

Pacific Reef Assessment and Monitoring Program

Data Report

Ecological monitoring 2014 – stationary point count surveys of reef fishes and benthic habitats of the Northwestern Hawaiian Islands, Mariana Islands, and Wake Atoll

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This report provides results from stationary point count (SPC) coral reef fish and benthic habitat monitoring surveys conducted by the National Oceanic and Atmospheric Administration (NOAA) Pacific Islands Fisheries Science Center's Coral Reef Ecosystem Division in 2014. This includes the following regions: Northwestern Hawaiian Islands, Mariana Islands, and Wake Atoll in the Pacific Remote Island Areas.

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Acronyms

CRED	Coral Reef Ecosystem Division
CRCP	Coral Reef Conservation Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
Pacific RAMP	Pacific Reef Assessment and Monitoring Program
SPC	Stationary Point Count
PMNM	Papahānaumokuākea Marine National Monument
PRIA	Pacific Remote Island Areas

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Introduction

Background

The Coral Reef Ecosystem Division (CRED) established a long-term monitoring program, known as the Pacific Reef Assessment and Monitoring Program (Pacific RAMP) in 2000. Pacific RAMP, which is supported by the National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Conservation Program (CRCP), is tasked with documenting and understanding the status and trends of coral reef ecosystems in the U.S. Pacific. Pacific RAMP monitors reef areas in the following regions: the Hawaiian and Mariana Archipelagos, American Samoa, and the Pacific Remote Island Areas (PRIA), which include the atolls of Johnston and Wake and the U.S. Line and Phoenix Islands (Figure 1).



Figure 1 Coral reef areas surveyed by NOAA-CRED for Pacific RAMP. White areas represent the exclusive economic zones for each U.S. Pacific region surveyed.

Pacific RAMP involves interdisciplinary monitoring of oceanographic conditions and biological surveys of organisms associated primarily with hard-bottomed habitats in the 0–30 m depth range. From 2000–2011, regions were surveyed on a biennial basis and in 2012 Pacific RAMP changed to a triennial cycle, as part of the implementation of NOAA's National Coral Reef Monitoring Plan (NCRMP) that is funded by NOAA CRCP.

The NCRMP aims to support integrated, consistent and comparable monitoring of coral reefs across all U.S.-affiliated regions. Partnership and cooperation with other federal and jurisdictional management groups is a core principle of the

NCRMP and Pacific RAMP. For example, NOAA’s Papahānaumokuākea Marine National Monument (PMNM) conducts a subset of coral reef monitoring surveys in the Northwestern Hawaiian Islands using a similar survey design and methods, and with considerable overlap in observers. Data gathered by PMNM is therefore readily merged with data gathered specifically for NCRMP by CRED. The supplemental data are included with data shown in this report.

The NCRMP has three themes: biological, climate and socioeconomic monitoring. Under the biological monitoring theme, the Pacific RAMP collects the following benthic and reef-associated fish data: fish and coral demographic information (species, size, abundance, biomass, disease (coral only), bleaching (coral only)); and information on benthic composition and key species (see [Appendix 1: Pacific RAMP data types collected for the biological theme of the NCRMP](#)). The focus of this report is the data collected using the stationary point count method (SPC) to survey the fish assemblage and rapid visual assessments of benthic composition (see [Section: Methods](#)). Additional, related fish and benthic data are collected via benthic transects and towed-diver surveys (for more information see NCRMP 2013); these data will be reported in a forthcoming series of complementary data reports.

Monitoring scope and historical programmatic changes

Pacific RAMP includes the following biological monitoring objectives:

- Gather information on and document the status and trends of coral reef fishes and benthic assemblages in the U.S. Pacific;
- Provide information on status and trends of coral reef taxa of ecological and economic importance;
- Generate data suitable for tracking and assessing changes in reef assemblages in response to human, oceanographic, or environmental stressors; and
- Generate data suitable for evaluating the effectiveness of specific management strategies, and to support appropriate adaptive management.

These objectives are based on the key monitoring questions for NCRMP and the CRCP support for baseline observations and monitoring (refer to NOAA CRCP 2013 and NOAA CRCP 2009 for more details).

Pacific RAMP involves monitoring over very large spatial scales: ~40 islands and atolls spread over thousands of kilometers. The target of Pacific RAMP biological monitoring under NCRMP is to provide snapshot assessments of coral reef assemblages at U.S.-affiliated islands in the Pacific, with the core reporting unit being at the island level (or sub-island scale for some of the large islands), and as such the survey design and effort are optimized to generate data at the spatial scale of islands and atolls. The NCRMP is therefore explicitly a “wide-but-thin” survey program, with the aim of generating large-scale, regional status and trend information of the Nation’s shallow water (0–30 m) coral reef ecosystems, in order to provide broad-scale context and perspective to local jurisdictions and other survey programs.

Additional surveys at smaller spatial scales that are intended to address more local information needs are also occasionally performed by CRED, but are not a part of Pacific RAMP. For instance, in September 2014 extra surveys were conducted in the Manell-Geus watershed in Guam as part of a NOAA Habitat Blueprint project, the results of which will be available in a forthcoming technical report.

In 2012, Pacific RAMP changed from surveying regions once every two years, to once every three years. The sampling design and methods used to monitor coral reef fish species and habitats for Pacific RAMP have also evolved over time.

More specifically, from 2000–2006 surveys were conducted at haphazardly located permanent sites using various belt transect methods. During 2007–2009, CRED and PMNM conducted comparative reef fish surveys using both the belt transect and the stationary point count (SPC) methods, and incorporated a stratified random sampling survey design. Survey replication (i.e., the number of sites sampled) greatly increased over this period and this higher level of replication has since been maintained ([Appendix 2: Surveys per region per year and method used](#)). Following this methods calibration period, from 2009 onwards the SPC method and depth-stratified random sampling were applied routinely in Pacific RAMP for surveying reef fish and associated benthic communities.

Report structure

This report summarizes a subset of the reef fish and benthic survey data collected by the Coral Reef Ecosystem Division for Pacific RAMP and for compatible PMNM, National Marine Fisheries Service (NMFS) and CRCP survey missions in 2014. Over that time period, surveys were conducted in the following regions: the Pacific Remote Island Areas, the Mariana Archipelago, and the Northwestern Hawaiian Islands. The status of reefs in each region is first described in the wider Pacific context ([Section: U.S. Pacific reefs status](#)) and then at the island scale for each of the regions ([Section: Island status and trends](#)). Given the substantial changes in methods and design, this report specifically focuses on examining the observations collected since 2009, which only includes the subset of Pacific RAMP data that were collected using the SPC method under the depth-stratified random sampling design. In the final section, the publications that were produced in 2014 as a result of those surveys are listed; these publications either use the Pacific RAMP fish data or were co-authored by members of the CRED fish team and relevant to Pacific RAMP fish ecological monitoring work. All data used in this report along with other biological and climate-monitoring data collected by CRED for Pacific RAMP are available upon request (See [Contact us](#)).

Methods

Sampling domain and design

The target sampling domain for the SPC fish and benthic surveys is hardbottom habitat in water shallower than 30 m. All islands / atolls within regions are stratified by reef zone (backreef, forereef, lagoon) and depth zone: shallow (0–6 m), mid (6–18 m), and deep (18–30 m). For the large majority of cases, entire islands or atolls are stratified by habitat and depth as described above, however, for populated large islands or where large portions of an island are under fundamentally different levels of management (e.g., inside or outside marine protected areas), there is an additional level of stratification based on “sector” (section of coastline and /or management status). Specifically, Guam is subdivided into three sectors: “Marine Preserve” (all areas within Guam’s Marine Preserve System); “Guam Open East” (areas outside of Marine Preserves on the east side of Guam); and “Guam West” ([Appendix 3: Sectors maps](#)). Furthermore, the generally larger, main Hawaiian Islands are divided into between 2 and 7 sectors per island, with sector boundaries designed to reflect broad differences in oceanographic exposure, reef structure, and local human population density ([Appendix 3: Sectors maps](#)). Finally, some of the smaller, more closely spaced islands are always pooled into single reporting and sampling units (i.e., Alamagan, Guguan and Sarigan in the Mariana Archipelago; Tutuila and Aunu’u, Ofu and Olosega in American Samoa; and Ni’ihau and Lehua in the main Hawaiian Islands). Due to their small size, these island groups are only ever allocated a limited number of sea days per cruise, and therefore total sampling effort

per island is inadequate to report data at the island level. Table 1 contains a summary of sampling terms and definitions, while details of the sectors and sampling effort on survey cruises covered by this report are given in [Appendix 4](#).

Term	Definition
Sample site data	The average values of estimated observed quantities from the SPC surveys conducted at each site. Typically derived from a single pair of simultaneous surveys. Sites are tied to geographic coordinates.
Reporting unit	A collection of sample sites, typically an island or atoll, and in some cases small island groups or sectors of larger islands.
Sampling domain	Hardbottom habitat in water less than 30 m depth.
Strata	Reef zone (backreef, forereef, lagoon) Depth zone (shallow 0–6 m ¹ , mid 6–18 m, deep 18–30 m) Sectors (e.g., management units ² and stretches of coastline with broadly similar habitat attributes and local human population density ³).

Table 1 Sampling terms and definitions. ¹ For practical reasons, sites in which the centerpoint of the survey cylinder is shallower than 1.5 m are not surveyed. ² For the island of Guam only. ³ Currently only in the main Hawaiian Islands and Guam.

Site selection

Prior to each survey mission, sample site locations are randomly drawn from geographic information system (GIS) habitat and strata maps (Figure 2). That is, the latitude and longitude of site locations are randomly drawn from a map of the entire sampling domain.

Maps used in the site selection procedure were created using information from the NOAA National Centers for Coastal Ocean Science, reef zones (e.g., forereef) digitized from IKONOS satellite imagery or nautical charts, bathymetric data from the CRED-affiliated Pacific Islands Benthic Habitat Mapping Center, University of Hawai‘i at Mānoa, and prior knowledge gained from previous visits to survey locations.

During cruise planning, logistic and weather conditions factor into the allocation of monitoring effort around each island or atoll. Prior to the cruises, these constraints determine the area of target habitat from which sites are randomly selected; for instance, one side of an island may be deemed unsurveyable given seasonal wave conditions or CRED’s allocation of sea days aboard the NOAA research vessel may curtail the time spent in a particular area. The density of sites that are sampled per stratum is therefore determined by proportionally allocating effort (e.g., the number of sites to be surveyed) based on a weighting factor calculated from the area per stratum per reporting unit and the variance of the target output metrics (e.g., consumer group biomass and total fish biomass; see [Section: Fish groupings](#)), combined with what is feasible given the time constraints of ship time allotted per island or atoll.

During field operations on a research cruise, if a site is not suitable (e.g., soft- as opposed to hard-bottomed habitat) or accessible (e.g., due to inclement sea conditions), the dive is aborted and an alternate (backup) site is picked from the randomized list. In some cases, the spatial coverage of sampling sites around the entire area of target sampling domain is incomplete. As such, any inferences about coral reef fish assemblages and habitat made at the island-scale are clearly only representative of the areas surveyed ([Appendix 4:](#)). For further details on the methods and maps used to select sites see Williams et al. (2011) or the Coral Reef Ecosystem Division Standard Operating Procedures: Data Collection for Rapid Ecological Assessment Fish Surveys (Ayotte et al. 2011).

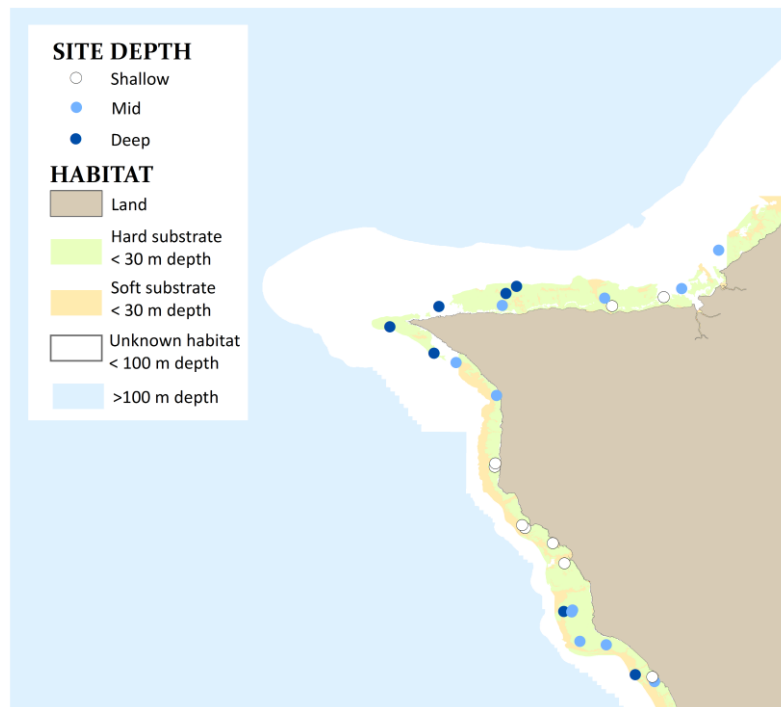


Figure 2 An example of the benthic habitat and depth strata information used in the site selection process. Reef fish survey sites are randomly selected within each depth stratum. Reef fish survey effort is allocated to optimize island-scale biomass estimates. Prior to surveying, a series of primary sites are selected, each circle identifies a site which falls on hard substrata (green) in the three depth strata (see map legend, shallow: 0–6 m, mid: 6–18 m and deep: 18–30 m). An alternate set of depth-stratified sites are also generated in the event that primary sites are not suitable or accessible.

Sampling methods

At each reef fish survey site two types of data are collected, visual counts of the fish assemblage and surveys of the benthic habitat.

Counting and sizing reef fishes

The SPC protocol closely follows that used by Ault and colleagues (Ault et al. 2006) and involves a pair of divers conducting simultaneous counts in adjacent, visually estimated 15-m-diameter cylindrical plots extending from the substrate to the limits of vertical visibility ([Figure 3](#)). Prior to beginning each SPC pair, a 30-m line is laid across the substratum. Markings at 7.5 m, 15 m and 22.5 m enable survey divers to locate the midpoint (7.5 m or 22.5 m) and two edges (0 m and 15 m; or 15 m and 30 m) of their survey plots. Each count consists of two components. The first of these

is a 5-min species enumeration period in which the diver records the taxa of all species observed within their cylinder. At the end of the 5-min period, divers begin the tallying portion of the count, in which they systematically work through their species listing and record the number and estimated size (total length, TL, to the nearest cm) of each individual fish. The tallying portion is conducted as a series of rapid visual sweeps of the plot, with one species-grouping counted per sweep. To the extent possible, divers remain at the center of their cylinders throughout the count. However, small, generally site-attached and semi-cryptic species, which tend to be underrepresented in counts made by an observer remaining in the center of a 7.5-m-radius cylinder, are left to the end of the tally period, at which time the observer swims through their plot area carefully searching for those species. In cases where a species is observed during the enumeration period but is not present in the cylinder during the tallying period, divers record their best estimates of size and number observed in the first encounter during the enumeration period and mark the data record as “noninstantaneous.” Surveys are not conducted if horizontal visibility is < 7.5 m, i.e., when observers cannot distinguish the edges of their cylinder (see Ayotte et al. 2011). Biomass per fish is then calculated using the standard length-weight equation. Data from the two adjacent SPC surveys are averaged to create a biomass estimate for each site ([Section: Data handling](#)), in cases where more than one SPC paired survey is conducted, data from matched members of each pair are first averaged before pair-specific results are averaged to create site estimates.

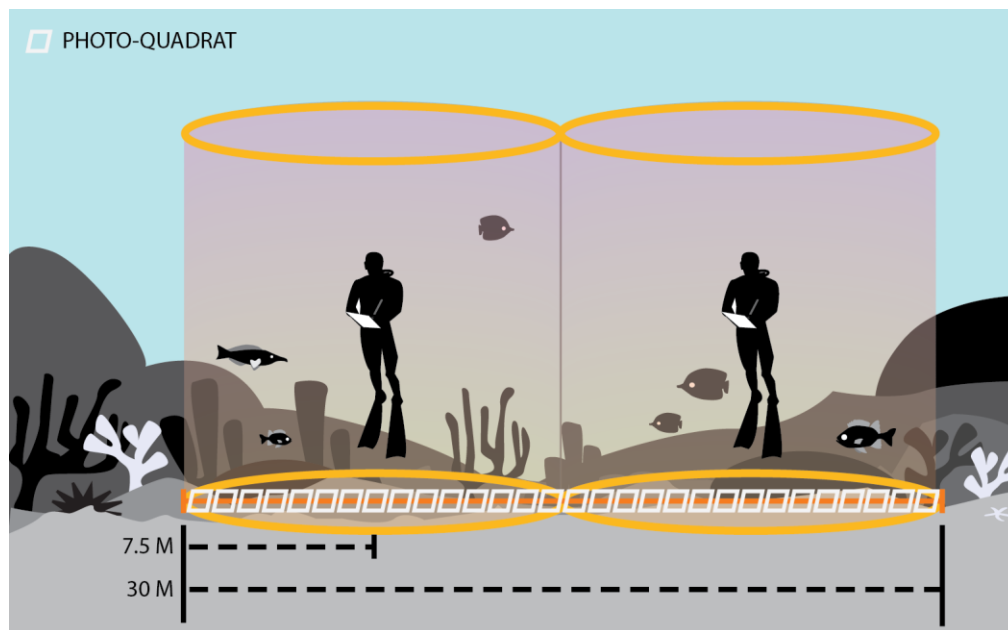


Figure 3 Side view of the stationary point count method. Dive partners count and size fishes within adjacent cylinders measuring 7.5 m in radius. Once the fish survey is complete, divers estimate benthic habitat composition and a benthic photo-transect is collected, spanning the two cylinders.

