracheilinus filamentosus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	4.55 ± 4.55	0 ± 0	0.00	1.000
Labridae	*Paracheilinus walton*	0.04 ± 0.04	0 ± 0	0 ± 0	1.51	0.671	9.09 ± 9.09	0 ± 0	0 ± 0	1.51	0.662
Labridae	*Pseudocoris heteroptera*	1.03 ± 0.83	0.17 ± 0.08	0.06 ± 0.04	2.07	0.075	59.04 ± 47.54	9.51 ± 4.43	3.17 ± 2.47	2.07	0.072
Labridae	*Pseudocoris yamashiroi*	0.65 ± 0.48	0.31 ± 0.27	0 ± 0	2.11	0.193	37.25 ± 27.53	17.83 ± 15.53	0 ± 0	2.11	0.193
Labridae	*Pseudodax moluccanus*	0.02 ± 0.02	0.04 ± 0.03	0 ± 0	0.51	0.733	4.55 ± 4.55	9.09 ± 6.29	0 ± 0	0.51	0.733
Labridae	*Pseudojuloides cerasinus*	0.02 ± 0.02	0 ± 0	0.01 ± 0.01	0.12	0.891	4.55 ± 4.55	0 ± 0	3.03 ± 3.03	0.12	0.890

Labridae	*Stethojulis bandanensis*	0 ± 0	0.22 ± 0.15	0.06 ± 0.06	0.21	0.740	0 ± 0	44.75 ± 31.21	12.59 ± 12.59	0.21	0.742
Labridae	*Stethojulis interrupta*	0.06 ± 0.06	0 ± 0	0 ± 0	1.51	0.659	7.33 ± 7.33	0 ± 0	0 ± 0	1.51	0.664
Labridae	*Stethojulis strigiventer*	0.02 ± 0.02	0.26 ± 0.23	0 ± 0	0.01	0.885	3.64 ± 3.64	44.91 ± 40.13	0 ± 0	0.01	0.890
Labridae	*Thalassoma amblycephalum*	0.76 ± 0.34	0.22 ± 0.17	0.35 ± 0.31	1.04	0.328	3.05 ± 1.37	0.88 ± 0.69	1.4 ± 1.26	1.04	0.329
Labridae	*Thalassoma hardwicke*	**1.94 ± 0.36**	**0.01 ± 0.01**	**0 ± 0**	**37.24**	**<0.001**	**60.29 ± 11.08**	**0.43 ± 0.43**	**0 ± 0**	**37.24**	**<0.001**
Labridae	*Thalassoma jansenii*	0.08 ± 0.05	0.04 ± 0.04	0 ± 0	2.55	0.186	4.08 ± 2.4	2.04 ± 2.04	0 ± 0	2.55	0.191
Labridae	*Thalassoma lunare*	**2.83 ± 0.6**	**0.32 ± 0.12**	**0 ± 0**	**29.70**	**<0.001**	**71.47 ± 15.19**	**8.15 ± 3**	**0 ± 0**	**29.70**	**<0.001**
Lethrinidae	*Gnathodentex aureolineatus*	0.15 ± 0.15	0 ± 0	0.1 ± 0.07	0.12	0.823	74.78 ± 74.78	0 ± 0	50.99 ± 36.02	0.12	0.813
Lethrinidae	*Gymnocranius elongatus*	0 ± 0	0 ± 0	0.02 ± 0.02	1.51	0.670	0 ± 0	0 ± 0	4.92 ± 4.92	1.51	0.662
Lethrinidae	*Gymnocranius grandoculis*	0.02 ± 0.02	0.13 ± 0.09	0.17 ± 0.09	2.31	0.138	82.55 ± 82.55	495.29 ± 337.29	687.9 ± 347.63	2.31	0.132
Lethrinidae	*Lethrinus amboinensis*	**0.01 ± 0.01**	**0.16 ± 0.08**	**0.53 ± 0.2**	**8.54**	**0.003**	**20.75 ± 20.75**	**233.48 ± 114.24**	**788.66 ± 301.19**	**8.54**	**0.002**
Lethrinidae	*Lethrinus atkinsoni*	0.01 ± 0.01	0.05 ± 0.03	0.14 ± 0.11	1.90	0.196	11.41 ± 11.41	39.93 ± 27.92	114.1 ± 86.7	1.90	0.188
Lethrinidae	*Lethrinus erythracanthus*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	29.61 ± 29.61	0 ± 0	0.00	1.000
Lethrinidae	*Lethrinus erythropterus*	0.02 ± 0.02	0 ± 0	0.02 ± 0.02	0.00	1.000	10.58 ± 10.58	0 ± 0	10.58 ± 10.58	0.00	1.000
Lethrinidae	*Lethrinus harak*	0.42 ± 0.14	0.11 ± 0.07	0.47 ± 0.35	0.02	0.913	145.53 ± 49.18	38.81 ± 25.67	162.51 ± 120.87	0.02	0.902
Lethrinidae	*Lethrinus laticaudis*	0 ± 0	0 ± 0	0.08 ± 0.0	1.51	0.667	0 ± 0	0 ± 0	84.75 ± 84.75	1.51	0.672

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Lethrinidae	*Lethrinus lentjan*	**0 ± 0**	**0 ± 0**	**0.15 ± 0.08**	**5.37**	**0.020**	**0 ± 0**	**0 ± 0**	**198.36 ± 104.2**	**5.37**	**0.023**
Lethrinidae	*Lethrinus microdon*	0 ± 0	0.18 ± 0.05	0.17 ± 0.09	3.68	0.058	0 ± 0	169.83 ± 46.72	159.84 ± 90.25	3.68	0.053
Lethrinidae	*Lethrinus nebulosus*	0 ± 0	0.14 ± 0.06	0.16 ± 0.09	3.47	0.060	0 ± 0	900.69 ± 387.38	1062.35 ± 583.54	3.47	0.062
Lethrinidae	*Lethrinus obsoletus*	**0.02 ± 0.02**	**0.28 ± 0.12**	**0.35 ± 0.14**	**4.47**	**0.036**	**13.59 ± 13.59**	**183.46 ± 80.53**	**226.49 ± 92.99**	**4.47**	**0.034**
Lethrinidae	*Lethrinus olivaceus*	0.06 ± 0.03	0.17 ± 0.08	0.1 ± 0.05	0.18	0.708	63.57 ± 35.07	169.51 ± 79.03	98.88 ± 50.93	0.18	0.686
Lethrinidae	*Lethrinus ornatus*	0 ± 0	0.03 ± 0.02	0.17 ± 0.15	1.91	0.162	0 ± 0	17.63 ± 12.45	84.61 ± 74.33	1.91	0.167
Lethrinidae	*Lethrinus ravus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	28.84 ± 28.84	0 ± 0	0.00	1.000
Lethrinidae	*Lethrinus rubrioperculatus*	0 ± 0	0 ± 0	0.11 ± 0.11	1.51	0.657	0 ± 0	0 ± 0	72.48 ± 72.48	1.51	0.666
Lethrinidae	*Lethrinus semicinctus*	0.12 ± 0.07	0.77 ± 0.46	0.88 ± 0.3	2.87	0.091	69.84 ± 40.02	456.02 ± 271.64	521.76 ± 178.99	2.87	0.087
Lethrinidae	*Lethrinus variegatus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	28.84 ± 28.84	0 ± 0	0.00	1.000
Lethrinidae	*Monotaxis grandoculis*	0.04 ± 0.03	0.22 ± 0.08	0.05 ± 0.03	0.01	0.953	9.33 ± 6.45	49.75 ± 18.58	10.88 ± 7.61	0.01	0.942
Lethrinidae	*Monotaxis heterodon*	0.06 ± 0.05	0.09 ± 0.08	0 ± 0	0.65	0.510	90.72 ± 66.43	136.07 ± 121.24	0 ± 0	0.65	0.517
Lutjanidae	*Aphareus furca*	0 ± 0	0.02 ± 0.02	0.1 ± 0.1	1.46	0.444	0 ± 0	4.45 ± 4.45	22.24 ± 22.24	1.46	0.440
Lutjanidae	*Aprion virescens*	0.03 ± 0.02	0.18 ± 0.06	0.13 ± 0.05	1.96	0.173	68.58 ± 48.45	349.76 ± 127.77	260.6 ± 94.98	1.96	0.173
Lutjanidae	*Lutjanus argentimaculatus*	0 ± 0	0 ± 0	0.02 ± 0.02	1.51	0.668	0 ± 0	0 ± 0	24.74 ± 24.74	1.51	0.662
Lutjanidae	*Lutjanus*	0.43	0.0	0.0	1.22	0.551	74.23	6.58 ±	7.18 ±	1.22	0.571