Assessing benthic habitat characteristics

Two complementary methods are used to assess benthic composition within the same area where fish are surveyed. The first involves divers conducting a rapid visual assessment of the percentage cover of major functional categories of benthic cover and the second involves collecting photo-quadrat images of the benthos taken along the survey transect line that are later analyzed (Figure 3). The rapid visual assessment method provides a coarse but immediate estimate of benthic composition. In contrast, the photo-quadrat surveys provide estimates of benthic composition at a higher

taxonomic or functional resolution, but only after substantial post-survey data processing. As with the fish data, benthic data from the two adjacent SPC surveys are averaged to create an estimate per site.

Benthic visual assessment

After completing the fish survey, both divers scan the benthos in their survey cylinder for 2–3 min and visually estimate the percentage cover of each of: encrusting algae, fleshy macro algae, hard coral, turf algae, sand and soft coral. Divers also estimate the slope, broad habitat type and structural complexity (Ayotte et al. 2011). Divers record reef habitat complexity by visually estimating the percentage of the cylinder that falls into the following levels of vertical relief: <0.20 m, 0.20–0.50 m, 0.50–1.00 m, 1.00–1.50 m, and >1.50 m. The abundance of free (e.g., *Tripneustes*, *Heterocentrotus*, *Diadema* and *Echinothrix*) and boring (e.g., *Echinometra* and *Echinostephus*) urchins is also rapidly visually assessed and recorded on a DACOR scale (Dominant, Abundant, Common, Occasional, Rare). Finally divers identify the broad-scale habitat type for the general area of the survey. The habitat classification scheme follows the geomorphological structures as identified by the Biogeography Branch of the NOAA National Ocean Service National Centers for Coastal Ocean Science. The coral reef and hardbottom habitat types are: aggregate reef, individual patch reef, aggregated patch reefs, spur and groove, pavement, pavement with sand channels, pavement with patch reefs, reef rubble, sand with scattered coral/rock and rock / boulder (Kendall and Poti 2011).

Photo-quadrat survey

With the fish survey and rapid benthic visual assessment completed, one diver takes photographs of the benthos at 1 m intervals along the transect line (30 photographs per site) (Figure 3). A 1 meter PVC stick is used to position a digital camera (Canon PowerShot SD1200 IS, 10.0 megapixel) directly above the substrate to frame an area of ~0.7 m² per photograph. These images are archived for future analysis.

Our primary benthic assessment method is the photo-quadrat survey because it is a proven standard method that allows benthic composition to be identified to a higher resolution. However, due to a lag in analyzing the photo-images, only the visual assessment data are shown in this report and we do not use the rapid visual assessment to infer trends in benthic cover over time. Photo-quadrat data and benthic trends will be available in future reports.

Data entry and storage

Data were entered into a Microsoft Access database. Upon completion of the monitoring cruise, all data were migrated to an Oracle database that is stored on a server at the Pacific Islands Fisheries Science Center.

Data quality control

Data quality control is implemented at three main stages:

- Ongoing routine training of observers (Figure 4 Pre-field, [Appendix 5: Quality control](#)).
- Checking for errors at the data entry stage (Figure 4 In the field). This occurs on the cruise when observers check the data entered by their dive partner against their datasheet for typing and potential sizing errors. At the

end of the cruise, a series of error checking scripts are run prior to migrating from the data entry database (Access) to the storage database (Oracle) (Figure 4 Post field).

- Examining diver estimation accuracy. This occurs during and after the monitoring cruise when diver estimates are compared between dive partner pairs (Figure 4 In the field). Observer comparisons from the regions surveyed in 2014 are in [Appendix 5.2](#) Observer cross-comparison.

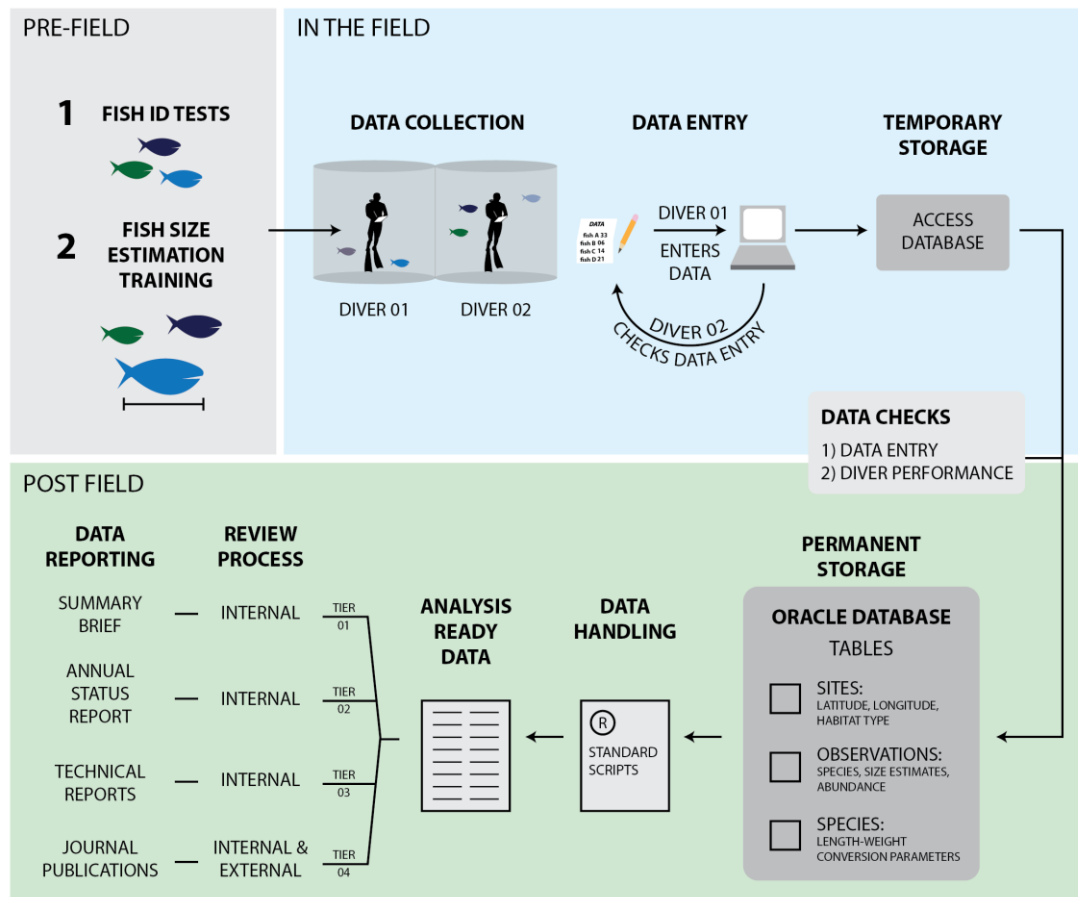


Figure 4 The training, data collection, data processing and reporting phases for Pacific RAMP fish and benthic surveys.

Data handling

Calculating fish biomass and benthic cover estimates per site

Using the count and size estimate data collected per observer in each replicate survey, the body weight of individual fish is calculated using length-to-weight (LW) conversion parameters, and, where necessary, length-length (LL) parameters (for example, to convert TL to fork length [FL] for species with LW parameters based on FL). LW and LL conversion parameters were taken from FishBase (Froese and Pauly 2010, Kulbicki et al. 2005; [Appendix 6: Species list](#)). Herein the term “biomass” refers to the aggregate body weight of a group of fishes per unit area (g m^{-2}). Site is the base sample unit and the estimated biomass of fishes per site is calculated by taking the mean values from the paired SPC surveys. Similarly the mean percentage cover estimates per benthic functional group and complexity measures are calculated as site level means.

Fish groupings

In this report, species data are summarized at three different levels: consumer group, size class, and total fish biomass (“all fishes”). Consumer groups are: “primary consumers” (herbivores and detritivores); “secondary consumers” (omnivores and benthic invertivores); “planktivores”; and “piscivores,” with classifications based on diet information taken largely from FishBase (Froese and Pauly, 2010; [Appendix 6: Species list](#)). The size classes used are 0–20, 20–50 and >50 cm TL.

Generating island-scale estimates from the stratified design

Summary statistics (e.g., mean and variances) of survey quantities, e.g., biomass, are calculated by first averaging values within each stratum before calculating the reporting unit values. A weighted average method to calculate summary statistics is used because survey strata vary in size within each reporting unit.

Estimates of the mean and variance for each survey quantity considered are calculated based on the observed values at sampled sites within each stratum. Then aggregate estimates of the quantities across all strata are calculated using the formulas below. For example, with respect to biomass we have:

(1) pooled mean biomass (X) across S strata: $X = \sum_1^S (X_i * w_i)$ and;

(2) pooled variance of mean biomass (VAR) across S strata: $VAR = \sum_1^S (VAR_i * w_i^2)$

where X_i is the estimate of mean biomass within stratum i , VAR_i is the estimated variance of X_i and w_i is the stratum-weighting factor. Strata weighting factors were based on the size of strata, i.e., if a stratum is 50% of the total area in an island then its weighting factor will be 0.5, and total of all weighting factors in an island sums to 1 (Smith et al. 2011).

In this report, only data from sites surveyed under the stratified sampling design are used, i.e., data collected from 2009 onwards; [Appendix 7](#): Random stratified sites surveyed at each island per year. In the few cases where less than 2 sites were surveyed in a stratum in a reporting period, these sites were removed from the island-scale parameter estimates for that period.

To assess Pacific-wide patterns in reef fish assemblages, statistics of total fish biomass (i.e., all fishes) and biomass within each consumer group and size class (mean and variance) are calculated per island per year and then averaged across years. In the section on U.S. Pacific reefs, summary graphs and metrics were generated from data collected since 2009 (see [Section: U.S. Pacific reefs status](#)).

Island-scale values for total fish biomass (i.e., all fishes) and biomass per consumer group and size class (mean and variance) are calculated by year (see [Section: Island status and trends](#)). Thus far, the time series under the stratified sampling design is too short to infer temporal trends¹.

All data handling and analyses were performed using raw site data extracted from the NOAA CRED Oracle database, processed using a set of routine processing scripts written in R (R Development Core Team 2011) (Figure 4 post field), and visualized using the ggplot2 package. The site level data used to generate all figures and summary statistics are reported in [Appendix 8](#): Site level data.

¹ Since the towed diver survey method has not changed since 2002, these data can be used to assess temporal trends in large fish (> 50 cm total length). These data are available upon request: nmfs.pic.credinfo@noaa.gov

U.S. Pacific reefs status

This section summarizes variation in reef fish community biomass across the following U.S. Pacific island regions; American Samoa, the main and Northwestern Hawaiian Islands, the Mariana Archipelago and the Pacific Remote Island Areas. The islands and atolls in the regions surveyed span broad biogeographic, geologic, oceanographic and human-impact gradients. Thus, patterns in the biological community will be influenced by a combination of these factors. There will also be within island habitat variability that affects the reef fish assemblages surveyed. For instance, several islands have a variety of habitat types, including forereef, lagoon, and backreef habitats and for the purpose of this pan-Pacific comparison, only forereef data are presented.

At the region scale, the highest mean total fish biomass was recorded in the Pacific Remote Island Areas (mean \pm standard error: $143 \pm 7.1 \text{ g m}^{-2}$), followed in decreasing order by the Northwestern Hawaiian Islands ($126 \pm 7.1 \text{ g m}^{-2}$), the northern Mariana Archipelago ($71 \pm 4.7 \text{ g m}^{-2}$), American Samoa ($46 \pm 2.1 \text{ g m}^{-2}$), the main Hawaiian Islands ($26 \pm 1 \text{ g m}^{-2}$), and the southern Mariana Archipelago ($19 \pm 0.8 \text{ g m}^{-2}$) (Figure 5 All fishes). Fish biomass is summarized by consumer group and size class in Figures 5 and 6 and Table 2). The regional mean (\pm standard error) values for total fish biomass and biomass per size class that are reported in this section are plotted as reference points for visual comparison in the following [Island status and trends](#) section.

Consumer groups

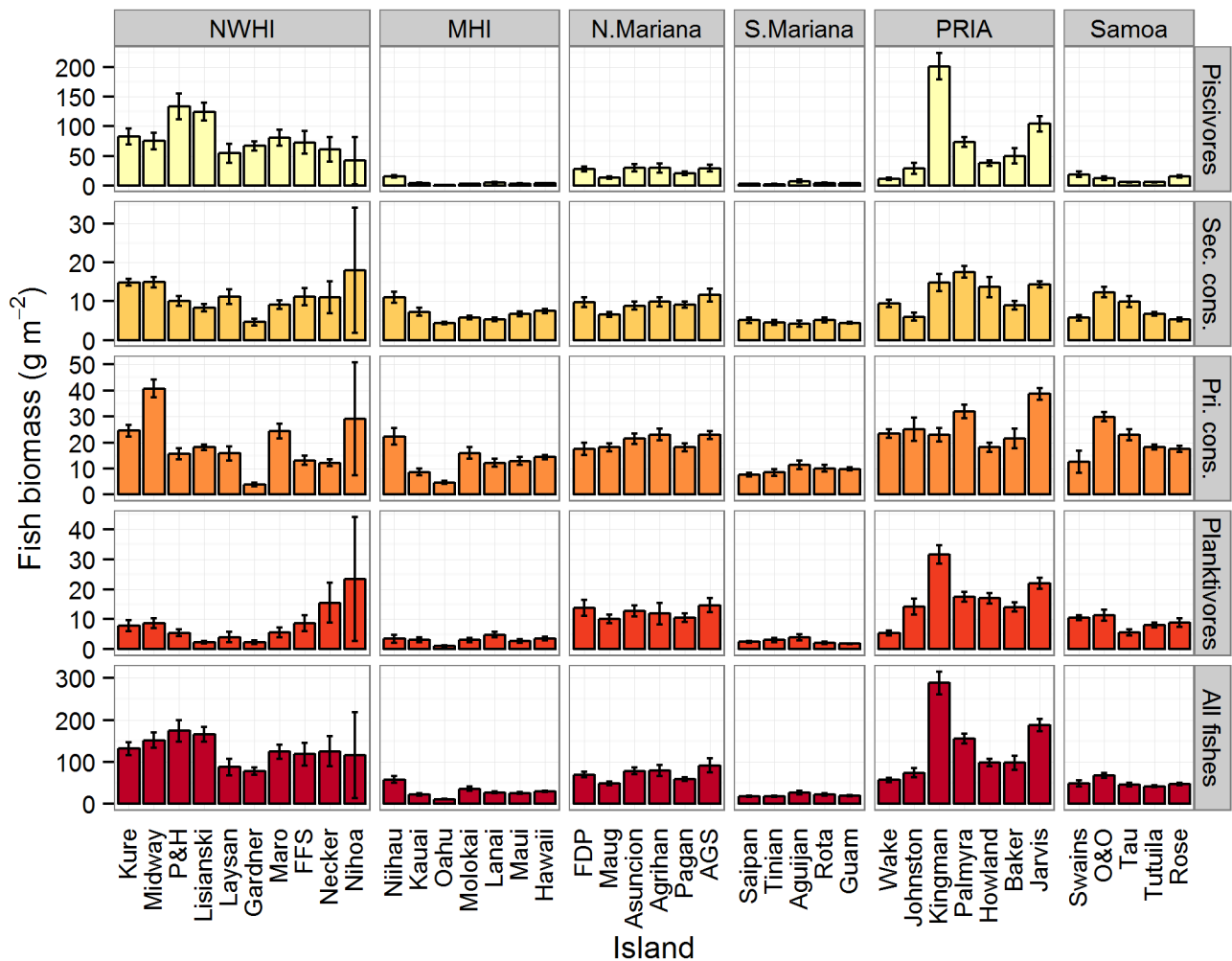


Figure 5 Mean fish biomass (g m^{-2}) by consumer group per U.S. Pacific reef area. Mean fish biomass (\pm standard error) per consumer group per reef area pooled across survey years (2009–2014). Islands are ordered within region by latitude. See [Appendix 6](#) for the species per consumer group classification scheme. See [Appendix 4](#) and [Appendix 7](#) for the sampling density per strata at each island by year and [Appendix 8](#) for the site level data used to produce the graph. NWHI = Northwestern Hawaiian Islands, MHI = main Hawaiian Islands, N.Mariana = northern Mariana Archipelago, S. Mariana = southern Mariana Archipelago, PRIA = Pacific Remote Island Areas, Samoa = American Samoa, Sec.consumers = secondary consumers (invertivores), Pri. Consumers = primary consumers (herbivores).