	biguttatus	± 0.43	4 ± 0.03	4 ± 0.04			± 74.23	5.04	7.18		
Lutjanidae	*Lutjanus bohar*	**0.72 ± 0.18**	**0.27 ± 0.09**	**0.06 ± 0.03**	**15.58**	**<0.001**	**313.89 ± 79.76**	**119.22 ± 39.75**	**24.15 ± 13.56**	**15.58**	**<0.001**
Lutjanidae	*Lutjanus carponotatus*	**0.18 ± 0.09**	**0.01 ± 0.01**	**0 ± 0**	**5.97**	**0.002**	**57.32 ± 28.29**	**4.41 ± 4.41**	**0 ± 0**	**5.97**	**0.002**
Lutjanidae	*Lutjanus decussatus*	**0.34 ± 0.11**	**0.08 ± 0.04**	**0 ± 0**	**13.00**	**<0.001**	**96.53 ± 30.85**	**23.64 ± 11.02**	**0 ± 0**	**13.00**	**<0.001**
Lutjanidae	*Lutjanus ehrenbergii*	0.08 ± 0.05	0 ± 0	0 ± 0	4.29	0.066	98.62 ± 58.16	0 ± 0	0 ± 0	4.29	0.072
Lutjanidae	*Lutjanus fulviflamma*	0.03 ± 0.02	0 ± 0	0 ± 0	3.01	0.220	9.85 ± 6.96	0 ± 0	0 ± 0	3.01	0.216
Lutjanidae	*Lutjanus fulvus*	**0.2 ± 0.08**	**0 ± 0**	**0 ± 0**	**8.30**	**0.001**	**39.64 ± 16.64**	**0 ± 0**	**0 ± 0**	**8.30**	**0.002**
Lutjanidae	*Lutjanus gibbus*	0.27 ± 0.27	0.41 ± 0.25	0 ± 0	0.82	0.409	35.14 ± 35.14	53.62 ± 31.92	0 ± 0	0.82	0.407
Lutjanidae	*Lutjanus lemniscatus*	0.03 ± 0.02	0.01 ± 0.01	0.02 ± 0.02	0.24	0.733	22.4 ± 15.82	8.96 ± 8.96	13.44 ± 13.44	0.24	0.739
Lutjanidae	*Lutjanus lunulatus*	0.06 ± 0.06	0 ± 0	0 ± 0	1.51	0.669	64.04 ± 64.04	0 ± 0	0 ± 0	1.51	0.665
Lutjanidae	*Lutjanus lutjanus*	0.03 ± 0.03	0.01 ± 0.01	0 ± 0	1.33	0.446	23.48 ± 23.48	8.8 ± 8.8	0 ± 0	1.33	0.450
Lutjanidae	*Lutjanus maxweberi*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.668	24.65 ± 24.65	0 ± 0	0 ± 0	1.51	0.669
Lutjanidae	*Lutjanus monostigma*	0.08 ± 0.04	0.11 ± 0.05	0 ± 0	2.12	0.160	33.2 ± 15.71	49.8 ± 22.64	0 ± 0	2.12	0.160
Lutjanidae	*Lutjanus rivulatus*	**0.15 ± 0.07**	**0.04 ± 0.03**	**0 ± 0**	**6.24**	**0.007**	**369.53 ± 167.97**	**100.78 ± 69.7**	**0 ± 0**	**6.24**	**0.007**
Lutjanidae	*Lutjanus russellii*	0.15 ± 0.06	0 ± 0	0.04 ± 0.04	3.15	0.089	16.65 ± 6.51	0 ± 0	4.76 ± 4.76	3.15	0.094
Lutjanidae	*Lutjanus semicinctus*	**0.88 ± 0.16**	**0.2 ± 0.06**	**0 ± 0**	**37.61**	**<0.001**	**220.83 ± 40.53**	**51.7 ± 15.19**	**0 ± 0**	**37.61**	**<0.001**
Lutjanidae	*Lutjanus vitta*	0.03 ± 0.02	0.27 ± 0.19	0.23 ± 0.1	1.19	0.317	5.63 ± 3.97	43.88 ± 31.21	37.13 ± 16.16	1.19	0.310

Lutjanidae	*Macolor macularis*	0.23 ± 0.13	0.5 ± 0.19	0 ± 0	1.38	0.265	73.1 ± 42.91	159.48 ± 60.04	0 ± 0	1.38	0.249
Lutjanidae	*Macolor niger*	0.13 ± 0.06	0.06 ± 0.05	0 ± 0	4.00	0.069	28.38 ± 14.09	14.19 ± 10.39	0 ± 0	4.00	0.070
Lutjanidae	*Pinjalo lewisi*	0 ± 0	1 ± 1	0 ± 0	0.00	1.000	0 ± 0	430.61 ± 430.61	0 ± 0	0.00	1.000
Malacanthidae	*Hoplolatilus chlupatyi*	0 ± 0	0.02 ± 0.02	0.01 ± 0.01	0.46	0.672	0 ± 0	0.4 ± 0.4	0.27 ± 0.27	0.46	0.662
Malacanthidae	*Hoplolatilus cuniculus*	0 ± 0	0 ± 0	0.06 ± 0.04	2.47	0.218	0 ± 0	0 ± 0	1.08 ± 0.84	2.47	0.216
Malacanthidae	*Hoplolatilus purpureus*	**0 ± 0**	**0 ± 0**	**0.38 ± 0.15**	**9.15**	**0.002**	**0 ± 0**	**0 ± 0**	**7.42 ± 2.96**	**9.15**	**0.003**
Malacanthidae	*Malacanthus brevirostris*	**0 ± 0**	**0.01 ± 0.01**	**0.07 ± 0.04**	**3.45**	**0.046**	**0 ± 0**	**0.96 ± 0.96**	**6.38 ± 4.12**	**3.45**	**0.042**
Malacanthidae	*Malacanthus latovittatus*	0.04 ± 0.04	0.01 ± 0.01	0.03 ± 0.02	0.03	0.964	7.07 ± 7.07	2.36 ± 2.36	5.89 ± 4.16	0.03	0.962
Microdesmidae	*Gunnellichthys monostigma*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	0.19 ± 0.19	0 ± 0	0.00	1.000
Microdesmidae	*Gunnellichthys pleurotaenia*	0.06 ± 0.03	0 ± 0	0.02 ± 0.02	1.27	0.357	0.5 ± 0.28	0 ± 0	0.19 ± 0.19	1.27	0.361
Monacanthidae	*Aluterus scriptus*	0.04 ± 0.03	0 ± 0	0.08 ± 0.05	0.79	0.534	46.57 ± 32.21	0 ± 0	93.14 ± 54.93	0.79	0.531
Monacanthidae	*Amanses scopas*	0.06 ± 0.03	0.05 ± 0.03	0.02 ± 0.02	1.15	0.312	6.93 ± 3.82	5 ± 2.89	2.31 ± 2.31	1.15	0.308
Monacanthidae	*Cantherhines dumerilii*	0.15 ± 0.09	0.04 ± 0.03	0.05 ± 0.03	1.52	0.270	48.53 ± 29.35	13.86 ± 9.59	16.18 ± 9.13	1.52	0.261
Monacanthidae	*Cantherhines fronticinctus*	0.04 ± 0.03	0 ± 0	0 ± 0	3.13	0.212	5.06 ± 3.5	0 ± 0	0 ± 0	3.13	0.223
Monacanthidae	*Cantherhines pardalis*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	2.53 ± 2.53	0 ± 0	0.00	1.000
Monacanthidae	*Paraluteres prionurus*	0 ± 0	0.13 ± 0.0	0 ± 0	0.00	1.000	0 ± 0	37.75 ± 25.1	0 ± 0	0.00	1.000

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Monacanthidae	*Paramonacanthus japonicus*	0 ± 0	0 ± 0	0.06 ± 0.04	2.47	0.218	0 ± 0	0 ± 0	8.56 ± 6.68	2.47	0.212
Monacanthidae	*Pervagor janthinosoma*	0.04 ± 0.04	0 ± 0	0 ± 0	1.51	0.674	13.07 ± 13.07	0 ± 0	0 ± 0	1.51	0.668
Monacanthidae	*Pseudomonacanthus macrurus*	0 ± 0	0 ± 0	0.02 ± 0.02	1.51	0.662	0 ± 0	0 ± 0	1.1 ± 1.1	1.51	0.664
Monodactylidae	*Monodactylus argenteus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.84 ± 0.84	0 ± 0	0.00	1.000
Mugilidae	*Crenimugil crenilabis*	0.61 ± 0.61	0 ± 0	0 ± 0	1.51	0.661	128.57 ± 128.57	0 ± 0	0 ± 0	1.51	0.662
Mullidae	*Mulloidichthys flavolineatus*	0.04 ± 0.04	0.02 ± 0.02	0.07 ± 0.05	0.25	0.655	7 ± 7	3.5 ± 3.5	11.67 ± 8.24	0.25	0.655
Mullidae	*Mulloidichthys vanicolensis*	0 ± 0	0 ± 0	0.02 ± 0.02	1.51	0.672	0 ± 0	0 ± 0	4.63 ± 4.63	1.51	0.667
Mullidae	*Parupeneus barberinoides*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	2.61 ± 2.61	0 ± 0	0.00	1.000
Mullidae	*Parupeneus barberinus*	0.53 ± 0.11	0.69 ± 0.17	0.26 ± 0.1	2.10	0.161	133.07 ± 27.91	172.81 ± 42.12	65.67 ± 24.19	2.10	0.152
Mullidae	*Parupeneus chrysopleuron*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	5.44 ± 5.44	0 ± 0	0.00	1.000
Mullidae	*Parupeneus crassilabris*	**0.33 ± 0.08**	**0.06 ± 0.05**	**0 ± 0**	**18.08**	**<0.001**	**86.98 ± 21.74**	**16.31 ± 11.94**	**0 ± 0**	**18.08**	**<0.001**
Mullidae	*Parupeneus cyclostomus*	0.13 ± 0.05	0.47 ± 0.15	0.29 ± 0.12	0.90	0.355	56.26 ± 22.62	201.33 ± 65.66	124.35 ± 51.19	0.90	0.348
Mullidae	*Parupeneus heptacanthus*	**0 ± 0**	**0.1 ± 0.07**	**0.38 ± 0.19**	**5.31**	**0.013**	**0 ± 0**	**23.16 ± 16.36**	**83.38 ± 41.39**	**5.31**	**0.009**
Mullidae	*Parupeneus indicus*	0.09 ± 0.05	0.08 ± 0.06	0.17 ± 0.1	0.55	0.501	7.47 ± 3.98	6.9 ± 4.77	13.79 ± 8.51	0.55	0.502
Mullidae	*Parupeneus multifasciatus*	0.99 ± 0.17	1.14 ± 0.19	0.55 ± 0.2	2.74	0.104	79.23 ± 13.81	90.87 ± 14.88	43.77 ± 16.16	2.74	0.100
Mullidae	*Parupeneus pleurostigma*	0 ± 0	0.07 ±	0 ± 0	0.00	1.000	0 ± 0	6.94 ± 5.99	0 ± 0	0.00	1.000