Size classes

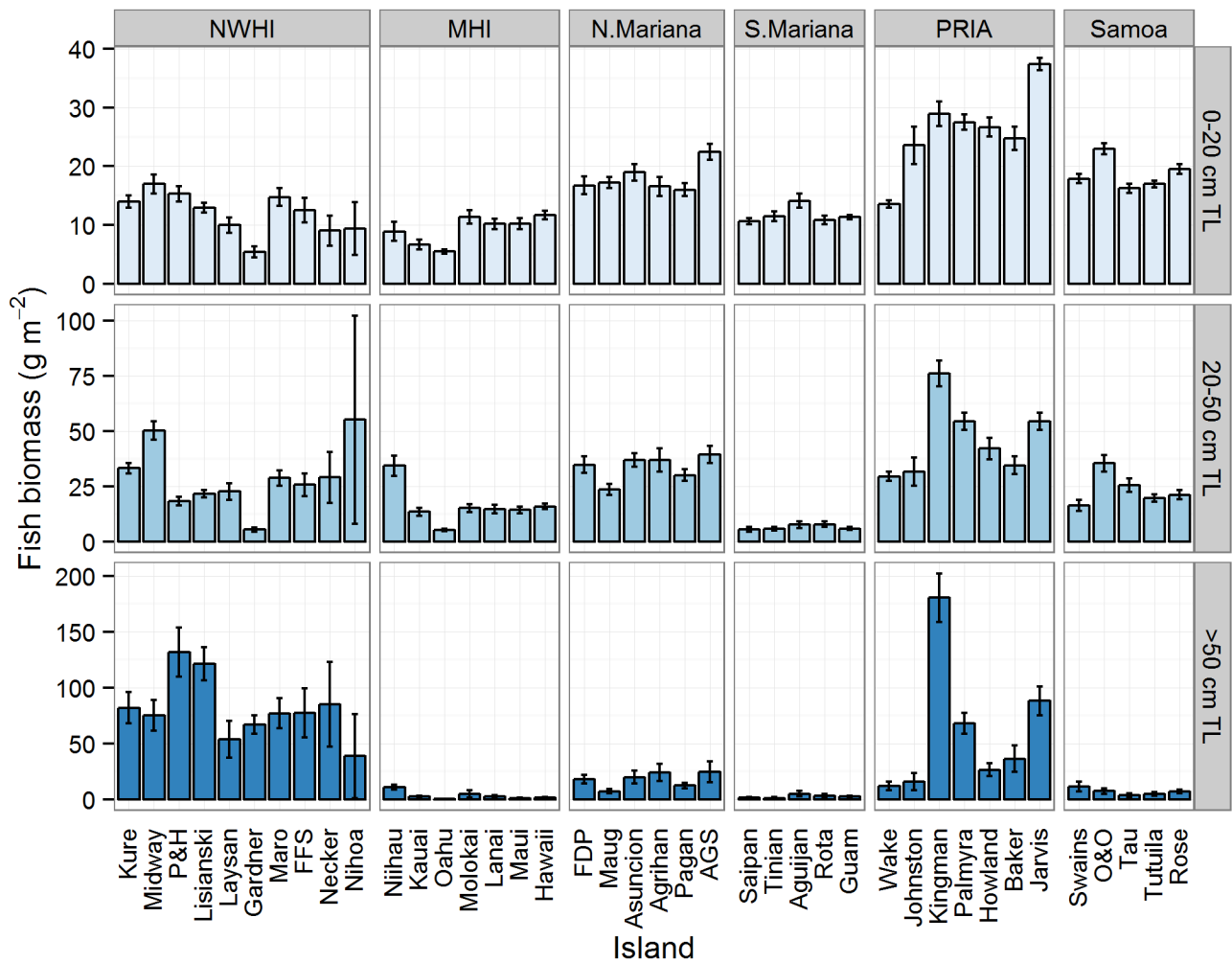


Figure 6 Mean fish biomass (g m^{-2}) per size class per U.S. Pacific reef areas. Mean fish biomass (\pm standard error) per size class (0–20 cm, 20–50 and > 50 cm in total length (TL)) per reef area pooled across survey years (2009–2014). Islands are ordered within region by latitude. See [Appendix 4](#) and [Appendix 7](#) for the sampling density per strata at each island by year and [Appendix 8](#) for the site level data. NWHI = Northwestern Hawaiian Islands, MHI = main Hawaiian Islands, N.Mariana = northern Mariana Archipelago, S. Mariana = southern Mariana Archipelago, PRIA = Pacific Remote Island Areas, Samoa = American Samoa, TL = total length.

Table 2 Mean fish biomass (g m⁻²) with standard error in parentheses for all fish biomass, biomass per consumer group and per size class for forereef habitat. NWHI = Northwestern Hawaiian Islands, MHI = main Hawaiian Islands, N.Mariana = northern Mariana Archipelago (Farallon de Pajaros down to Sarigan), S. Mariana = southern Mariana Archipelago (Saipan, Tinian, Aguijan, Rota, and Guam), PRIA = Pacific Remote Island Areas, Samoa = American Samoa, Sec.consumers = secondary consumers, Pri. Consumers = primary consumers, TL = total length.

Region	Sites ¹	All fishes	Piscivores	Sec. consumers	Pri. consumers	Planktivores	0–20 cm TL	20–50 cm TL	> 50 cm TL
NWHI	459	125.7 (7.1)	90.7 (5.9)	8.3 (0.5)	15.7 (0.8)	4.3 (0.5)	11.4 (0.5)	20.1 (1.1)	89.2 (5.9)
MHI	621	26.3 (1.3)	3.8 (0.3)	6.6 (0.4)	11.5 (0.7)	2.7 (0.3)	8.6 (0.5)	14.1 (0.8)	2.6 (0.6)
N.Mariana	376	70.7 (4.7)	24.4 (2.3)	9.6 (0.5)	20.4 (0.8)	11.9 (1.1)	17.7 (0.6)	33.5 (1.8)	17.4 (2.8)
S.Mariana	496	19.5 (0.8)	3.1 (0.4)	4.7 (0.2)	9.2 (0.4)	2.2 (0.1)	11.2 (0.3)	6.0 (0.4)	2.2 (0.5)
PRIA	418	143.3 (7.1)	71.6 (5.2)	14.3 (0.8)	29.1 (1.6)	17.4 (1)	26.7 (0.9)	49.4 (2.4)	62.8 (5.6)
Samoa	437	45.8 (2.1)	7.1 (0.6)	7.8 (0.4)	20.0 (0.7)	8.2 (0.6)	17.7 (0.4)	22.2 (1.3)	5.1 (1.1)

¹ The number of forereef sites surveyed during 2009–2014.

Island status and trends

This section summarizes data collected at each island in 2009–2014. For each island within region, maps illustrate the site level data from the past and most recent surveys and a standard set of graphs show summary information on the fish and benthic community at the island scale. On each fish biomass graph, a reference line indicates the regionwide mean estimate, provided as a relevant regional comparison for island-level estimates.

Northern Mariana Islands

Alamagan, Guguan, and Sarigan Islands (AGS)

Alamagan, Guguan, and Sarigan Islands were surveyed in 2009 ($n = 19$), 2011 ($n = 24$), and 2014 ($n = 33$). These islands are treated as a single reporting unit, as per our survey design (See Methods Sampling domain and design section).

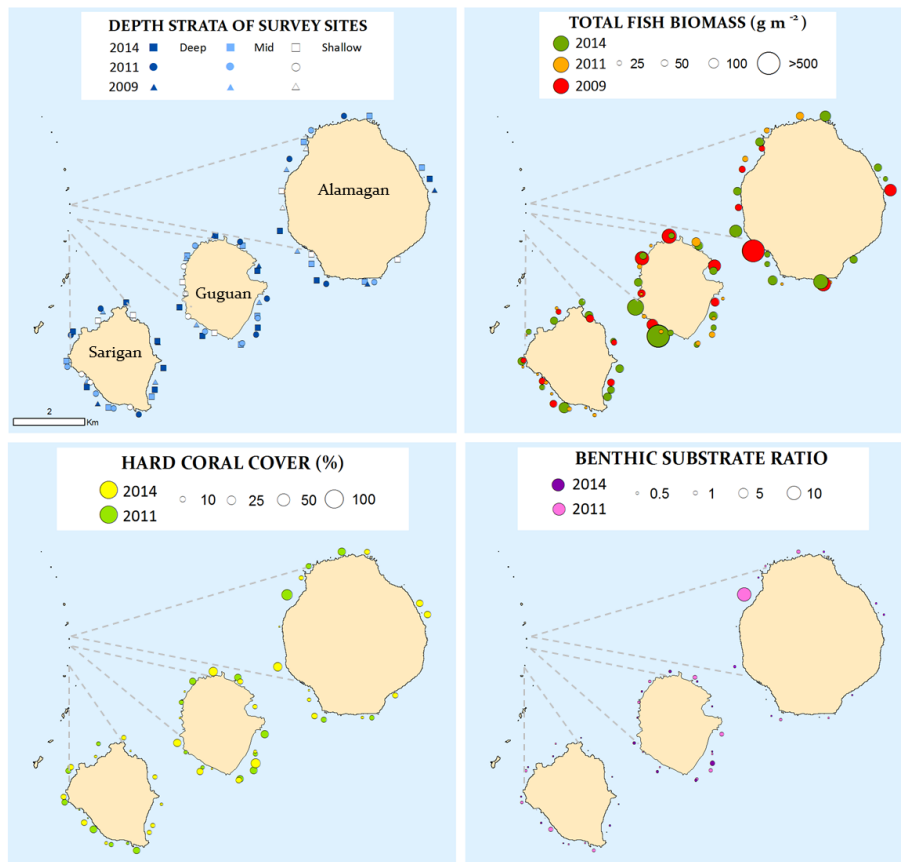


Figure 7 Alamagan, Guguan, and Sarigan Islands site survey data 2009, 2011 and 2014 identified by depth strata (top left). Total fish biomass recorded at each site per year (top right). Hard coral cover (%) assessed by rapid visual assessment (bottom left). Benthic substrate ratio (hard coral plus encrusting algae / turf and macroalgae) (bottom right). This ratio indicates the balance between the benthic components that contribute to reef accretion (coral and crustose coralline algae) compared to fleshy macroalgae and turf algae that compete for space on a reef.

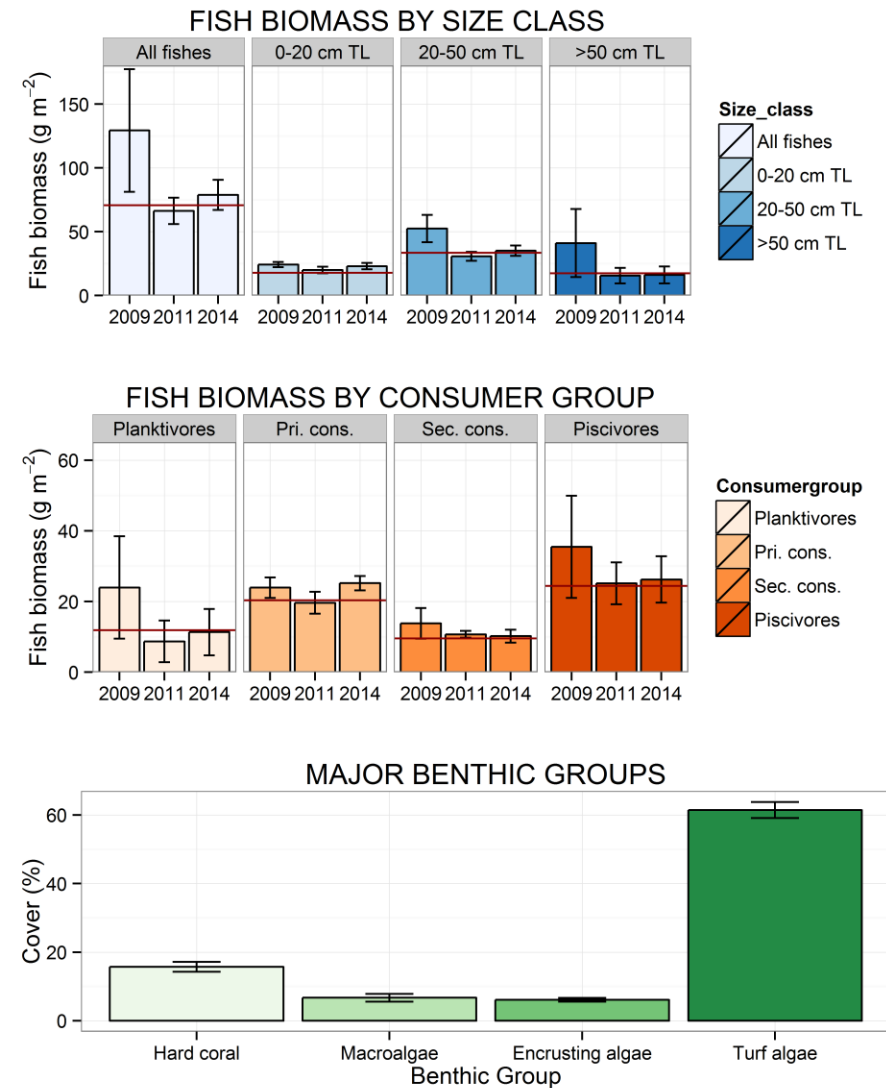
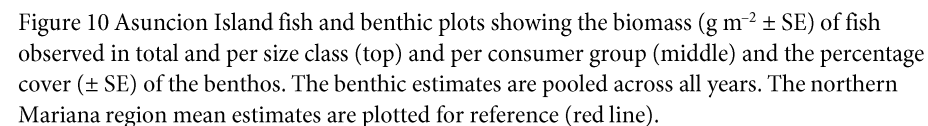
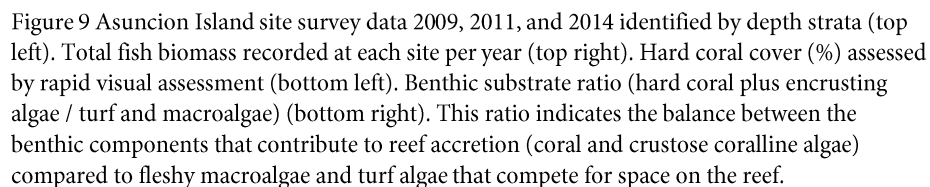
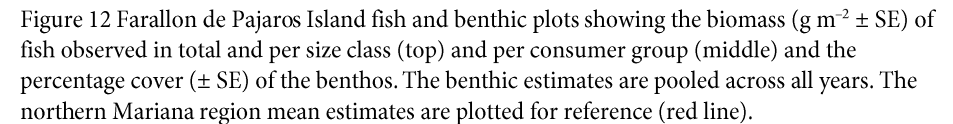
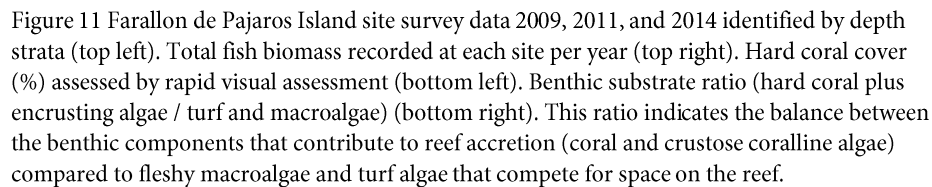


Figure 8 Alamagan, Guguan, and Sarigan Islands fish and benthic plots showing the biomass ($\text{g m}^{-2} \pm \text{SE}$) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover (\pm SE) of the benthos. The benthic estimates are pooled across all years. The northern Mariana region mean estimates are plotted for reference (red line).

Asuncion Island was surveyed in 2009 (n=13), 2011 (n=20), and 2014 (n=21).



Farallon de Pajaros Island was surveyed in in 2009 (n=7), 2011 (n=12), and 2014 (n=11).



Maug Island

Maug Island was surveyed in 2009 (n=21), 2011 (n=30), and 2014 (n=40).

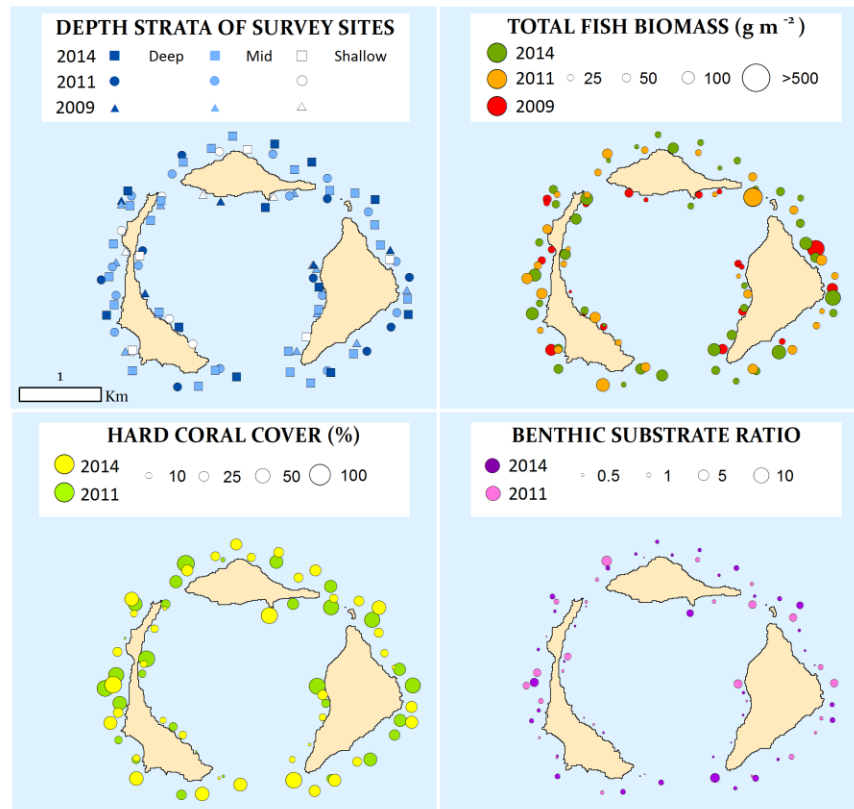


Figure 13 Maug Island site survey data 2009, 2011, and 2014 identified by depth strata (top left). Total fish biomass recorded at each site per year (top right). Hard coral cover (%) assessed by rapid visual assessment (bottom left). Benthic substrate ratio (hard coral plus encrusting algae / turf and macroalgae) (bottom right). This ratio indicates the balance between the benthic components that contribute to reef accretion (coral and crustose coralline algae) compared to fleshy macroalgae and turf algae that compete for space on the reef.