			0.06								
Mullidae	*Upeneus tragula*	0.03 ± 0.02	0.03 ± 0.02	0.17 ± 0.15	1.42	0.347	1.89 ± 1.31	2.36 ± 1.67	11.82 ± 10.03	1.42	0.315
Muraenidae	*Echidna nebulosa*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.665	3.02 ± 3.02	0 ± 0	0 ± 0	1.51	0.667
Muraenidae	*Gymnothorax chilospilus*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.662	9.43 ± 9.43	0 ± 0	0 ± 0	1.51	0.670
Muraenidae	*Gymnothorax enigmaticus*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.673	9.43 ± 9.43	0 ± 0	0 ± 0	1.51	0.657
Muraenidae	*Gymnothorax flavimarginatus*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.664	9.86 ± 9.86	0 ± 0	0 ± 0	1.51	0.668
Muraenidae	*Gymnothorax javanicus*	**0.13 ± 0.05**	**0.05 ± 0.03**	**0 ± 0**	**6.71**	**0.010**	**56.58 ± 23.26**	**23.57 ± 13.59**	**0 ± 0**	**6.71**	**0.009**
Muraenidae	*Gymnothorax undulatus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	9.38 ± 9.38	0 ± 0	0.00	1.000
Muraenidae	*Gymnothorax zonipectis*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.66 ± 0.66	0 ± 0	0.00	1.000
Nemipteridae	*Pentapodus aureofasciatus*	0.06 ± 0.03	1.43 ± 0.42	1.39 ± 0.69	4.02	0.050	1.86 ± 1.05	47.97 ± 14.12	46.57 ± 23.23	4.02	0.051
Nemipteridae	*Pentapodus caninus*	**0.01 ± 0.01**	**1.33 ± 0.73**	**2.55 ± 1.14**	**5.32**	**0.022**	**0.5 ± 0.5**	**47.52 ± 26.05**	**90.83 ± 40.7**	**5.32**	**0.022**
Nemipteridae	*Pentapodus emeryii*	**0.17 ± 0.11**	**0.62 ± 0.14**	**0.97 ± 0.3**	**7.74**	**0.005**	**11.9 ± 7.42**	**42.38 ± 9.93**	**66.19 ± 20.62**	**7.74**	**0.004**
Nemipteridae	*Pentapodus nagasakiensis*	**0 ± 0**	**0.4 ± 0.19**	**2.5 ± 1.28**	**5.59**	**0.002**	**0 ± 0**	**4.56 ± 2.24**	**28.77 ± 14.75**	**5.59**	**0.002**
Nemipteridae	*Pentapodus numberii*	0 ± 0	0.09 ± 0.05	0.66 ± 0.65	1.58	0.266	0 ± 0	3.03 ± 1.61	22.12 ± 21.64	1.58	0.259
Nemipteridae	*Pentapodus paradiseus*	**0.04 ± 0.04**	**0.08 ± 0.08**	**1.62 ± 0.76**	**6.30**	**<0.001**	**1.64 ± 1.64**	**3.28 ± 3.28**	**63.78 ± 29.91**	**6.30**	**<0.001**
Nemipteridae	*Pentapodus porosus*	0.03 ± 0.02	0.57 ± 0.25	0.46 ± 0.46	0.99	0.367	1.37 ± 0.97	22.58 ± 9.73	18.07 ± 18.07	0.99	0.374
Nemipteridae	*Pentapodus trivittatus*	**0.82 ± 0.22**	**0.16 ± 0.09**	**0.06 ± 0.05**	**14.29**	**<0.001**	**32.3 ± 8.71**	**6.16 ± 3.47**	**2.46 ± 1.8**	**14.29**	**<0.001**

Nemipteridae	*Scolopsis affinis*	0.56 ± 0.42	0.61 ± 0.25	1.07 ± 0.25	1.34	0.267	141.08 ± 105.83	154.31 ± 64.23	271.58 ± 62.35	1.34	0.266
Nemipteridae	*Scolopsis bilineata*	**0.53 ± 0.1**	**0.32 ± 0.1**	**0.04 ± 0.04**	**17.04**	**<0.001**	**23.49 ± 4.5**	**14.06 ± 4.25**	**1.85 ± 1.85**	**17.04**	**<0.001**
Nemipteridae	*Scolopsis ciliata*	0.15 ± 0.08	0.12 ± 0.07	0.12 ± 0.07	0.11	0.765	2.96 ± 1.5	2.29 ± 1.43	2.29 ± 1.35	0.11	0.763
Nemipteridae	*Scolopsis lineata*	0.33 ± 0.27	0 ± 0	0 ± 0	2.26	0.065	16.67 ± 13.6	0 ± 0	0 ± 0	2.26	0.071
Nemipteridae	*Scolopsis margaritifera*	0.19 ± 0.07	0.57 ± 0.36	0.19 ± 0.12	0.00	1.000	14.32 ± 5.6	43.5 ± 27.43	14.32 ± 8.85	0.00	1.000
Nemipteridae	*Scolopsis monogramma*	0.04 ± 0.04	0.44 ± 0.34	0.03 ± 0.02	0.00	0.997	5.46 ± 5.46	57.36 ± 45.22	4.55 ± 3.22	0.00	0.996
Nemipteridae	*Scolopsis temporalis*	0.21 ± 0.09	0.68 ± 0.43	0.15 ± 0.08	0.02	0.885	24.66 ± 11.03	80.97 ± 51.2	15.58 ± 7.58	0.04	0.831
Nemipteridae	*Scolopsis trilineata*	0.18 ± 0.11	0.02 ± 0.02	0.04 ± 0.04	2.16	0.162	11.24 ± 6.58	1.3 ± 1.3	2.59 ± 2.59	2.16	0.166
Nemipteridae	*Scolopsis vosmeri*	**0 ± 0**	**0 ± 0**	**0.4 ± 0.2**	**6.28**	**0.002**	**0 ± 0**	**0 ± 0**	**26.37 ± 12.79**	**6.28**	**0.001**
Nemipteridae	*Scolopsis xenochroa*	0.17 ± 0.07	0.1 ± 0.07	0.17 ± 0.11	0.00	1.000	10.81 ± 4.21	6.49 ± 4.18	10.81 ± 7.11	0.00	1.000
Ophichthidae	*Myrichthys colubrinus*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.671	8.38 ± 8.38	0 ± 0	0 ± 0	1.51	0.665
Ostraciidae	*Lactoria cornuta*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	8.36 ± 8.36	0 ± 0	0.00	1.000
Ostraciidae	*Ostracion cubicus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	8.73 ± 8.73	0 ± 0	0.00	1.000
Ostraciidae	*Ostracion meleagris*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.674	1.45 ± 1.45	0 ± 0	0 ± 0	1.51	0.666
Pempheridae	*Parapriacanthus ransonneti*	0 ± 0	2.75 ± 2.75	0 ± 0	0.00	1.000	0 ± 0	36.68 ± 36.68	0 ± 0	0.00	1.000
Pholidichthyidae	*Pholidichthys leucotaenia*	0 ± 0	0 ± 0	0.46 ± 0.46	1.51	0.662	0 ± 0	0 ± 0	0.03 ± 0.03	1.51	0.669
Pinguipedidae	*Parapercis clathrata*	0.03 ±	0 ± 0	0.03 ±	0.05	0.963	1.49 ± 1.05	0 ± 0	1.19 ± 1.19	0.05	0.967