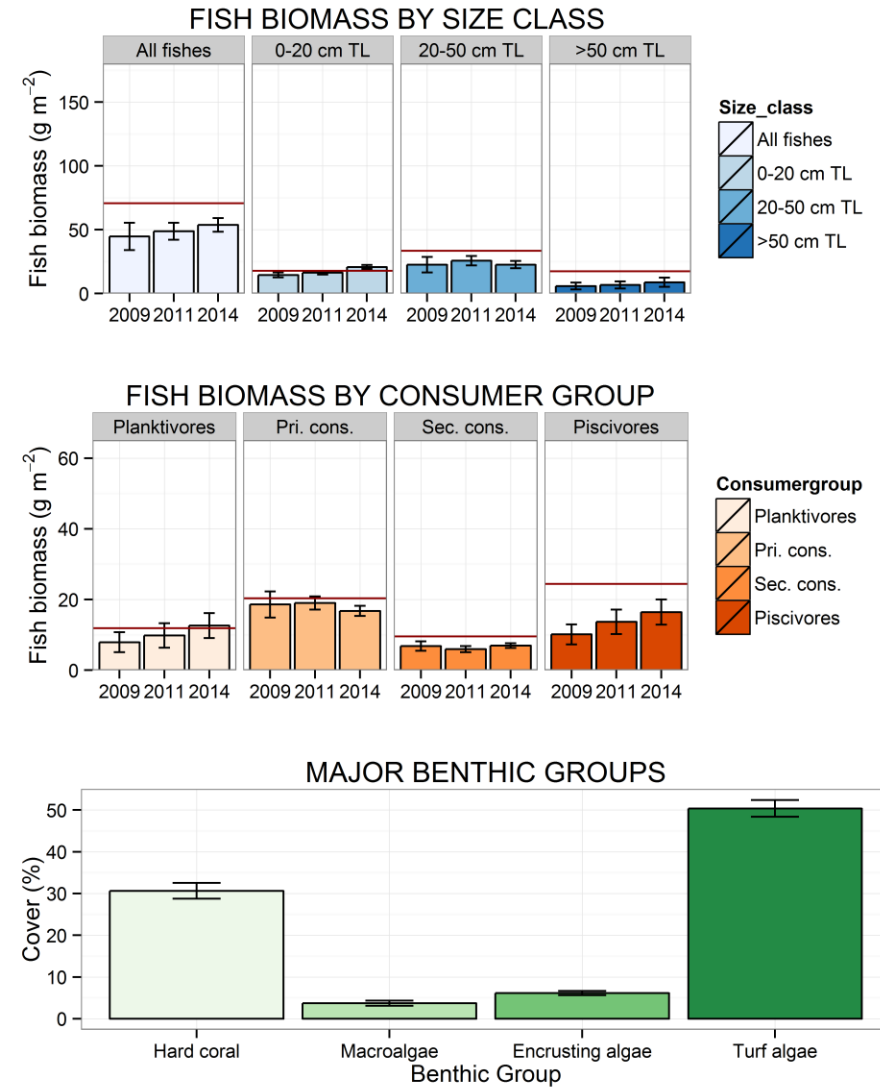
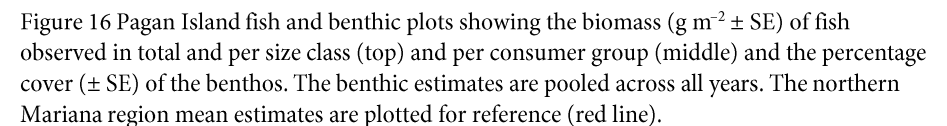
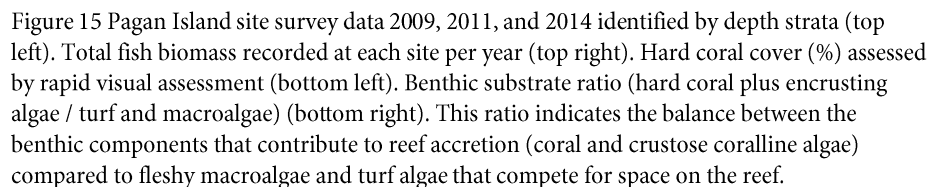


Figure 14 Maug Island fish and benthic plots showing the biomass ($\text{g m}^{-2} \pm \text{SE}$) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover ($\pm \text{SE}$) of the benthos. The benthic estimates are pooled across all years. The northern Mariana region mean estimates are plotted for reference (red line).

Pagan Island was surveyed in 2009 (n=21), 2011 (n=29), and 2014 (n=43).



Southern Mariana Islands

Aguijan Island

Aguijan Island was surveyed in 2009 (n=6), 2011 (n=13), and 2014 (n=10).

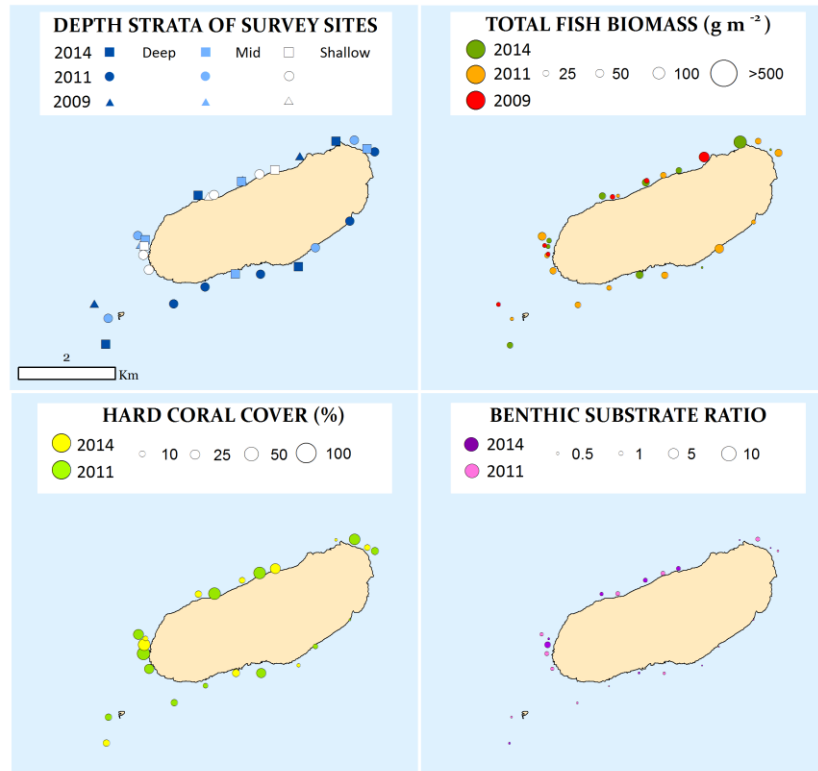


Figure 17 Aguijan Island site survey data 2009, 2011, and 2014 identified by depth strata (top left). Total fish biomass recorded at each site per year (top right). Hard coral cover (%) assessed by rapid visual assessment (bottom left). Benthic substrate ratio (hard coral plus encrusting algae / turf and macroalgae) (bottom right). This ratio indicates the balance between the benthic components that contribute to reef accretion (coral and crustose coralline algae) compared to fleshy macroalgae and turf algae that compete for space on the reef.

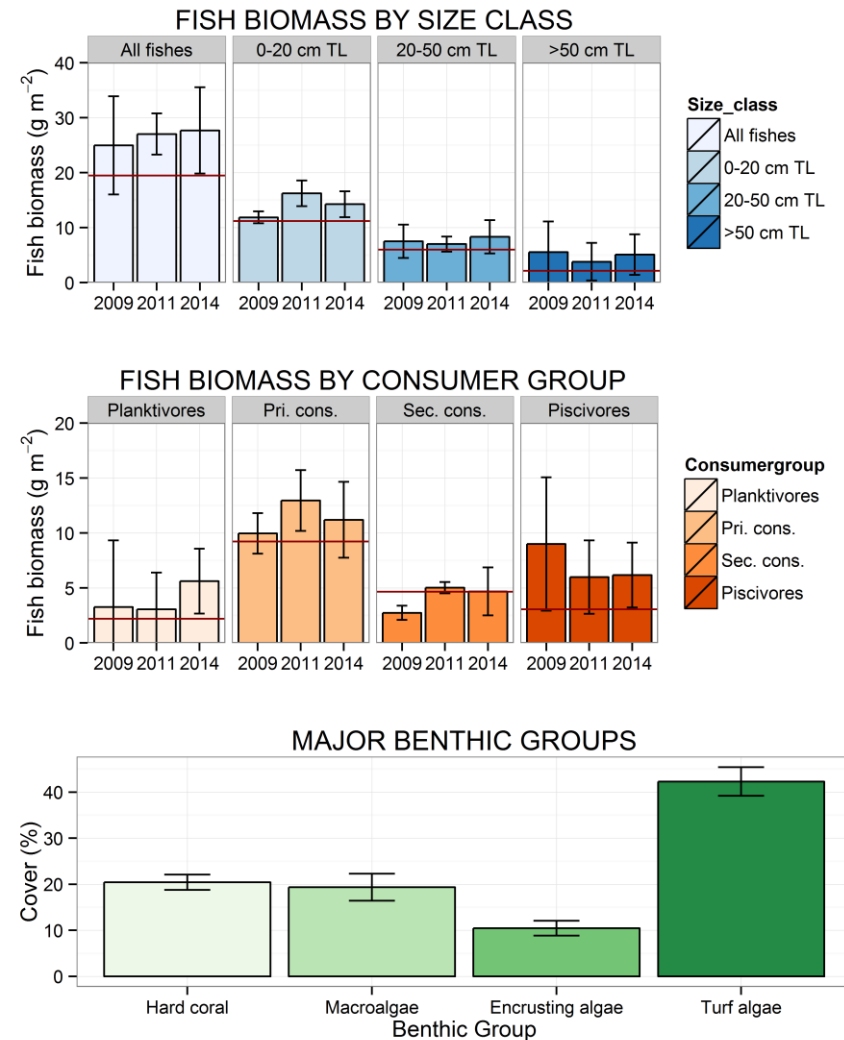


Figure 18 Aguijan Island fish and benthic plots showing the biomass (g m⁻² ± SE) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover (± SE) of the benthos. The benthic estimates are pooled across all years. The southern Mariana region mean estimates are plotted for reference (red line).

Guam Island

Guam Island was surveyed in 2009 (n=25), 2011 (n=133), and 2014 (n=93). In 2011, additional shore-based surveys contributed 89 sites, and in 2014, 20 additional shore-based surveys contributed to the total.

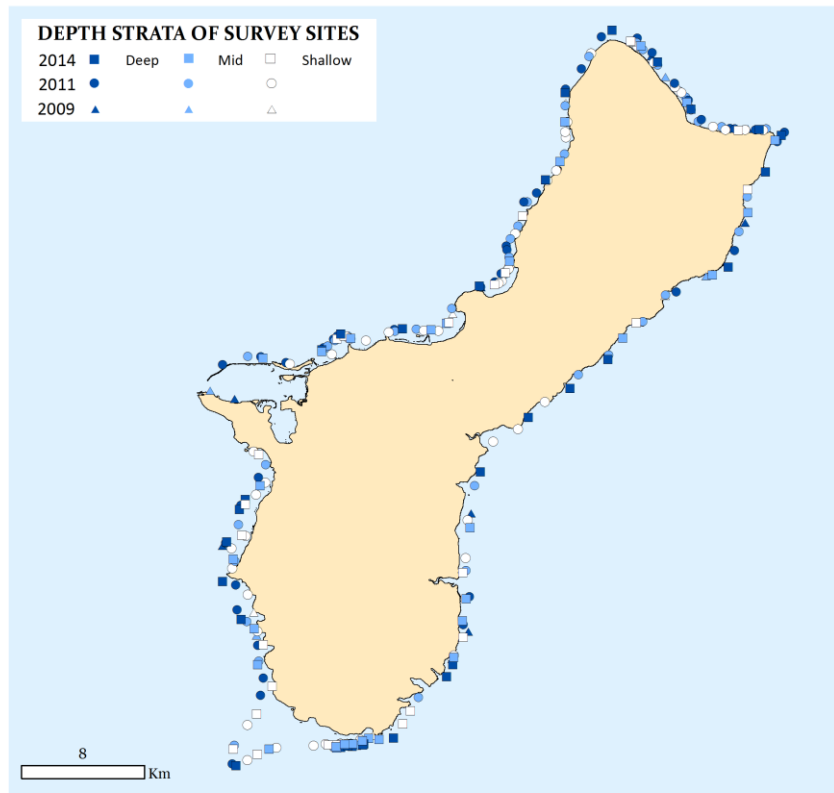


Figure 19 Guam Island site survey data 2009, 2011, and 2014 identified by depth strata.

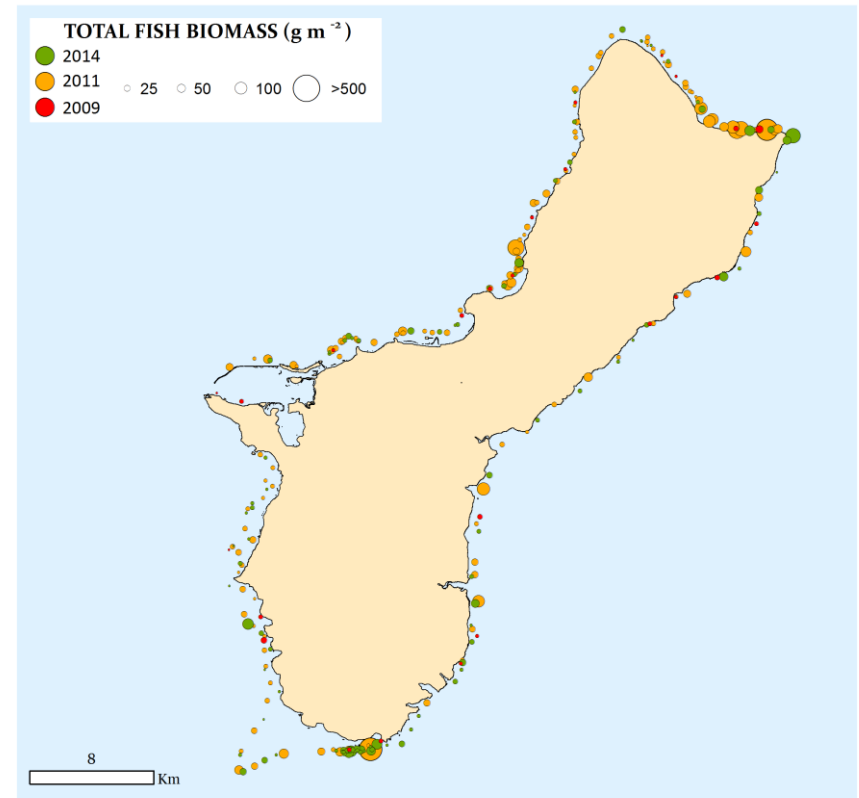


Figure 20 Total fish biomass recorded at each site per year.

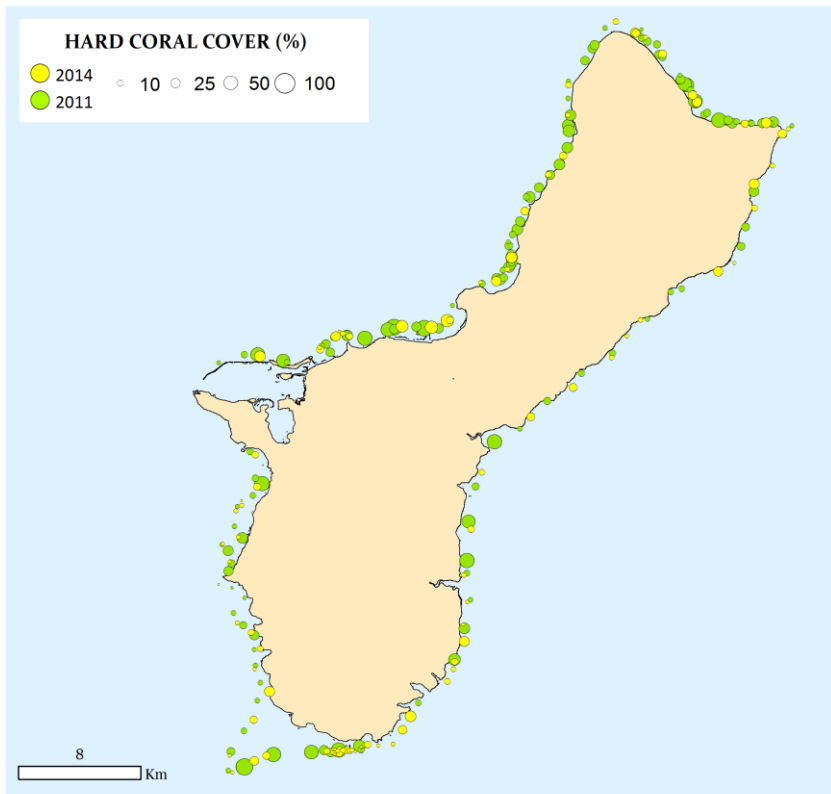


Figure 21 Hard coral cover (%) assessed by rapid visual assessment.

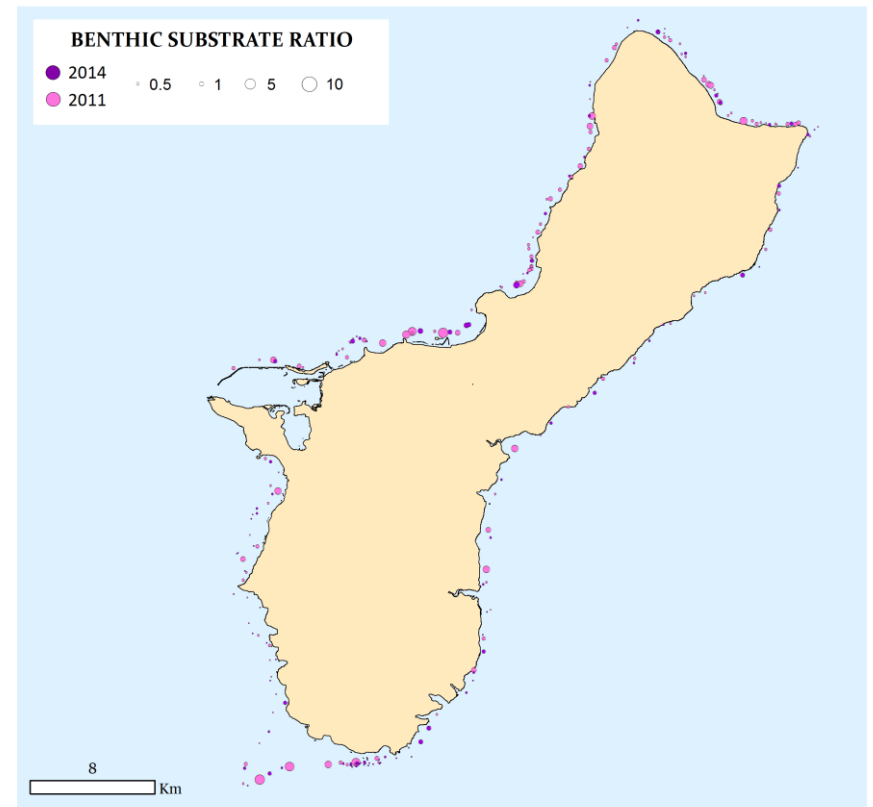


Figure 22 Benthic substrate ratio (hard coral plus encrusting algae / turf and macroalgae). This ratio indicates the balance between the benthic components that contribute to reef accretion (coral and crustose coralline algae) compared to fleshy macroalgae and turf algae that compete for space on the reef.

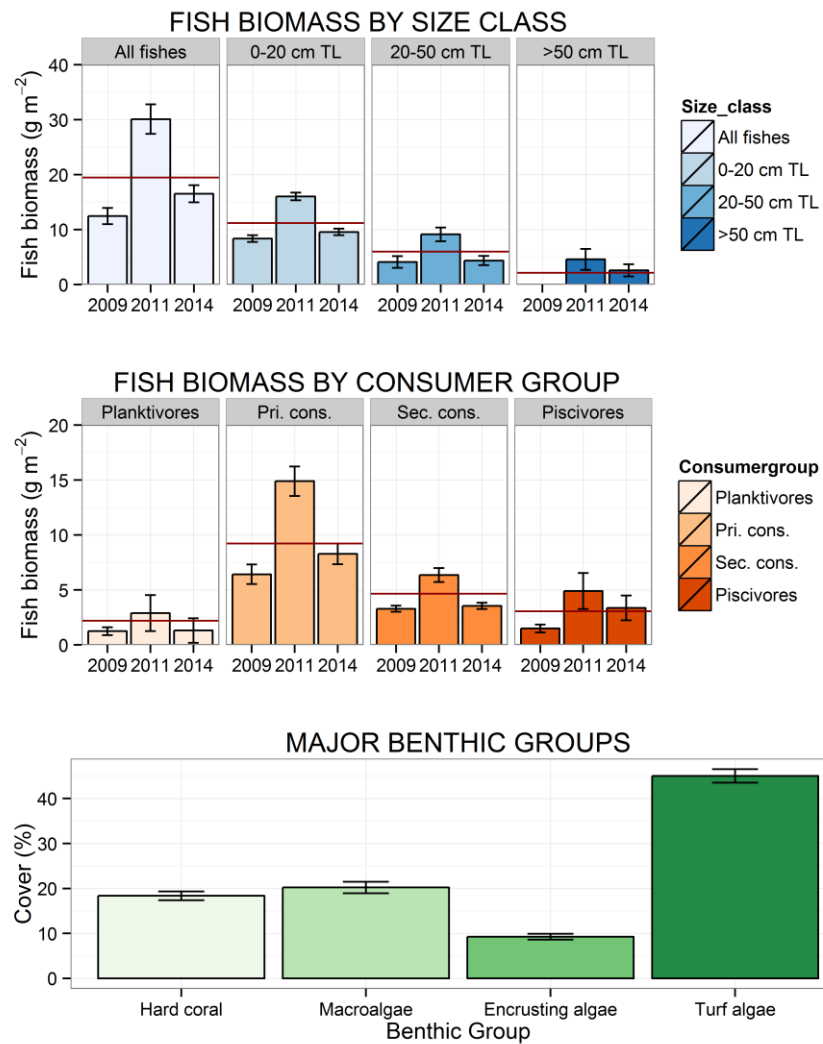


Figure 23 Guam Island fish and benthic plots showing the biomass (g m⁻² ± SE) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover (± SE) of the benthos. The benthic estimates are pooled across all years. The southern Mariana region mean estimates are plotted for reference (red line).

Rota Island

Rota was surveyed in 2009 (n =14), 2011 (n =24) and 2014 (n=28).

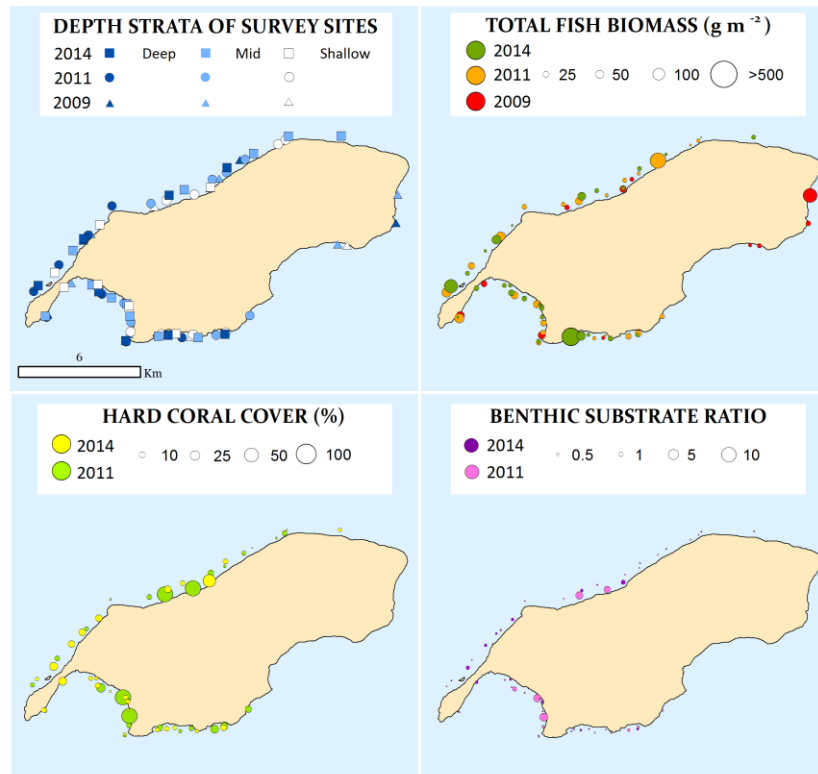


Figure 20 Rota Island site survey data 2009, 2011, and 2014 identified by depth strata (top left). Total fish biomass recorded at each site per year (top right). Hard coral cover (%) assessed by rapid visual assessment (bottom left). Benthic substrate ratio (hard coral plus encrusting algae / turf and macroalgae) (bottom right). This ratio indicates the balance between the benthic components that contribute to reef accretion (coral and crustose coralline algae) compared to fleshy macroalgae and turf algae that compete for space on the reef.

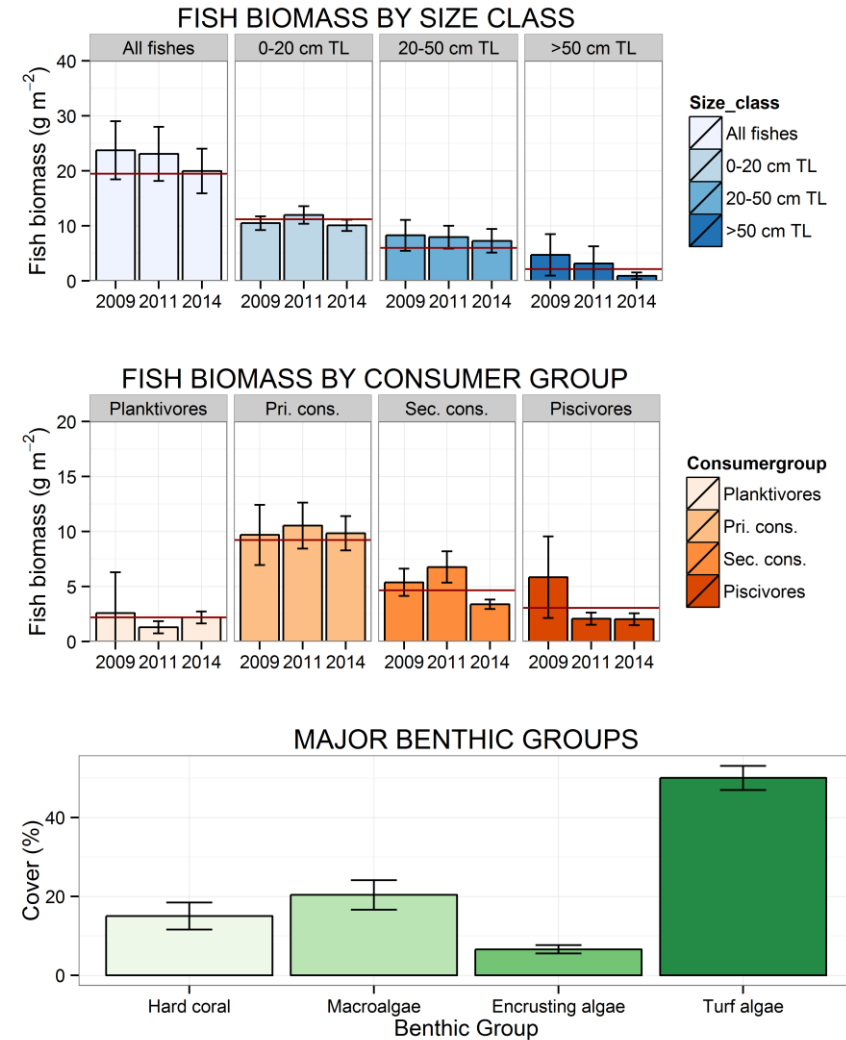


Figure 215 Rota Island fish and benthic plots showing the biomass ($\text{g m}^{-2} \pm \text{SE}$) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover (\pm SE) of the benthos. The benthic estimates are pooled across all years. The southern Mariana region mean estimates are plotted for reference (red line).

Saipan Island

Saipan Island was surveyed in 2009 (n =23), 2011 (n =30) and 2014 (n=48).

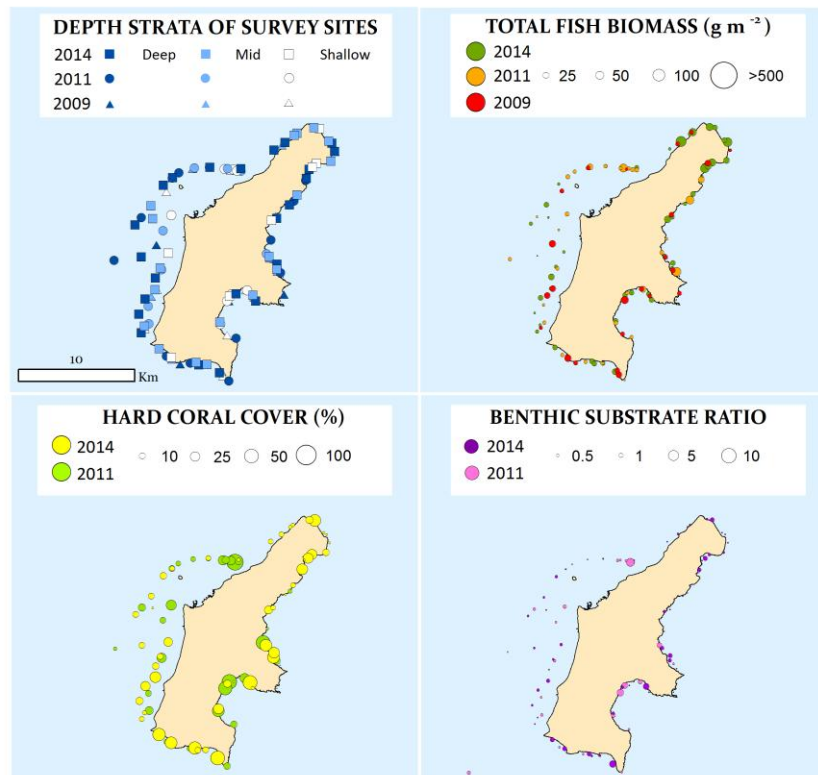


Figure 226 Saipan Island site survey data 2009, 2011, and 2014 identified by depth strata (top left). Total fish biomass recorded at each site per year (top right). Hard coral cover (%) assessed by rapid visual assessment (bottom left). Benthic substrate ratio (hard coral plus encrusting algae / turf and macroalgae) (bottom right). This ratio indicates the balance between the benthic components that contribute to reef accretion (coral and crustose coralline algae) compared to fleshy macroalgae and turf algae that compete for space on the reef.

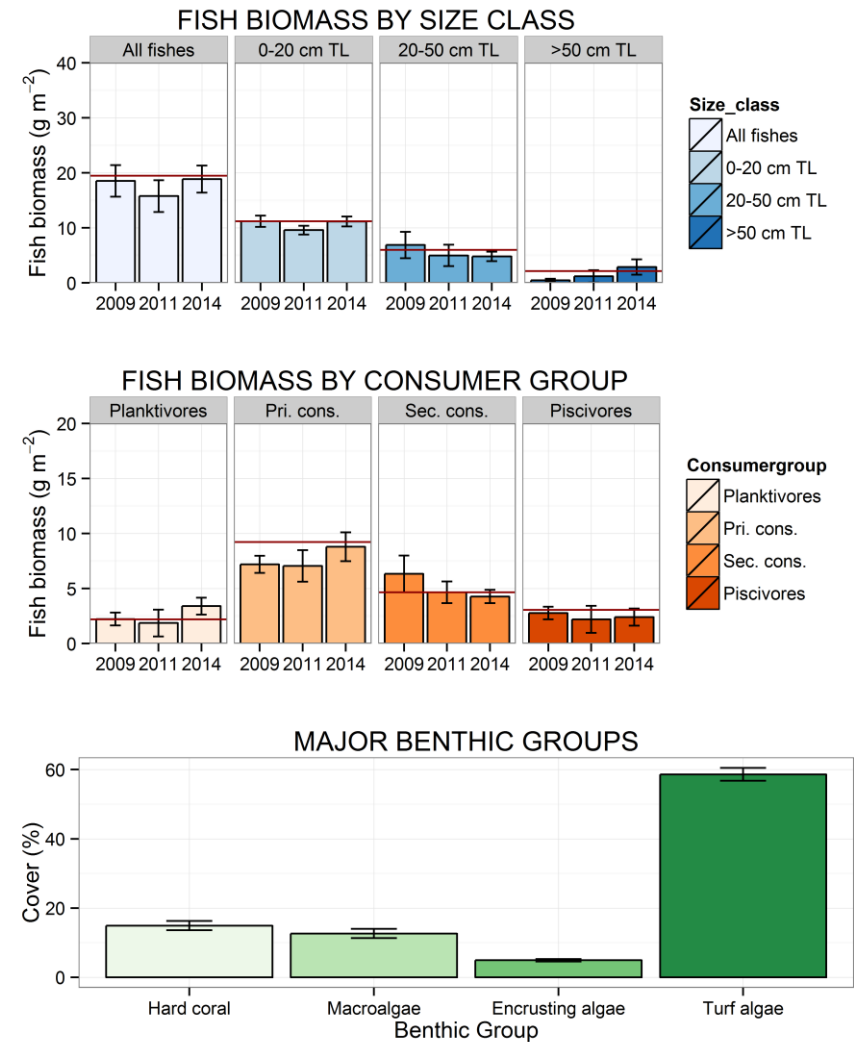


Figure 23 Saipan Island fish and benthic plots showing the biomass ($\text{g m}^{-2} \pm \text{SE}$) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover ($\pm \text{SE}$) of the benthos. The benthic estimates are pooled across all years. The southern Mariana region mean estimates are plotted for reference (red line).

Tinian Island

Tinian Island was surveyed in 2009 (n =14), 2011 (n=19) and 2014 (n =19).

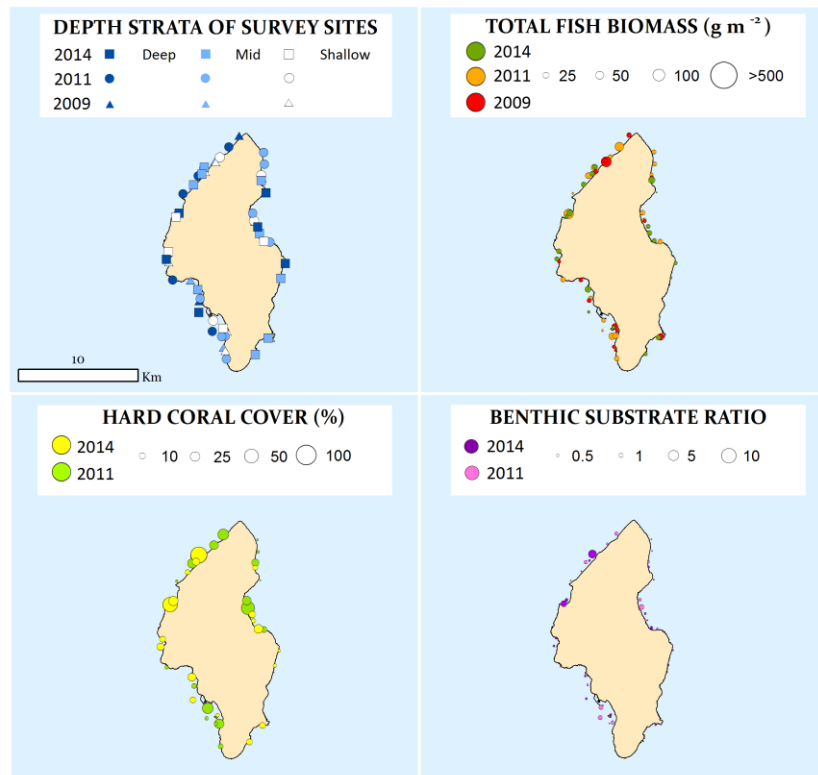


Figure 28 Tinian Island site survey data 2009, 2011, and 2014 identified by depth strata (top left). Total fish biomass recorded at each site per year (top right). Hard coral cover (%) assessed by rapid visual assessment (bottom left). Benthic substrate ratio (hard coral plus encrusting algae / turf and macroalgae) (bottom right). This ratio indicates the balance between the benthic components that contribute to reef accretion (coral and crustose coralline algae) compared to fleshy macroalgae and turf algae that compete for space on the reef.