		0.02		0.03							
Pinguipedidae	*Parapercis cylindrica*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	5.49 ± 3.84	0 ± 0	0.00	1.000
Pinguipedidae	*Parapercis hexophtalma*	0.07 ± 0.03	0.02 ± 0.02	0.01 ± 0.01	2.70	0.130	4.77 ± 2.28	1.43 ± 1.43	0.95 ± 0.95	2.70	0.130
Pinguipedidae	*Parapercis lineopunctata*	0.02 ± 0.02	0.04 ± 0.03	0.02 ± 0.02	0.00	1.000	5.09 ± 5.09	10.18 ± 7.04	5.09 ± 5.09	0.00	1.000
Pinguipedidae	*Parapercis snyderi*	0 ± 0	0 ± 0	0.13 ± 0.11	2.12	0.210	0 ± 0	0 ± 0	30.53 ± 25.73	2.12	0.224
Pinguipedidae	*Parapercis tetracantha*	0.03 ± 0.03	0.1 ± 0.06	0.09 ± 0.05	0.83	0.407	6.79 ± 6.79	25.45 ± 14.67	22.05 ± 12.73	0.83	0.396
Pinguipedidae	*Parapercis xanthozona*	0 ± 0	0.07 ± 0.04	0.04 ± 0.04	0.86	0.423	0 ± 0	17.81 ± 8.6	10.18 ± 10.18	0.86	0.426
Plotosidae	*Plotosus lineatus*	0 ± 0	9.5 ± 9.5	0 ± 0	0.00	1.000	0 ± 0	28.99 ± 28.99	0 ± 0	0.00	1.000
Pomacanthidae	*Apolemichthys trimaculatus*	0.07 ± 0.04	0.08 ± 0.04	0.14 ± 0.06	1.06	0.329	2.24 ± 1.25	2.69 ± 1.25	4.48 ± 2.01	1.06	0.324
Pomacanthidae	*Centropyge bicolor*	0.06 ± 0.04	0.34 ± 0.11	0.02 ± 0.02	0.17	0.722	0.56 ± 0.32	3.02 ± 0.96	0.19 ± 0.19	0.17	0.726
Pomacanthidae	*Centropyge bispinosa*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.19 ± 0.19	0 ± 0	0.00	1.000
Pomacanthidae	*Centropyge fisheri*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.14 ± 0.14	0 ± 0	0.00	1.000
Pomacanthidae	*Centropyge nox*	0.07 ± 0.04	0 ± 0	0 ± 0	4.78	0.070	0.56 ± 0.31	0 ± 0	0 ± 0	4.78	0.068
Pomacanthidae	*Centropyge tibicen*	0.08 ± 0.05	0.08 ± 0.07	0 ± 0	1.58	0.304	4.49 ± 2.65	4.49 ± 3.51	0 ± 0	1.58	0.296
Pomacanthidae	*Centropyge vrolikii*	0.03 ± 0.02	0 ± 0	0 ± 0	3.01	0.210	0.28 ± 0.2	0 ± 0	0 ± 0	3.01	0.225
Pomacanthidae	*Chaetodontoplus dimidiatus*	**0 ± 0**	**0.1 ± 0.05**	**0.27 ± 0.12**	**6.45**	**0.008**	**0 ± 0**	**34.59 ± 17.25**	**89.94 ± 40.09**	**6.45**	**0.009**
Pomacanthidae	*Chaetodontoplus mesoleucus*	0.18 ± 0.08	0.25 ± 0.0	0.02 ± 0.0	2.65	0.119	59.96 ± 26.43	83.02 ± 28.27	6.92 ± 6.92	2.65	0.109

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Pomacanthidae	*Chaetodontoplus poliourus*	0.06 ± 0.05	0 ± 0	0 ± 0	2.80	0.213	20.76 ± 15.2	0 ± 0	0 ± 0	2.80	0.216
Pomacanthidae	*Genicanthus lamarck*	0 ± 0	0.44 ± 0.16	0.06 ± 0.06	0.18	0.740	0 ± 0	54.6 ± 19.63	7.8 ± 7.8	0.18	0.712
Pomacanthidae	*Genicanthus melanospilos*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	2.6 ± 2.6	0 ± 0	0.00	1.000
Pomacanthidae	*Paracentropyge multifasciata*	0.02 ± 0.02	0.02 ± 0.02	0.01 ± 0.01	0.07	0.893	0.22 ± 0.22	0.22 ± 0.22	0.15 ± 0.15	0.07	0.893
Pomacanthidae	*Pomacanthus imperator*	0.12 ± 0.06	0.18 ± 0.06	0.07 ± 0.03	0.43	0.552	123.96 ± 63.62	189.59 ± 60.44	72.92 ± 34.8	0.43	0.555
Pomacanthidae	*Pomacanthus navarchus*	0.03 ± 0.02	0.01 ± 0.01	0 ± 0	2.58	0.143	11.82 ± 8.35	3.54 ± 3.54	0 ± 0	2.58	0.144
Pomacanthidae	*Pomacanthus semicirculatus*	0.01 ± 0.01	0.04 ± 0.04	0 ± 0	0.15	0.891	10.46 ± 10.46	31.38 ± 31.38	0 ± 0	0.15	0.893
Pomacanthidae	*Pomacanthus sexstriatus*	0.07 ± 0.05	0.19 ± 0.1	0.07 ± 0.05	0.00	1.000	69.71 ± 49.25	195.17 ± 95.88	69.71 ± 49.25	0.00	1.000
Pomacanthidae	*Pomacanthus xanthometopon*	0.01 ± 0.01	0.02 ± 0.02	0 ± 0	0.46	0.665	14.2 ± 14.2	21.3 ± 21.3	0 ± 0	0.46	0.666
Pomacanthidae	*Pygoplites diacanthus*	**0.18 ± 0.07**	**0.21 ± 0.07**	**0 ± 0**	**5.03**	**0.030**	**56.8 ± 20.68**	**65.54 ± 22.54**	**0 ± 0**	**5.03**	**0.029**
Pomacentridae	*Abudefduf bengalensis*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.669	0.91 ± 0.91	0 ± 0	0 ± 0	1.51	0.654
Pomacentridae	*Abudefduf sexfasciatus*	0.17 ± 0.17	0 ± 0	0 ± 0	1.51	0.662	7.26 ± 7.26	0 ± 0	0 ± 0	1.51	0.674
Pomacentridae	*Abudefduf vaigiensis*	0.72 ± 0.71	0 ± 0	0 ± 0	1.57	0.223	30.62 ± 30.01	0 ± 0	0 ± 0	1.57	0.218
Pomacentridae	*Acanthochromis polyacanthus*	0.4 ± 0.14	0.76 ± 0.75	0 ± 0	0.42	0.672	4.3 ± 1.5	8.16 ± 8	0 ± 0	0.42	0.660
Pomacentridae	*Amblyglyphidodon aureus*	0.02 ± 0.02	0.11 ± 0.08	0 ± 0	0.09	0.892	0.49 ± 0.49	2.59 ± 1.85	0 ± 0	0.09	0.895
Pomacentridae	*Amblyglyphidodon batunai*	0.1 ± 0.1	0.03 ± 0.02	0 ± 0	1.44	0.371	2.09 ± 2.09	0.67 ± 0.49	0 ± 0	1.44	0.364
Pomacentridae	*Amblyglyphidod*	**0.37**	**0.0**	**0 ±**	**6.01**	**0.007**	**1.86 ±**	**0.11 ±**	**0 ± 0**	**6.01**	**0.006**

	on curacao	**± 0.18**	**2 ± 0.02**	**0**			**0.92**	**0.11**			
Pomacentridae	*Amblyglyphidodon leucogaster*	0.33 ± 0.16	0.19 ± 0.15	0 ± 0	3.30	0.079	7.62 ± 3.85	4.54 ± 3.45	0 ± 0	3.30	0.073
Pomacentridae	*Amblyglyphidodon ternatensis*	**0.35 ± 0.18**	**0 ± 0**	**0 ± 0**	**5.46**	**0.021**	**7.45 ± 3.88**	**0 ± 0**	**0 ± 0**	**5.46**	**0.019**
Pomacentridae	*Amblypomacentrus breviceps*	0.04 ± 0.03	0 ± 0	0 ± 0	3.13	0.214	1.48 ± 1.02	0 ± 0	0 ± 0	3.13	0.218
Pomacentridae	*Amblypomacentrus clarus*	1.17 ± 1.15	0.02 ± 0.02	0.02 ± 0.02	1.51	0.409	41.43 ± 40.66	0.74 ± 0.74	0.74 ± 0.74	1.51	0.417
Pomacentridae	*Cheiloprion labiatus*	0 ± 0	0.04 ± 0.04	0 ± 0	0.00	1.000	0 ± 0	1.48 ± 1.48	0 ± 0	0.00	1.000
Pomacentridae	*Chromis alpha*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.68 ± 0.68	0 ± 0	0.00	1.000
Pomacentridae	*Chromis amboinensis*	**1.76 ± 1.38**	**0.08 ± 0.05**	**0 ± 0**	**2.47**	**0.010**	**10.21 ± 7.97**	**0.44 ± 0.27**	**0 ± 0**	**2.47**	**0.010**
Pomacentridae	*Chromis analis*	0.44 ± 0.26	0 ± 0	0 ± 0	4.08	0.065	2.64 ± 1.6	0 ± 0	0 ± 0	4.08	0.068
Pomacentridae	*Chromis atripectoralis*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.666	0.13 ± 0.13	0 ± 0	0 ± 0	1.51	0.668
Pomacentridae	*Chromis caudalis*	0.1 ± 0.07	0.01 ± 0.01	0.19 ± 0.11	0.71	0.436	0.63 ± 0.44	0.06 ± 0.06	1.17 ± 0.65	0.71	0.426
Pomacentridae	*Chromis cinerascens*	0.06 ± 0.06	0 ± 0	0 ± 0	1.51	0.664	2.05 ± 2.05	0 ± 0	0 ± 0	1.51	0.666
Pomacentridae	*Chromis fumea*	0.44 ± 0.35	0.13 ± 0.06	0 ± 0	2.25	0.088	14.38 ± 11.63	4.11 ± 2.04	0 ± 0	2.25	0.051
Pomacentridae	*Chromis margaritifer*	**0.87 ± 0.25**	**0.08 ± 0.05**	**0.01 ± 0.01**	**16.02**	**<0.001**	**5.23 ± 1.51**	**0.5 ± 0.3**	**0.08 ± 0.08**	**16.02**	**<0.001**
Pomacentridae	*Chromis retrofasciata*	0 ± 0	0.06 ± 0.06	0 ± 0	0.00	1.000	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000
Pomacentridae	*Chromis scotochiloptera*	**0.41 ± 0.23**	**0.15 ± 0.1**	**0 ± 0**	**3.96**	**0.039**	**13.46 ± 7.63**	**4.79 ± 3.35**	**0 ± 0**	**3.96**	**0.036**
Pomacentridae	*Chromis ternatensis*	**3.39 ± 1.87**	**0.05 ± 0.03**	**0 ± 0**	**4.90**	**<0.001**	**20.44 ± 11.27**	**0.29 ± 0.17**	**0 ± 0**	**4.90**	**<0.001**
Pomacentridae	*Chromis viridis*	0.75	0 ±	0 ±	2.63	0.069	5.49 ±	0 ± 0	0 ± 0	2.63	0.064

		± 0.57	0	0			4.15				
Pomacentridae	*Chromis weberi*	**0.89 ± 0.41**	**0.22 ± 0.17**	**0 ± 0**	**6.10**	**0.006**	**5.68 ± 2.61**	**1.4 ± 1.08**	**0 ± 0**	**6.10**	**0.004**
Pomacentridae	*Chromis xanthochira*	0.1 ± 0.05	0.04 ± 0.04	0 ± 0	3.64	0.077	3.42 ± 1.74	1.37 ± 1.37	0 ± 0	3.64	0.056
Pomacentridae	*Chromis xanthura*	**0.38 ± 0.2**	**0.06 ± 0.03**	**0 ± 0**	**5.38**	**0.012**	**3.72 ± 1.94**	**0.55 ± 0.31**	**0 ± 0**	**5.38**	**0.012**
Pomacentridae	*Chrysiptera bleekeri*	0 ± 0	0.33 ± 0.27	0.1 ± 0.07	0.18	0.739	0 ± 0	12.15 ± 10.12	3.62 ± 2.74	0.18	0.732
Pomacentridae	*Chrysiptera cyanea*	**1.41 ± 0.77**	**0.01 ± 0.01**	**0 ± 0**	**5.00**	**0.002**	**52.48 ± 28.62**	**0.52 ± 0.52**	**0 ± 0**	**5.00**	**0.002**
Pomacentridae	*Chrysiptera flavipinnis*	0 ± 0	0.1 ± 0.1	0.06 ± 0.06	0.40	0.669	0 ± 0	3.88 ± 3.88	2.33 ± 2.33	0.40	0.665
Pomacentridae	*Chrysiptera glauca*	0.06 ± 0.05	0 ± 0	0 ± 0	2.80	0.221	2.24 ± 1.64	0 ± 0	0 ± 0	2.80	0.218
Pomacentridae	*Chrysiptera hemicyanea*	0.04 ± 0.04	0.13 ± 0.11	0 ± 0	0.20	0.817	1.55 ± 1.55	4.65 ± 3.92	0 ± 0	0.20	0.815
Pomacentridae	*Chrysiptera parasema*	0.1 ± 0.09	0.07 ± 0.06	0.02 ± 0.02	0.91	0.390	3.88 ± 3.17	2.71 ± 2.34	0.78 ± 0.78	0.91	0.375
Pomacentridae	*Chrysiptera pricei*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.674	0.78 ± 0.78	0 ± 0	0 ± 0	1.51	0.670
Pomacentridae	*Chrysiptera rex*	0.14 ± 0.08	0.08 ± 0.08	0 ± 0	2.27	0.183	1.22 ± 0.68	0.73 ± 0.73	0 ± 0	2.27	0.189
Pomacentridae	*Chrysiptera rollandi*	0.1 ± 0.07	0.19 ± 0.09	0 ± 0	1.15	0.318	0.03 ± 0.02	0.06 ± 0.03	0 ± 0	1.15	0.312
Pomacentridae	*Chrysiptera springeri*	0.06 ± 0.06	0.02 ± 0.02	0 ± 0	1.37	0.436	2.33 ± 2.33	0.78 ± 0.78	0 ± 0	1.37	0.445
Pomacentridae	*Chrysiptera talboti*	0.06 ± 0.03	0 ± 0	0 ± 0	4.72	0.067	0.49 ± 0.27	0 ± 0	0 ± 0	4.72	0.069
Pomacentridae	*Dascyllus aruanus*	0.12 ± 0.1	0.04 ± 0.04	0 ± 0	1.85	0.289	0.67 ± 0.56	0.24 ± 0.24	0 ± 0	1.85	0.288
Pomacentridae	*Dascyllus melanurus*	0.13 ± 0.11	0 ± 0	0 ± 0	2.12	0.216	0.06 ± 0.05	0 ± 0	0 ± 0	2.12	0.217

Pomacentridae	*Dascyllus reticulatus*	**0.33 ± 0.15**	**0.04 ± 0.04**	**0 ± 0**	**6.47**	**0.010**	**3.57 ± 1.66**	**0.46 ± 0.46**	**0 ± 0**	**6.47**	**0.012**
Pomacentridae	*Dascyllus trimaculatus*	0.29 ± 0.17	0.04 ± 0.04	0.04 ± 0.04	2.78	0.096	4.18 ± 2.49	0.6 ± 0.6	0.6 ± 0.6	2.78	0.078
Pomacentridae	*Dischistodus chrysopoecilus*	0.04 ± 0.04	0 ± 0	0 ± 0	1.51	0.664	3.02 ± 3.02	0 ± 0	0 ± 0	1.51	0.663
Pomacentridae	*Dischistodus fasciatus*	0.02 ± 0.02	0.06 ± 0.04	0 ± 0	0.28	0.743	1.51 ± 1.51	4.03 ± 3.14	0 ± 0	0.28	0.745
Pomacentridae	*Dischistodus melanotus*	**0.31 ± 0.18**	**0.02 ± 0.02**	**0 ± 0**	**4.38**	**0.010**	**22.16 ± 12.86**	**1.51 ± 1.51**	**0 ± 0**	**4.38**	**0.009**
Pomacentridae	*Dischistodus perspicillatus*	0.22 ± 0.14	0 ± 0	0 ± 0	3.51	0.073	15.61 ± 10.2	0 ± 0	0 ± 0	3.51	0.069
Pomacentridae	*Dischistodus prosopotaenia*	0.08 ± 0.05	0 ± 0	0 ± 0	3.94	0.071	5.54 ± 3.41	0 ± 0	0 ± 0	3.94	0.068
Pomacentridae	*Dischistodus pseudochrysopoecilus*	0.22 ± 0.16	0.08 ± 0.07	0 ± 0	2.55	0.139	16.12 ± 11.52	6.04 ± 4.71	0 ± 0	2.55	0.146
Pomacentridae	*Hemiglyphidodon plagiometopon*	0.1 ± 0.05	0.13 ± 0.13	0 ± 0	0.89	0.465	3.7 ± 1.88	4.44 ± 4.44	0 ± 0	0.89	0.450
Pomacentridae	*Lepidozygus tapeinosoma*	0 ± 0	0.04 ± 0.04	0 ± 0	0.00	1.000	0 ± 0	0.35 ± 0.35	0 ± 0	0.00	1.000
Pomacentridae	*Neoglyphidodon crossi*	0.03 ± 0.02	0.02 ± 0.02	0 ± 0	1.46	0.293	0.99 ± 0.68	0.74 ± 0.74	0 ± 0	1.46	0.284
Pomacentridae	*Neoglyphidodon melas*	**0.26 ± 0.1**	**0.04 ± 0.04**	**0 ± 0**	**8.96**	**0.002**	**9.91 ± 3.71**	**1.61 ± 1.61**	**0 ± 0**	**8.96**	**0.001**
Pomacentridae	*Neoglyphidodon nigroris*	0.19 ± 0.09	0.23 ± 0.16	0 ± 0	1.64	0.225	7.23 ± 3.45	8.98 ± 5.99	0 ± 0	1.64	0.231
Pomacentridae	*Neoglyphidodon oxyodon*	0.05 ± 0.03	0.1 ± 0.07	0 ± 0	0.53	0.539	1.73 ± 1.21	3.7 ± 2.61	0 ± 0	0.53	0.507
Pomacentridae	*Neoglyphidodon thoracotaeniatus*	0 ± 0	0.07 ± 0.05	0 ± 0	0.00	1.000	0 ± 0	0.59 ± 0.42	0 ± 0	0.00	1.000
Pomacentridae	*Neopomacentrus azysron*	0.06 ± 0.05	0 ± 0	0 ± 0	2.80	0.214	1.97 ± 1.44	0 ± 0	0 ± 0	2.80	0.210
Pomacentridae	*Neopomacentrus cyanomos*	0 ± 0	0.02 ±	0 ± 0	0.00	1.000	0 ± 0	0.46 ± 0.46	0 ± 0	0.00	1.000