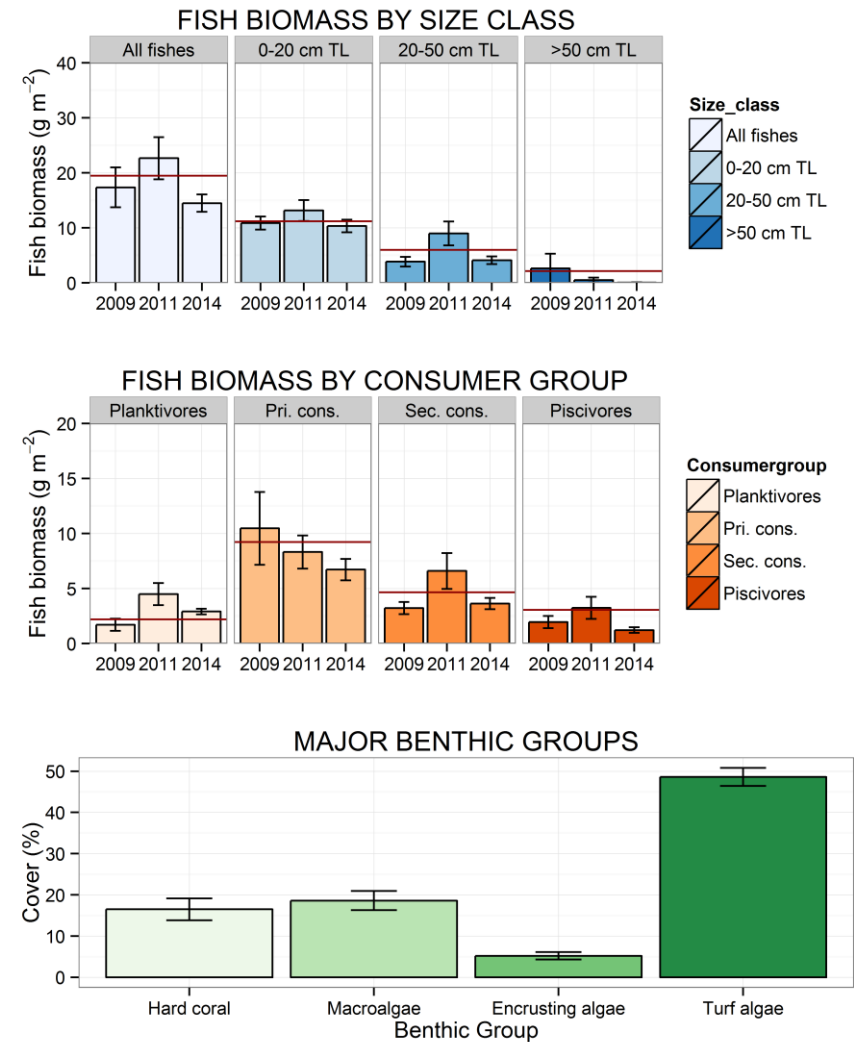


Figure 29 Tinian Island fish and benthic plots showing the biomass ($\text{g m}^{-2} \pm \text{SE}$) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover ($\pm \text{SE}$) of the benthos. The benthic estimates are pooled across all years. The southern Mariana region mean estimates are plotted for reference (red line).

Northwestern Hawaiian Islands

French Frigate Shoals (FFS)

French Frigate Shoals were surveyed in 2010 (n =27), 2011 (n=8), 2012 (n=15), and 2014 (n =27). Results are shown for each habitat type surveyed: forereef, lagoon, and backreef in separate plots.

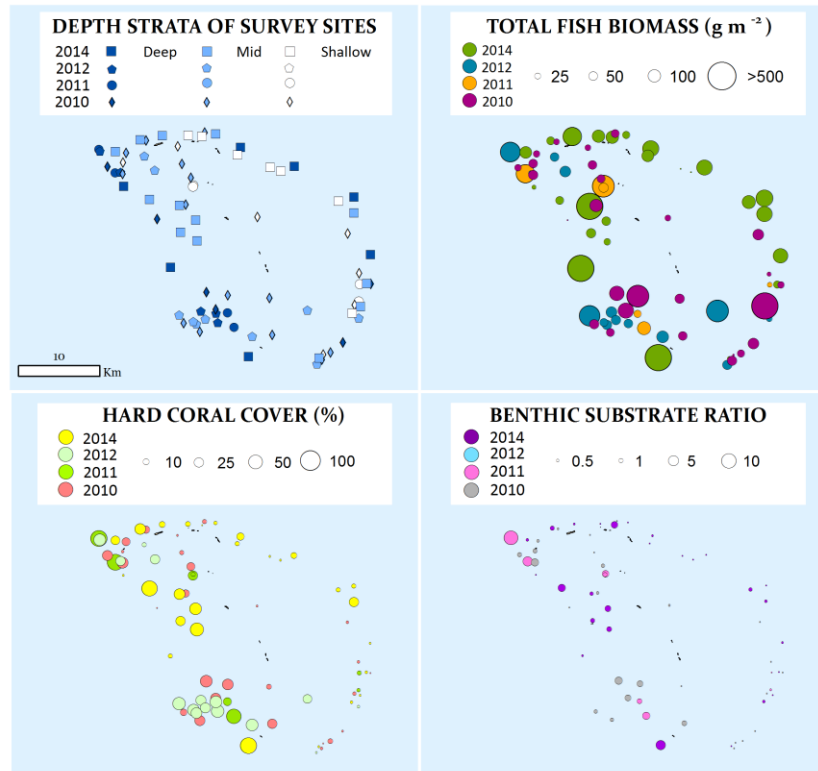


Figure 30 French Frigate Shoals site survey data 2010, 2011, 2012, and 2014 identified by depth strata (top left). Total fish biomass recorded at each site per year (top right). Hard coral cover (%) assessed by rapid visual assessment (bottom left). Benthic substrate ratio (hard coral plus encrusting algae / turf and macroalgae) (bottom right). This ratio indicates the balance between the benthic components that contribute to reef accretion (coral and crustose coralline algae) compared to fleshy macroalgae and turf algae that compete for space on the reef.

The forereef habitat was surveyed in 2010 (n =11), 2011 (n=2), 2012 (n=5), and 2014 (n =24).

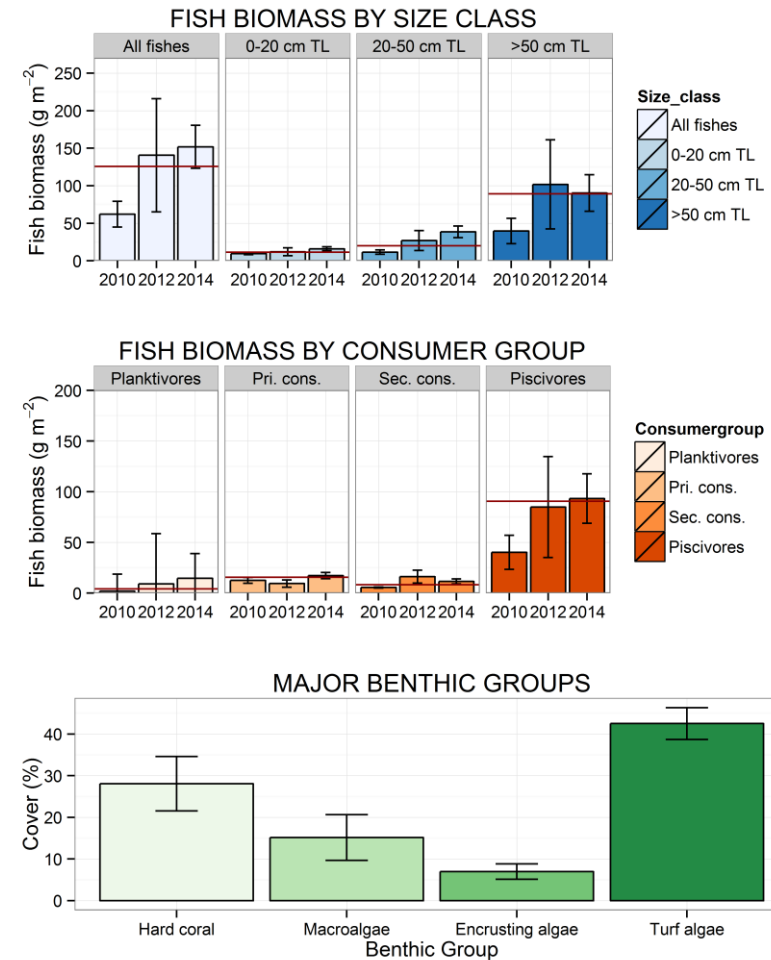


Figure 31 French Frigate Shoals fish and benthic plots showing the biomass ($\text{g m}^{-2} \pm \text{SE}$) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover (\pm SE) of the benthos for forereef habitat only. Only 2 forereef sites were surveyed in 2011, so that data is not included. The benthic estimates are pooled across all years. The Northwestern Hawaiian Islands region mean forereef estimates are plotted for reference (red line).

The lagoon habitat was surveyed in 2010 (n=16), 2011 (n=6), and 2012 (n=10).

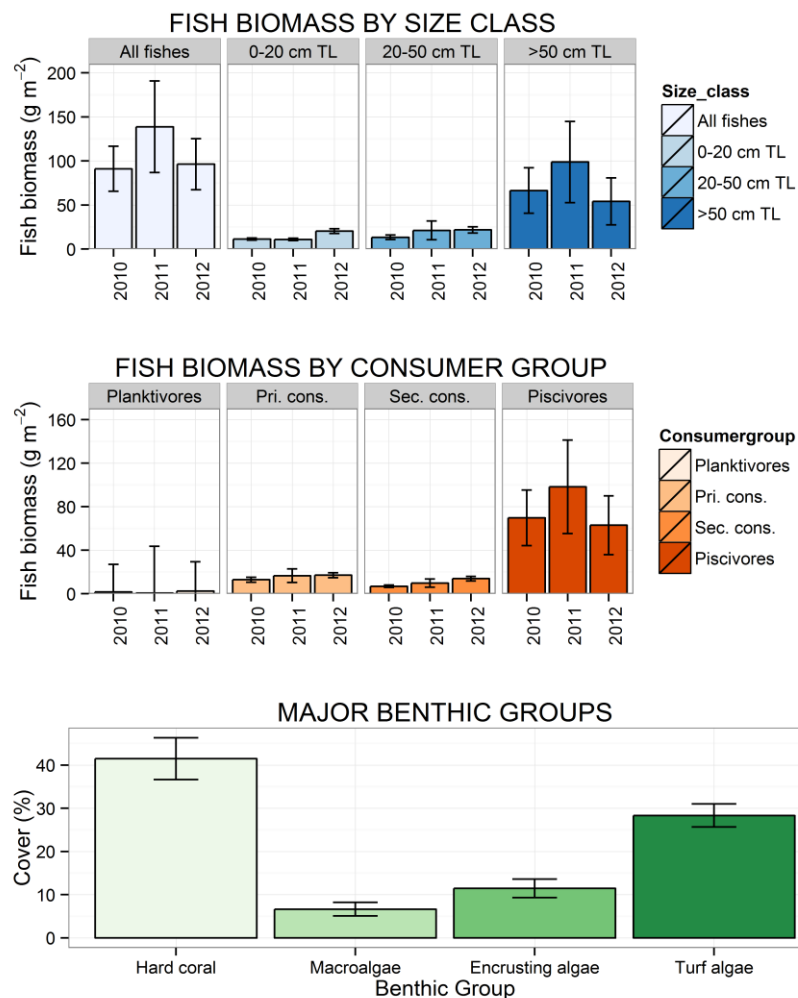


Figure 32 French Frigate Shoals fish and benthic plots showing the biomass ($\text{g m}^{-2} \pm \text{SE}$) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover ($\pm \text{SE}$) of the benthos for lagoon habitat. The benthic estimates are pooled across all years. The Northwestern Hawaiian Islands region mean lagoon estimates are not plotted due to small sample size.

The backreef habitat was surveyed in 2014 (n=3).

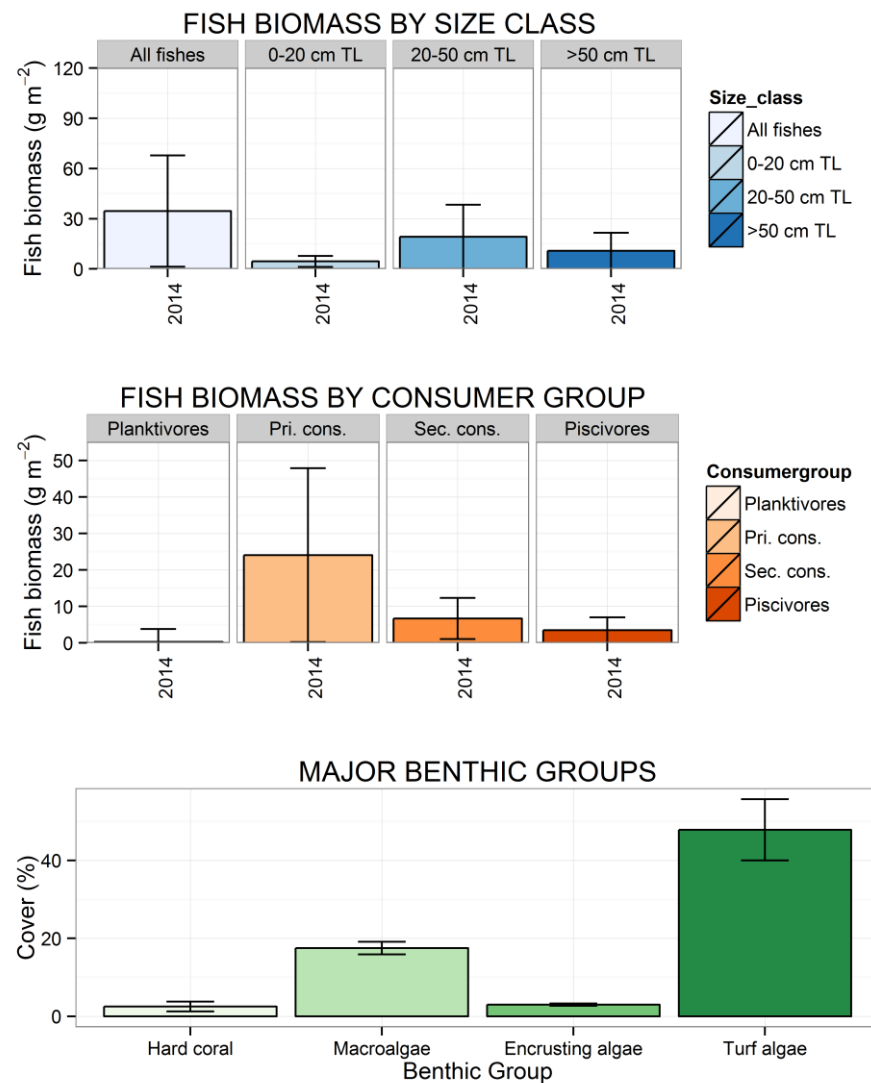


Figure 33 French Frigate Shoals fish and benthic plots showing the biomass ($\text{g m}^{-2} \pm \text{SE}$) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover ($\pm \text{SE}$) of the benthos for backreef habitat. The Northwestern Hawaiian Islands region mean backreef estimates are not plotted due to small sample size.

Lisianski Island

Lisianski Island was surveyed in 2009 (n=19), 2010 (n=25), 2011 (n=9), 2012 (n=25), and 2014 (n=28).

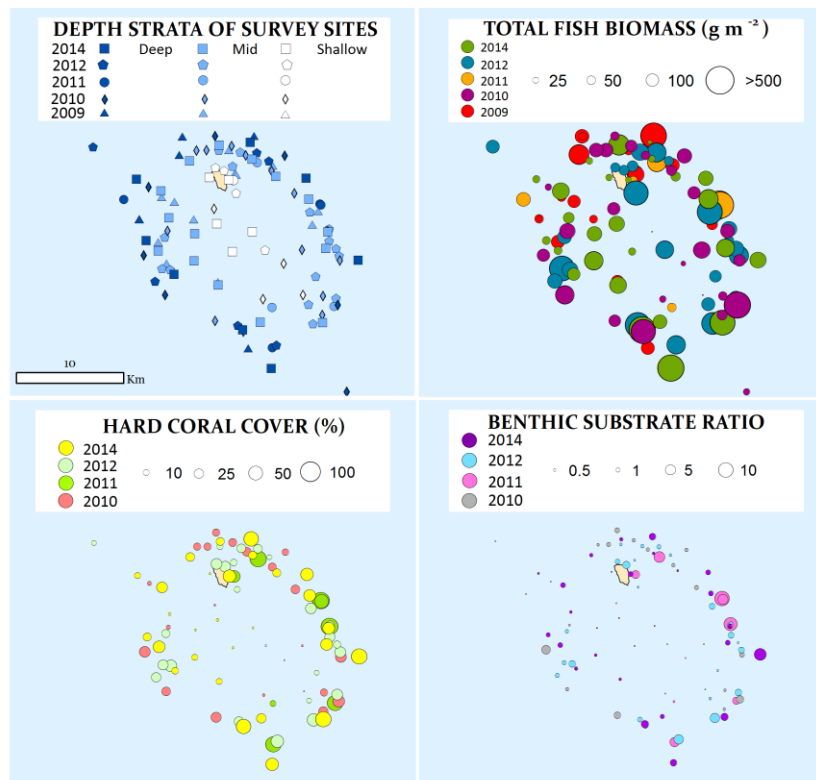


Figure 34 Lisianski Island site survey data 2009, 2010, 2011, 2012, and 2014 identified by depth strata (top left). Total fish biomass recorded at each site per year (top right). Hard coral cover (%) assessed by rapid visual assessment (bottom left). Benthic substrate ratio (hard coral plus encrusting algae / turf and macroalgae) (bottom right). This ratio indicates the balance between the benthic components that contribute to reef accretion (coral and crustose coralline algae) compared to fleshy macroalgae and turf algae that compete for space on the reef.

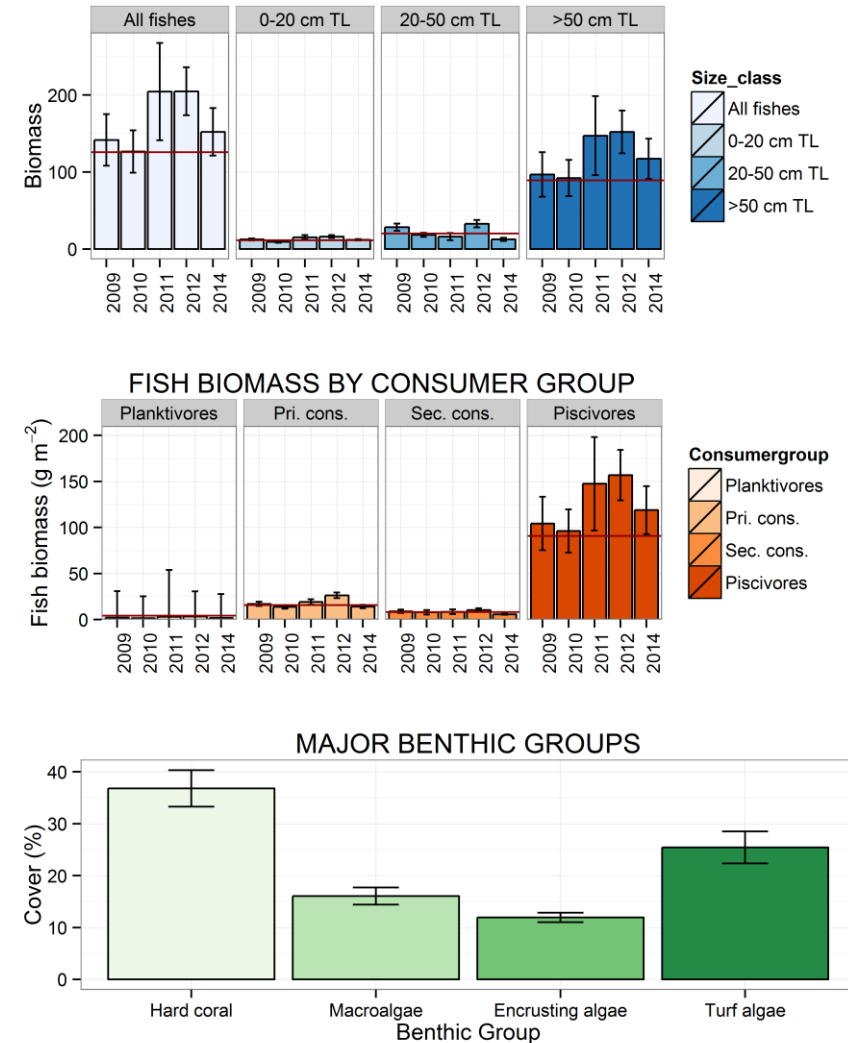


Figure 35 Lisianski Island fish and benthic plots showing the biomass ($\text{g m}^{-2} \pm \text{SE}$) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover (\pm SE). The benthic estimates are pooled across all years. The Northwestern Hawaiian Islands region mean estimates are plotted for reference (red line).

Midway Island

Midway Island was surveyed in 2009 (n =53), 2011 (n=30), and 2014 (n =34). Results are shown for each habitat type surveyed: forereef, lagoon, and backreef in separate plots.

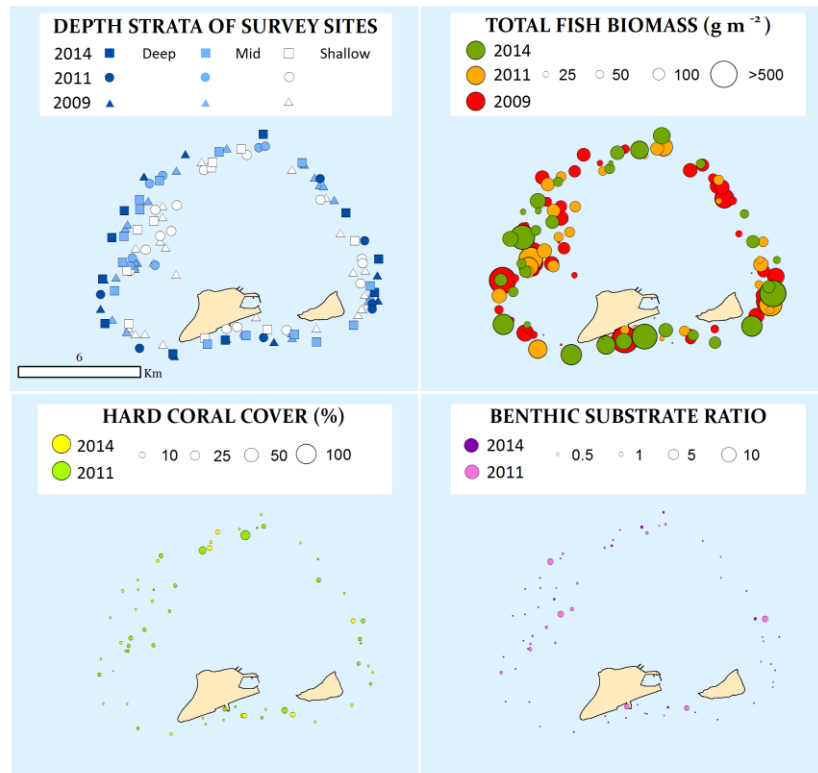


Figure 36 Midway Island site survey data 2009, 2011, and 2014 identified by depth strata (top left). Total fish biomass recorded at each site per year (top right). Hard coral cover (%) assessed by rapid visual assessment (bottom left). Benthic substrate ratio (hard coral plus encrusting algae / turf and macroalgae) (bottom right). This ratio indicates the balance between the benthic components that contribute to reef accretion (coral and crustose coralline algae) compared to fleshy macroalgae and turf algae that compete for space on the reef.

The forereef habitat was surveyed in 2009 (n =31), 2011 (n=17), and 2014 (n=30).

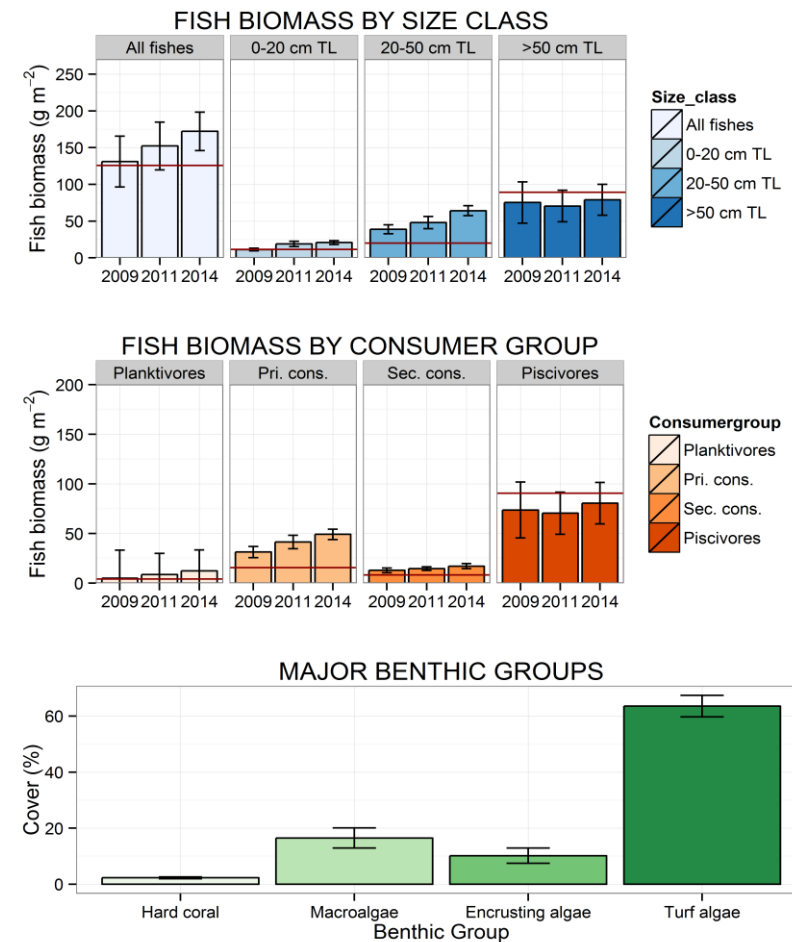


Figure 37 Midway Island fish and benthic plots showing the biomass ($\text{g m}^{-2} \pm \text{SE}$) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover ($\pm \text{SE}$) of the benthos for forereef habitat only. The benthic estimates are pooled across all years. The Northwest Hawaiian Islands region mean estimates are plotted for reference (red line).

The lagoon habitat was surveyed in 2009 (n=15), and 2014 (n=8).

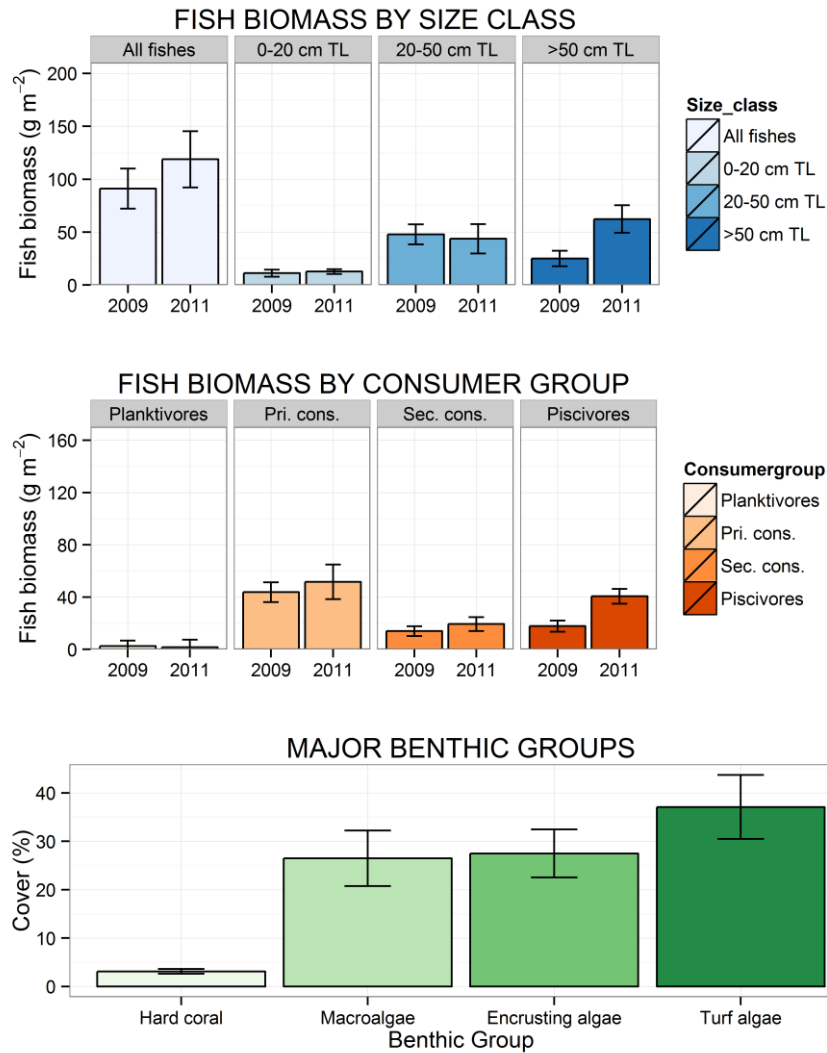


Figure 38 Midway Island fish and benthic plots showing the biomass ($\text{g m}^{-2} \pm \text{SE}$) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover ($\pm \text{SE}$) of the benthos for lagoon habitat. The benthic estimates are pooled across all years. The Northwestern Hawaiian Islands region mean lagoon estimates are not plotted due to small sample size.

The backreef habitat was surveyed in 2009 (n=7), 2011 (n=5), and 2014 (n=14).

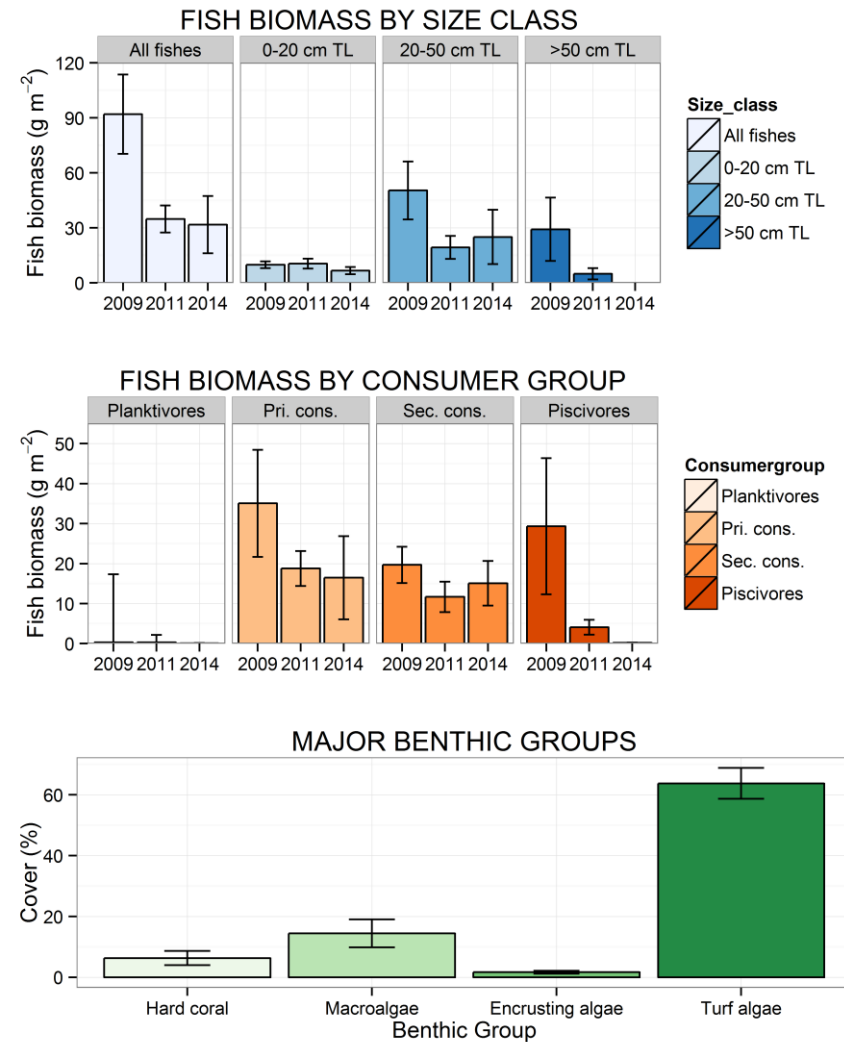


Figure 39 Midway Island fish and benthic plots showing the biomass ($\text{g m}^{-2} \pm \text{SE}$) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover ($\pm \text{SE}$) of the benthos for backreef habitat. The benthic estimates are pooled across all years. The Northwestern Hawaiian Islands region mean backreef estimates are not plotted due to small sample size.

Pacific Remote Island Areas

Wake Atoll

Wake Atoll was surveyed in 2009 (n=29), 2011 (n=30), and 2014 (n=45). Due to its location Wake is surveyed *en route* to the Marianas, therefore the survey years match the Marianas, rather than the PRIA cruise cycle.

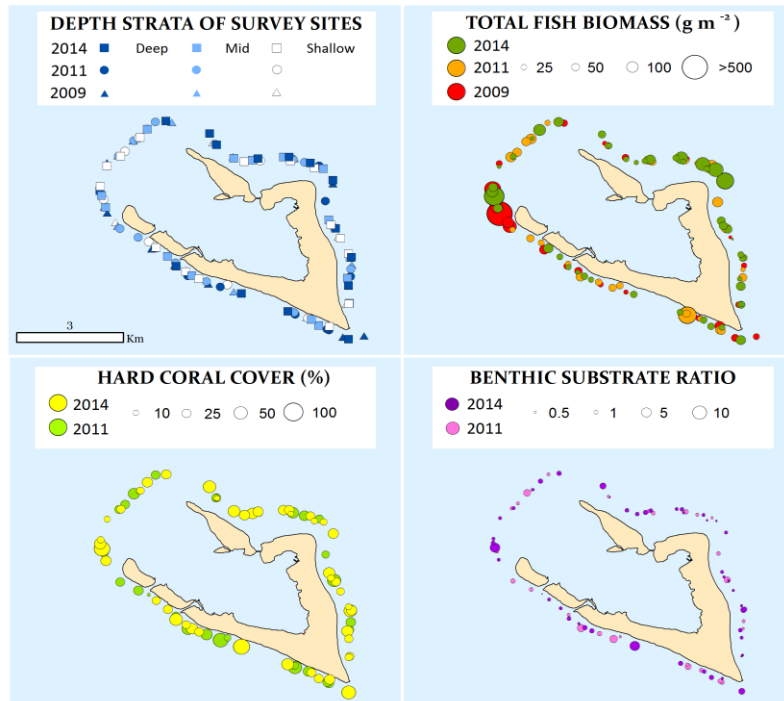


Figure 40 Wake Atoll site survey data 2009, 2011, and 2014 identified by depth strata (top left). Total fish biomass recorded at each site per year (top right). Hard coral cover (%) assessed by rapid visual assessment (bottom left). Benthic substrate ratio (hard coral plus encrusting algae / turf and macroalgae) (bottom right). This ratio indicates the balance between the benthic components that contribute to reef accretion (coral and crustose coralline algae) compared to fleshy macroalgae and turf algae that compete for space on the reef.