			0.02								
Pomacentridae	*Neopomacentrus filamentosus*	0.02 ± 0.02	0.1 ± 0.1	0 ± 0	0.06	0.895	0.66 ± 0.66	3.29 ± 3.29	0 ± 0	0.06	0.890
Pomacentridae	*Plectroglyphidodon dickii*	**0.15 ± 0.07**	**0 ± 0**	**0 ± 0**	**6.32**	**0.006**	**2.26 ± 1.09**	**0 ± 0**	**0 ± 0**	**6.32**	**0.007**
Pomacentridae	*Plectroglyphidodon lacrymatus*	0.02 ± 0.02	0.02 ± 0.02	0 ± 0	0.76	0.664	0.29 ± 0.29	0.29 ± 0.29	0 ± 0	0.76	0.667
Pomacentridae	*Plectroglyphidodon leucozonus*	0.03 ± 0.03	0 ± 0	0 ± 0	1.51	0.671	1.41 ± 1.41	0 ± 0	0 ± 0	1.51	0.666
Pomacentridae	*Pomacentrus adelus*	0 ± 0	0.08 ± 0.08	0 ± 0	0.00	1.000	0 ± 0	3.24 ± 3.24	0 ± 0	0.00	1.000
Pomacentridae	*Pomacentrus amboinensis*	0.02 ± 0.02	0.89 ± 0.45	0.03 ± 0.03	0.00	0.992	0.19 ± 0.19	8.26 ± 4.22	0.26 ± 0.26	0.00	0.992
Pomacentridae	*Pomacentrus auriventris*	1.96 ± 1.16	1.66 ± 0.89	0.25 ± 0.25	2.01	0.169	18.27 ± 10.8	15.46 ± 8.33	2.33 ± 2.33	2.01	0.167
Pomacentridae	*Pomacentrus bankanensis*	**0.47 ± 0.16**	**0.04 ± 0.04**	**0 ± 0**	**10.99**	**<0.001**	**4.34 ± 1.54**	**0.39 ± 0.39**	**0 ± 0**	**10.99**	**<0.001**
Pomacentridae	*Pomacentrus brachialis*	**0.24 ± 0.1**	**0.08 ± 0.05**	**0 ± 0**	**6.42**	**0.014**	**1.23 ± 0.54**	**0.44 ± 0.26**	**0 ± 0**	**6.42**	**0.015**
Pomacentridae	*Pomacentrus chrysurus*	**0.51 ± 0.24**	**0.06 ± 0.06**	**0 ± 0**	**6.46**	**0.009**	**19.69 ± 9.16**	**2.43 ± 2.43**	**0 ± 0**	**6.46**	**0.009**
Pomacentridae	*Pomacentrus coelestis*	**0.49 ± 0.28**	**0 ± 0**	**0 ± 0**	**4.56**	**0.006**	**12.82 ± 7.32**	**0 ± 0**	**0 ± 0**	**4.56**	**0.007**
Pomacentridae	*Pomacentrus cuneatus*	0.01 ± 0.01	0 ± 0	0 ± 0	1.51	0.668	0.54 ± 0.54	0 ± 0	0 ± 0	1.51	0.669
Pomacentridae	*Pomacentrus lepidogenys*	0.08 ± 0.05	0.08 ± 0.08	0 ± 0	0.96	0.405	1.25 ± 0.77	1.37 ± 1.37	0 ± 0	0.96	0.424
Pomacentridae	*Pomacentrus littoralis*	0.02 ± 0.02	0.04 ± 0.03	0 ± 0	0.51	0.743	0.81 ± 0.81	1.62 ± 1.12	0 ± 0	0.51	0.741
Pomacentridae	*Pomacentrus moluccensis*	**1.94 ± 0.57**	**0 ± 0**	**0 ± 0**	**16.24**	**<0.001**	**18.14 ± 5.33**	**0 ± 0**	**0 ± 0**	**16.24**	**<0.001**
Pomacentridae	*Pomacentrus nagasakiensis*	**0 ± 0**	**0 ± 0**	**0.16 ± 0.09**	**4.93**	**0.024**	**0 ± 0**	**0 ± 0**	**6.2 ± 3.41**	**4.93**	**0.020**
Pomacentridae	*Pomacentrus nigromanus*	0.15 ±	0.42 ±	0.02 ±	0.74	0.419	1.36 ± 0.86	3.95 ± 1.31	0.19 ± 0.19	0.74	0.403

		0.09	0.14	0.02							
Pomacentridae	*Pomacentrus nigromarginatus*	0 ± 0	0.06 ± 0.05	0 ± 0	0.00	1.000	0 ± 0	2.43 ± 1.78	0 ± 0	0.00	1.000
Pomacentridae	*Pomacentrus opisthostigma*	0.08 ± 0.05	0 ± 0	0 ± 0	4.29	0.071	3.24 ± 1.91	0 ± 0	0 ± 0	4.29	0.071
Pomacentridae	*Pomacentrus pavo*	0.04 ± 0.03	0 ± 0	0 ± 0	3.13	0.221	1.62 ± 1.12	0 ± 0	0 ± 0	3.13	0.220
Pomacentridae	*Pomacentrus philippinus*	0.06 ± 0.05	0 ± 0	0 ± 0	2.80	0.218	0.16 ± 0.11	0 ± 0	0 ± 0	2.80	0.215
Pomacentridae	*Pomacentrus reidi*	0.2 ± 0.15	0.03 ± 0.02	0 ± 0	2.53	0.113	8.5 ± 6.49	1.47 ± 1.04	0 ± 0	2.53	0.114
Pomacentridae	*Pomacentrus simsiang*	**0.14 ± 0.08**	**0.04 ± 0.03**	**0 ± 0**	**4.48**	**0.037**	**5.4 ± 2.93**	**1.62 ± 1.12**	**0 ± 0**	**4.48**	**0.035**
Pomacentridae	*Pomacentrus taeniometopon*	0 ± 0	0 ± 0	0.04 ± 0.04	1.51	0.664	0 ± 0	0 ± 0	1.62 ± 1.62	1.51	0.666
Pomacentridae	*Pomacentrus tripunctatus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.81 ± 0.81	0 ± 0	0.00	1.000
Pomacentridae	*Pomacentrus vaiuli*	0.02 ± 0.02	0.02 ± 0.02	0 ± 0	0.76	0.672	0.26 ± 0.26	0.26 ± 0.26	0 ± 0	0.76	0.670
Pomacentridae	*Stegastes albifasciatus*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	0.28 ± 0.28	0 ± 0	0.00	1.000
Pomacentridae	*Stegastes fasciolatus*	0.01 ± 0.01	0 ± 0	0 ± 0	1.51	0.671	0.34 ± 0.34	0 ± 0	0 ± 0	1.51	0.667
Priacanthidae	*Priacanthus hamrur*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	16.93 ± 16.93	0 ± 0	0.00	1.000
Pseudochromidae	*Pictichromis caitlinae*	0 ± 0	0.04 ± 0.04	0 ± 0	0.00	1.000	0 ± 0	2.62 ± 2.62	0 ± 0	0.00	1.000
Pseudochromidae	*Pseudochromis fuscus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.13 ± 0.13	0 ± 0	0.00	1.000
Pseudochromidae	*Pseudochromis jace*	0 ± 0	0 ± 0	0.02 ± 0.02	1.51	0.668	0 ± 0	0 ± 0	1.47 ± 1.47	1.51	0.661
Pseudochromidae	*Pseudochromis perspicillatus*	0 ± 0	0 ± 0	0.07 ± 0.05	3.01	0.213	0 ± 0	0 ± 0	4.91 ± 3.47	3.01	0.220

Pseudochromidae	*Pseudochromis pylei*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	1.47 ± 1.47	0 ± 0	0.00	1.000
Ptereleotridae	*Ptereleotris evides*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.31 ± 0.31	0 ± 0	0.00	1.000
Ptereleotridae	*Ptereleotris hanae*	0.03 ± 0.03	0 ± 0	0 ± 0	1.51	0.669	0.25 ± 0.25	0 ± 0	0 ± 0	1.51	0.667
Ptereleotridae	*Ptereleotris heteroptera*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.31 ± 0.31	0 ± 0	0.00	1.000
Rachycentridae	*Rachycentron canadum*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	211.47 ± 211.47	0 ± 0	0.00	1.000
Scaridae	*Bolbometopon muricatum*	0 ± 0	0.03 ± 0.02	0.04 ± 0.03	1.84	0.215	0 ± 0	165.19 ± 116.7	198.23 ± 137.09	1.84	0.214
Scaridae	*Cetoscarus ocellatus*	0.02 ± 0.02	0.02 ± 0.02	0 ± 0	0.76	0.673	10.8 ± 10.8	10.8 ± 10.8	0 ± 0	0.76	0.669
Scaridae	*Chlorurus bleekeri*	**0.06 ± 0.03**	**0 ± 0**	**0 ± 0**	**6.49**	**0.020**	**18.9 ± 9.01**	**0 ± 0**	**0 ± 0**	**6.49**	**0.022**
Scaridae	*Chlorurus bowersi*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.660	6.3 ± 6.3	0 ± 0	0 ± 0	1.51	0.662
Scaridae	*Chlorurus japanensis*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.668	8.12 ± 8.12	0 ± 0	0 ± 0	1.51	0.675
Scaridae	*Chlorurus microrhinos*	0.08 ± 0.05	0 ± 0	0 ± 0	4.29	0.070	64.78 ± 38.21	0 ± 0	0 ± 0	4.29	0.072
Scaridae	*Chlorurus sordidus*	**0.21 ± 0.08**	**0.02 ± 0.02**	**0.01 ± 0.01**	**8.43**	**0.002**	**42.59 ± 15.79**	**4.26 ± 4.26**	**2.84 ± 2.84**	**8.43**	**0.002**
Scaridae	*Hipposcarus longiceps*	0.01 ± 0.01	0 ± 0	0 ± 0	1.51	0.667	5.88 ± 5.88	0 ± 0	0 ± 0	1.51	0.668
Scaridae	*Scarus chameleon*	0.06 ± 0.06	0 ± 0	0 ± 0	1.51	0.669	15.36 ± 15.36	0 ± 0	0 ± 0	1.51	0.666
Scaridae	*Scarus dimidiatus*	**0.13 ± 0.06**	**0 ± 0**	**0 ± 0**	**6.00**	**0.019**	**30.2 ± 14.99**	**0 ± 0**	**0 ± 0**	**6.00**	**0.021**
Scaridae	*Scarus flavipectoralis*	0.08 ± 0.03	0.18 ± 0.08	0 ± 0	1.22	0.295	15.07 ± 6.28	32.01 ± 15.02	0 ± 0	1.22	0.294
Scaridae	*Scarus forsteni*	0.06 ± 0.05	0 ± 0	0 ± 0	2.80	0.214	22.27 ± 16.31	0 ± 0	0 ± 0	2.80	0.218
Scaridae	*Scarus ghobban*	0.02 ± 0.02	0.02 ± 0.0	0 ± 0	0.76	0.665	5.84 ± 5.84	5.84 ± 5.84	0 ± 0	0.76	0.665

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Scaridae	*Scarus niger*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.659	6.98 ± 6.98	0 ± 0	0 ± 0	1.51	0.663
Scaridae	*Scarus oviceps*	0.13 ± 0.06	0.1 ± 0.05	0.04 ± 0.04	1.30	0.284	39.55 ± 19.63	30.76 ± 15.84	13.18 ± 13.18	1.30	0.282
Scaridae	*Scarus prasiognathos*	0.03 ± 0.02	0.02 ± 0.02	0 ± 0	1.77	0.300	28.47 ± 20.12	17.08 ± 17.08	0 ± 0	1.77	0.297
Scaridae	*Scarus psittacus*	0.07 ± 0.04	0.04 ± 0.04	0 ± 0	1.96	0.237	18.2 ± 11.73	10.92 ± 10.92	0 ± 0	1.96	0.241
Scaridae	*Scarus quoyi*	0.06 ± 0.04	0 ± 0	0 ± 0	4.51	0.065	29.77 ± 17.1	0 ± 0	0 ± 0	4.51	0.066
Scaridae	*Scarus rivulatus*	0.21 ± 0.21	0.02 ± 0.02	0 ± 0	1.50	0.443	55.94 ± 55.94	5.59 ± 5.59	0 ± 0	1.50	0.437
Scaridae	*Scarus rubroviolaceus*	0 ± 0	0.04 ± 0.03	0 ± 0	0.00	1.000	0 ± 0	41.32 ± 28.58	0 ± 0	0.00	1.000
Scaridae	*Scarus schlegeli*	0.02 ± 0.02	0 ± 0	0.02 ± 0.02	0.00	1.000	5.21 ± 5.21	0 ± 0	5.21 ± 5.21	0.00	1.000
Scaridae	*Scarus spinus*	0.04 ± 0.04	0 ± 0	0 ± 0	1.51	0.666	10.78 ± 10.78	0 ± 0	0 ± 0	1.51	0.670
Scaridae	*Scarus tricolor*	0.02 ± 0.02	0.13 ± 0.07	0.02 ± 0.02	0.00	1.000	15.73 ± 15.73	94.39 ± 52.07	15.73 ± 15.73	0.00	1.000
Scombridae	*Grammatorcynus bilineatus*	0 ± 0	0.06 ± 0.03	0.08 ± 0.07	1.95	0.250	0 ± 0	50.55 ± 27.89	67.4 ± 52.58	1.95	0.254
Scombridae	*Gymnosarda unicolor*	0 ± 0	0.1 ± 0.1	0.06 ± 0.03	0.39	0.659	0 ± 0	685.9 ± 685.9	365.81 ± 205.38	0.39	0.672
Scombridae	*Scomberomorus commerson*	0 ± 0	0.08 ± 0.06	0.01 ± 0.01	0.08	0.892	0 ± 0	290.83 ± 201.13	48.47 ± 48.47	0.08	0.889
Serranidae	*Aethaloperca rogaa*	**0.19 ± 0.06**	**0.08 ± 0.04**	**0 ± 0**	**9.96**	**0.001**	**54.91 ± 18.65**	**22.37 ± 10.58**	**0 ± 0**	**9.96**	**0.001**
Serranidae	*Cephalopholis argus*	**0.33 ± 0.09**	**0.16 ± 0.06**	**0 ± 0**	**14.13**	**<0.001**	**95.94 ± 25.28**	**46.95 ± 18.76**	**0 ± 0**	**14.13**	**0.001**
Serranidae	*Cephalopholis boenak*	**0.25 ± 0.07**	**0.04 ± 0.03**	**0.01 ± 0.01**	**12.67**	**0.001**	**94.11 ± 27.75**	**15.68 ± 10.85**	**5.23 ± 5.23**	**12.67**	**<0.001**

Serranidae	*Cephalopholis cyanostigma*	0.01 ± 0.01	0.06 ± 0.05	0 ± 0	0.12	0.817	4.71 ± 4.71	21.19 ± 15.52	0 ± 0	0.12	0.819
Serranidae	*Cephalopholis microprion*	0.03 ± 0.02	0.05 ± 0.04	0.01 ± 0.01	0.25	0.677	14.04 ± 9.92	21.06 ± 17.18	5.61 ± 5.61	0.25	0.693
Serranidae	*Cephalopholis miniata*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	5.38 ± 5.38	0 ± 0	0.00	1.000
Serranidae	*Cephalopholis polleni*	0 ± 0	0.04 ± 0.04	0 ± 0	0.00	1.000	0 ± 0	16.84 ± 16.84	0 ± 0	0.00	1.000
Serranidae	*Cephalopholis sexmaculata*	0 ± 0	0.03 ± 0.02	0.03 ± 0.02	1.62	0.238	0 ± 0	16.34 ± 11.97	18.16 ± 12.83	1.62	0.241
Serranidae	*Cephalopholis sonnerati*	0.05 ± 0.03	0 ± 0	0 ± 0	3.07	0.216	48.69 ± 34.05	0 ± 0	0 ± 0	3.07	0.215
Serranidae	*Cephalopholis spiloparaea*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	2.28 ± 2.28	0 ± 0	0.00	1.000
Serranidae	*Cephalopholis urodeta*	0.13 ± 0.05	0.11 ± 0.06	0 ± 0	3.58	0.070	25.56 ± 11.09	23.43 ± 12.3	0 ± 0	3.58	0.052
Serranidae	*Diploprion bifasciatum*	0.13 ± 0.06	0.21 ± 0.09	0.17 ± 0.08	0.09	0.778	48.34 ± 23.53	77.6 ± 34.33	61.07 ± 30.53	0.09	0.778
Serranidae	*Epinephelus areolatus*	0.04 ± 0.04	0 ± 0	0.08 ± 0.07	0.43	0.658	120.12 ± 120.12	0 ± 0	240.24 ± 187.43	0.43	0.669
Serranidae	*Epinephelus bontoides*	0.01 ± 0.01	0.01 ± 0.01	0 ± 0	0.97	0.447	53.14 ± 53.14	39.86 ± 39.86	0 ± 0	0.97	0.443
Serranidae	*Epinephelus coioides*	0.04 ± 0.03	0.08 ± 0.06	0 ± 0	0.53	0.586	78.09 ± 54	143.16 ± 118.88	0 ± 0	0.53	0.537
Serranidae	*Epinephelus fasciatus*	0 ± 0	0.04 ± 0.03	0 ± 0	0.00	1.000	0 ± 0	12.58 ± 8.7	0 ± 0	0.00	1.000
Serranidae	*Epinephelus fuscoguttatus*	0.02 ± 0.02	0.04 ± 0.03	0 ± 0	0.51	0.732	93.9 ± 93.9	187.8 ± 129.87	0 ± 0	0.51	0.738
Serranidae	*Epinephelus macrospilos*	0.02 ± 0.02	0 ± 0	0 ± 0	1.51	0.669	64.07 ± 64.07	0 ± 0	0 ± 0	1.51	0.670
Serranidae	*Epinephelus malabaricus*	0.02 ± 0.02	0.02 ± 0.02	0 ± 0	0.76	0.662	379.72 ± 379.72	379.72 ± 379.72	0 ± 0	0.76	0.667

Serranidae	*Epinephelus merra*	0.04 ± 0.03	0 ± 0	0 ± 0	2.80	0.222	198.09 ± 145.06	0 ± 0	0 ± 0	2.80	0.219
Serranidae	*Epinephelus polyphekadion*	0 ± 0	0.02 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	13.56 ± 9.38	0 ± 0	0.00	1.000
Serranidae	*Epinephelus spilotoceps*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	6.51 ± 6.51	0 ± 0	0.00	1.000
Serranidae	*Gracila albomarginata*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	10.53 ± 10.53	0 ± 0	0.00	1.000
Serranidae	*Plectropomus areolatus*	0.02 ± 0.02	0.08 ± 0.05	0 ± 0	0.24	0.710	18.46 ± 18.46	67.7 ± 41.68	0 ± 0	0.24	0.706
Serranidae	*Plectropomus laevis*	0.01 ± 0.01	0 ± 0	0 ± 0	1.51	0.660	13.93 ± 13.93	0 ± 0	0 ± 0	1.51	0.662
Serranidae	*Plectropomus leopardus*	0.02 ± 0.02	0.02 ± 0.02	0 ± 0	0.76	0.669	5.58 ± 5.58	5.58 ± 5.58	0 ± 0	0.76	0.665
Serranidae	*Plectropomus maculatus*	0.01 ± 0.01	0.04 ± 0.04	0 ± 0	0.15	0.891	3.41 ± 3.41	10.23 ± 10.23	0 ± 0	0.15	0.893
Serranidae	*Plectropomus oligacanthus*	0.01 ± 0.01	0.14 ± 0.07	0 ± 0	0.05	0.863	11.73 ± 11.73	120.27 ± 59.85	0 ± 0	0.05	0.863
Serranidae	*Pseudanthias dispar*	0.71 ± 0.71	0 ± 0	0 ± 0	1.51	0.658	3.78 ± 3.78	0 ± 0	0 ± 0	1.51	0.670
Serranidae	*Pseudanthias huchtii*	0.02 ± 0.02	0.04 ± 0.04	0 ± 0	0.30	0.889	0.43 ± 0.43	0.86 ± 0.86	0 ± 0	0.30	0.895
Serranidae	*Pseudanthias pleurotaenia*	0 ± 0	0.11 ± 0.11	0 ± 0	0.00	1.000	0 ± 0	0.59 ± 0.59	0 ± 0	0.00	1.000
Serranidae	*Variola albimarginata*	0.02 ± 0.02	0.18 ± 0.08	0.04 ± 0.03	0.09	0.819	6.1 ± 6.1	52.88 ± 21.97	12.2 ± 8.44	0.09	0.807
Serranidae	*Variola louti*	0.16 ± 0.06	0.16 ± 0.07	0.1 ± 0.07	0.50	0.505	80.76 ± 28.46	79 ± 33.87	49.16 ± 33.23	0.50	0.485
Siganidae	*Siganus argenteus*	**0.44 ± 0.33**	**0.04 ± 0.04**	**0 ± 0**	**2.57**	**0.023**	**118.49 ± 90.19**	**11.28 ± 11.28**	**0 ± 0**	**2.57**	**0.021**
Siganidae	*Siganus canaliculatus*	0.01 ± 0.01	0 ± 0	0 ± 0	1.51	0.666	1.38 ± 1.38	0 ± 0	0 ± 0	1.51	0.667
Siganidae	*Siganus*	**0.16**	**0.1**	**0 ±**	**4.37**	**0.045**	**10.79**	**8.45 ±**	**0 ± 0**	**4.37**	**0.047**

	corallinus	**± 0.07**	**3 ± 0.06**	**0**			**± 4.77**	**4.19**			
Siganidae	*Siganus doliatus*	**0.15 ± 0.08**	**0 ± 0**	**0 ± 0**	**5.29**	**0.021**	**9.86 ± 5.22**	**0 ± 0**	**0 ± 0**	**5.29**	**0.022**
Siganidae	*Siganus guttatus*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	1.65 ± 1.65	0 ± 0	0.00	1.000
Siganidae	*Siganus puellus*	**0.26 ± 0.1**	**0.06 ± 0.04**	**0 ± 0**	**9.23**	**0.002**	**16.38 ± 6.13**	**3.54 ± 2.45**	**0 ± 0**	**9.23**	**0.003**
Siganidae	*Siganus punctatissimus*	0.08 ± 0.05	0.12 ± 0.09	0 ± 0	0.92	0.411	12.07 ± 7.43	18.66 ± 13.5	0 ± 0	0.92	0.409
Siganidae	*Siganus punctatus*	0.17 ± 0.08	0.13 ± 0.09	0 ± 0	2.92	0.138	24.33 ± 11.35	18.25 ± 13.36	0 ± 0	2.92	0.140
Siganidae	*Siganus vulpinus*	**0.24 ± 0.07**	**0.06 ± 0.04**	**0 ± 0**	**12.96**	**0.001**	**21.05 ± 6.08**	**4.81 ± 3.75**	**0 ± 0**	**12.96**	**<0.001**
Sphyraenidae	*Sphyraena barracuda*	0 ± 0	0 ± 0	0.03 ± 0.03	1.51	0.660	0 ± 0	0 ± 0	210.64 ± 210.64	1.51	0.666
Syngnathidae	*Choeroichthys brachysoma*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000
Syngnathidae	*Dunckerocampus pessuliferus*	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000	0 ± 0	0.01 ± 0.01	0 ± 0	0.00	1.000
Synodontidae	*Synodus variegatus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	0.59 ± 0.59	0 ± 0	0.00	1.000
Tetraodontidae	*Arothron caeruleopunctatus*	0.02 ± 0.02	0.05 ± 0.03	0.02 ± 0.02	0.00	1.000	24.69 ± 24.69	53.49 ± 30.88	24.69 ± 24.69	0.00	1.000
Tetraodontidae	*Arothron hispidus*	0.04 ± 0.03	0 ± 0	0 ± 0	3.13	0.221	58.64 ± 40.55	0 ± 0	0 ± 0	3.13	0.218
Tetraodontidae	*Arothron immaculatus*	0 ± 0	0 ± 0	0.01 ± 0.01	1.51	0.662	0 ± 0	0 ± 0	8.42 ± 8.42	1.51	0.670
Tetraodontidae	*Arothron mappa*	0.02 ± 0.02	0 ± 0	0.04 ± 0.03	0.51	0.732	21.04 ± 21.04	0 ± 0	42.07 ± 29.1	0.51	0.725
Tetraodontidae	*Arothron nigropunctatus*	0.02 ± 0.02	0.08 ± 0.05	0 ± 0	0.22	0.834	3.43 ± 3.43	13.71 ± 8.08	0 ± 0	0.22	0.683
Tetraodontidae	*Arothron*	0 ± 0	0 ±	0.0	1.51	0.662	0 ± 0	0 ± 0	66.25	1.51	0.668

	stellatus		0	2 ± 0.02					± 66.25		
Tetraodontidae	*Canthigaster amboinensis*	0 ± 0	0.03 ± 0.03	0 ± 0	0.00	1.000	0 ± 0	10.83 ± 10.83	0 ± 0	0.00	1.000
Tetraodontidae	*Canthigaster valentini*	0 ± 0	0.11 ± 0.07	0 ± 0	0.00	1.000	0 ± 0	1.29 ± 0.76	0 ± 0	0.00	1.000
Tetraodontidae	*Lagocephalus sceleratus*	0 ± 0	0.02 ± 0.02	0 ± 0	0.00	1.000	0 ± 0	15.36 ± 15.36	0 ± 0	0.00	1.000
Toxotidae	*Toxotes jaculatrix*	0.05 ± 0.03	0 ± 0	0 ± 0	3.07	0.225	7.68 ± 5.37	0 ± 0	0 ± 0	3.07	0.225
Zanclidae	*Zanclus cornutus*	**0.82 ± 0.16**	**0.77 ± 0.16**	**0.26 ± 0.12**	**6.91**	**0.011**	**32.37 ± 6.5**	**30.58 ± 6.24**	**10.42 ± 4.74**	**6.91**	**0.008**

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