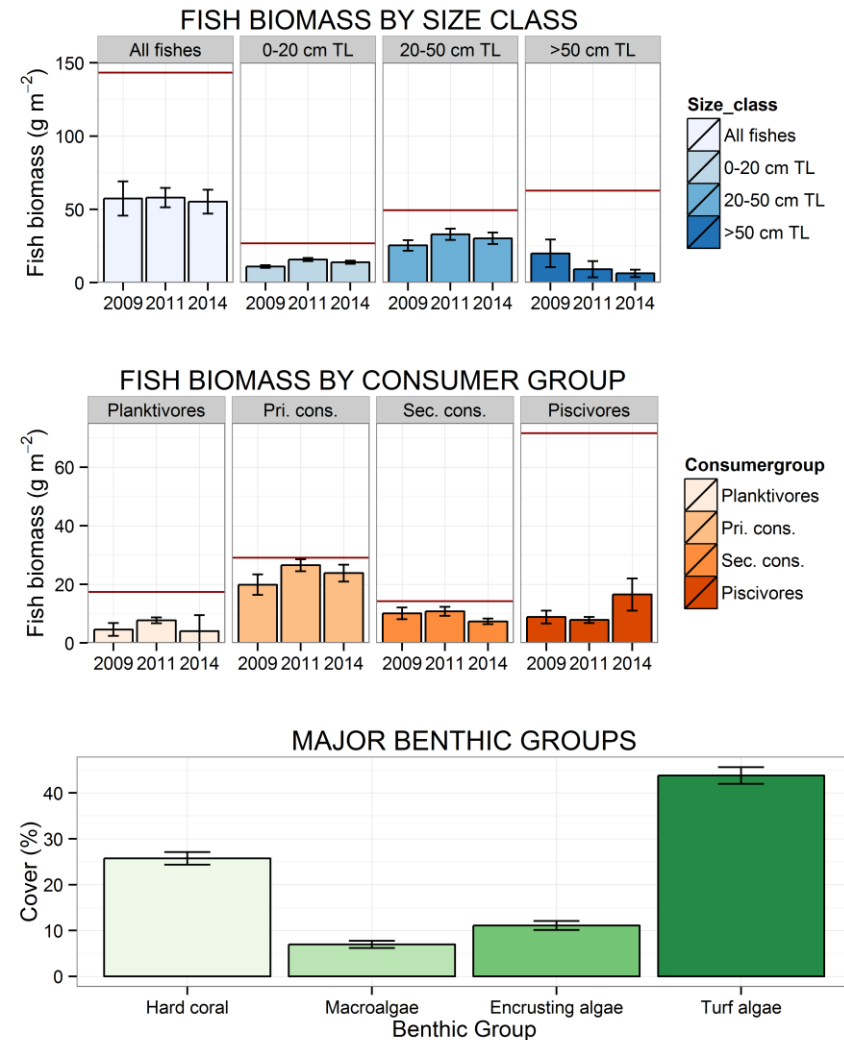


Figure 41 Wake Atoll fish and benthic plots showing the biomass ($\text{g m}^{-2} \pm \text{SE}$) of fish observed in total and per size class (top) and per consumer group (middle) and the percentage cover ($\pm \text{SE}$) of the benthos. The benthic estimates are pooled across all years. The Pacific Remote Island Areas region mean estimates are plotted for reference (red line).

Publications, information products, and data requests 2014

The following products published in 2014 were either produced using data collected during fish and benthic Pacific RAMP monitoring surveys, or were coauthored by members of the CRED fish team.

Blogs

Using science and technology to manage fisheries in the Coral Triangle... Survey says?

<http://pifscblog.wordpress.com/2014/11/20/science-and-technology-survey/>

Recruits Finding a Home. <http://pifscblog.wordpress.com/2014/10/22/recruits-finding-a-home/>

Coral research in main Hawaiian Islands: report. <http://pifscblog.wordpress.com/2014/07/08/coral-research-in-main-hawaiian-islands-report/>

Coral reef monitoring in the Mariana Archipelago: preliminary results from visual surveys of fishes and benthic habitats. <http://pifscblog.wordpress.com/2014/06/03/mariana-archipelago-brief/>

Meaningful monitoring. <http://pifscblog.wordpress.com/2014/04/22/meaningful-monitoring/>

Reef monitoring at Wake Island: preliminary results from fish surveys.

<http://pifscblog.wordpress.com/2014/04/10/monitoring-brief-wake/>

Monitoring briefs

Coral Reef Ecosystem Division, Pacific Islands Fisheries Science Center. 2014. Pacific Reef Assessment and Monitoring Program. Fish monitoring brief: southern Mariana Archipelago 2014. Pacific Islands Fisheries Science Center, PIFSC Data Report, DR-14-009, 2 p.

Coral Reef Ecosystem Division, Pacific Islands Fisheries Science Center. 2014. Pacific Reef Assessment and Monitoring Program. Fish monitoring brief: northern Mariana Archipelago 2014. Pacific Islands Fisheries Science Center, PIFSC Data Report, DR-14-010, 2 p.

Coral Reef Ecosystem Division, Pacific Islands Fisheries Science Center, 2014. Pacific Reef Assessment and Monitoring Program. Fish monitoring brief: Pacific Remote Island Areas 2014. Pacific Islands Fisheries Science Center, PIFSC Data Report, DR-14-007, 2 p.

Scientific publications

Jouffray J-B, Nyström M, Norström, A, Williams, ID, Wedding L, Kittinger J, Williams G. 2014, Identifying multiple coral reef regimes and their drivers across the Hawaiian Archipelago. Philosophical Transactions B, 370: 20130268.

<http://dx.doi.org/10.1098/rstb.2013.0268>

Edwards CB, Friedlander AM, Green AG, Hardt MJ, Sala E, Sweatman HP, Williams ID, Zgliczynski B, Sandin SA, Smith JE, 2014 Global assessment of the status of coral reef herbivorous fishes: evidence for fishing effects. *Proc. R. Soc. B* 281: 20131835. <http://dx.doi.org/10.1098/rspb.2013.1835>

Connolly SR, MacNeil MA, Caley MJ, Knowlton N, Cripps E, Hisano M, Thibaut LM, Bhattacharya BD, Benedetti-Cecchi L, Brainard RE, Brandt A, Bulleri F, Ellingsen KE, Kaiser S, Kroncke I, Linse K, Maggi E, O'Hara TD, Plaisance L, Poore GCB, Sarkar SK, Satpathy KK, Schuckel U, Williams A, Wilson RS, [2014], Commonness and rarity in the marine biosphere, *Proceedings of the National Academy of Sciences* 111: 8524-8529

Munoz RC, Zgliczynski BJ, Teer BZ, Laughlin JL, 2014, Spawning aggregation behavior and reproductive ecology of the giant bumphead parrotfish, *Bolbometopon muricatum*, in a remote marine reserve. *PeerJ* 2:e681; DOI 10.7717/peerj.681.*

* No CRED authorship, but report utilizes Pacific RAMP data

Fish and benthic data requests

In 2014: 48 requests.

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Kendall, M.S. and M. Poti (eds.), 2011. A Biogeographic Assessment of the Samoan Archipelago. NOAA Technical Memorandum NOS NCCOS 132. Silver Spring, MD. 229 pp.

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Appendices

Appendix 1: Pacific RAMP data types collected for the biological theme of the NCRMP

Theme	Indicator	Method	Spatial sampling	Temporal scale
Benthos	Coral demographics and condition: species, abundance, size, bleaching, disease, mortality	Paired 18m coral demographic transects	Stratified random sampling optimized for commercially and ecologically important fish and coral species in shallow (0–30 m) hard bottom areas. Strata include depth, habitat type, and management zone.	Surveys conducted every 3 years, all surveys generally conducted within the same 3-month season.
	Benthic percent cover			
	Benthic key species (presence/absence)	Paired 15m photoquadrat transects		
	Rugosity	2000 x10m towed-diver survey		
Fish	Fish abundance, size, and species	Paired 15-m-diameter stationary point count (SPC) surveys		
	Fish key species (presence/absence)	~2000 x10m ² towed-diver survey		

Table A1.1 Summary of the benthic and fish data collected (indicators), and the various methods, sampling design and survey cycle of the NCRMP

Appendix 2: Surveys per region per year and method used

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Region							Belt &	Belt &	Belt &						
Method	Belt	Belt	Belt	Belt	Belt	Belt	SPC	SPC	SPC	SPC	SPC	SPC	SPC	SPC	SPC
N. Mariana				42		38		36		135		135			148
S. Mariana				25		34		30		116		219			198
Main HI						73	57		186		184		163	287	
NWHI*	58	18	63	62	57	40	64	155	147	203	118	141	91		89
PRIAs		30	34		48	13	67	12	193	42	179	30	231		45
Am.Samoa			42		58		61		222		241		223		

Table A2.1 The number of sites surveyed per region per year. From 2000–2006 the belt transect method was used to survey coral reef fishes. During the calibration period that took place from 2006–2008, surveys were conducted using both the belt and the stationary point count (SPC) method. The SPC data collected prior to 2009 is not used in this report because sites were not selected based on the randomized depth stratified design (see [Section: Methods](#)). Furthermore, during the methods transition period, sites surveyed at the mid-depth strata in 2009 were the haphazardly selected, fixed sites selected in the previous years. Shallow and deep sites were randomly selected. Here we report all data from 2009 onwards, including the non-randomized mid-depth 2009 sites. In the future, these mid-depth sites should be excluded from any time series analysis.

*In partnership with NOAA’s Papahānaumokuākea Marine National Monument (PMNM) surveys have been conducted in the Northwestern Hawaiian Islands on a more frequent, almost annual basis.

Appendix 3: Sectors maps

For the majority of islands, the entire island or atoll is stratified by habitat or depth. Guam and the main Hawaiian Islands, however, have an additional level of stratification.

Guam

Guam is subdivided into sectors based on management status (marine preserve or not) and aspect (East or West): thus there are two open sectors: “Guam Open East” (areas outside of Marine Preserves on east side of Guam); and “Guam Open West”. Grouping of marine preserve sites – i.e. whether to pool all into a single strata ‘Guam Marine Preserve’ or break out at level of some or all individual marine preserves depends on sampling density per year – higher sampling density allows for individual marine preserves to be sectors. In 2014, we pooled MP sites into “Achang MP” (Achang Reef Flat Marine Preserve, due to intensive sampling efforts there); “Marine Preserve” (all other areas within Guam’s Marine Preserve System; (Figure A3.1).

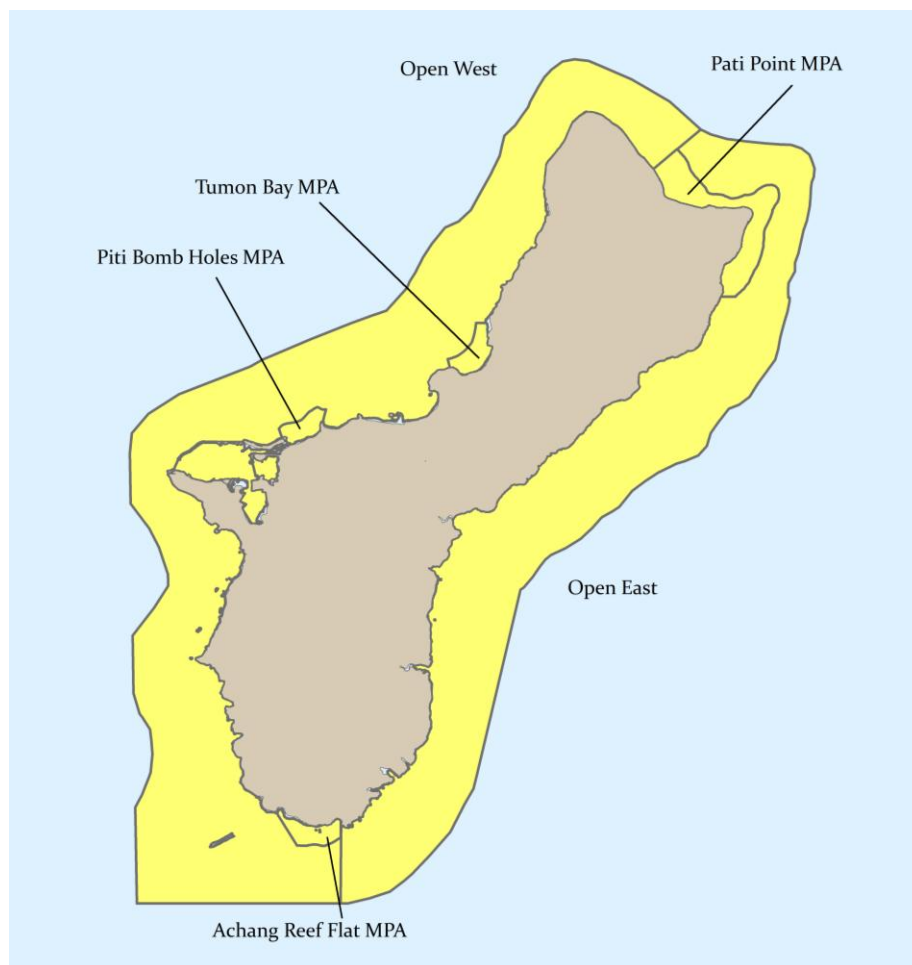


Figure A3.1 Guam sectors. Sampling is stratified by habitat, depth and the additional sectors based on whether areas are inside or outside Achang Reef Flat MP, the pooled Marine Preserve system, and by the East and West side of the island.

The main Hawaiian Islands

The main Hawaiian Islands are divided into between 2 and 7 sectors per island, with sector boundaries based on broad differences in oceanographic exposure, reef structure, and local human population density (Figure A3.2).

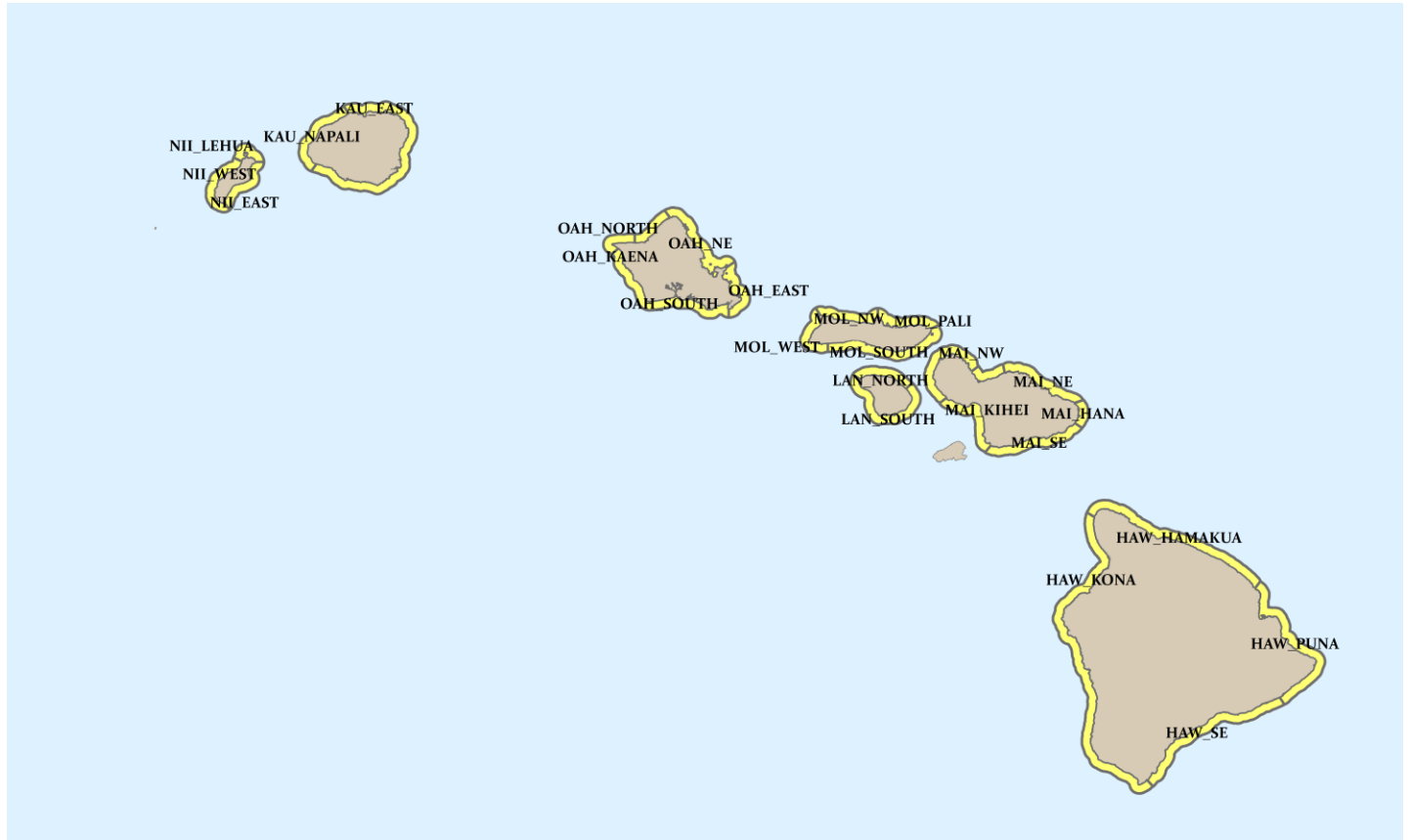


Figure A3.2 The sectors of the main Hawaiian Islands. Sectors are broadly based on wave exposure, habitat complexity and local human population density.

Appendix 4: Samples per sector and strata in 2014

Table A4.1 The number of sites surveyed per depth strata and the sector used to pool up the data in island level parameter estimates. For most islands, during the site selection process, the sector area from which site locations are randomly drawn are the islands. In some case, such as Guam, islands are broken down into smaller sectors. D = deep (18–30 m), M = mid (6–18 m), S = shallow (0–6 m). Backreef site depths were pooled for analysis.

Year	Region	Island	Sector	Backreef-All	Forereef-D	Forereef-M	Forereef-S
2014	N.MARIAN	AGS	Alamagan		3	5	3
2014	N.MARIAN	AGS	Guguan		5	4	2
2014	N.MARIAN	AGS	Sarigan		6	3	2
2014	N.MARIAN	Asuncion	Asuncion		6	12	3
2014	N.MARIAN	Farallon de Pajaros	Farallon de Pajaros		3	6	2
2014	N.MARIAN	Maug	Maug		11	24	5
2014	N.MARIAN	Pagan	Pagan		19	17	7
2014	NWHI	French Frigate	French Frigate	3	7	13	4
2014	NWHI	Lisianski	Lisianski		8	15	5
2014	NWHI	Midway	Midway	4	10	14	6
2014	PRIAs	Wake	Wake		15	15	15
2014	S.MARIAN	Aguijan	Aguijan		4	4	2
2014	S.MARIAN	Guam	ACHANG_MPA		5	10	5
2014	S.MARIAN	Guam	GUAM_EAST_OPEN		8	7	5
2014	S.MARIAN	Guam	GUAM_MP_MINUS_ACHANG		7	6	6
2014	S.MARIAN	Guam	GUAM_WEST_OPEN		11	11	12
2014	S.MARIAN	Rota	Rota		8	12	8
2014	S.MARIAN	Saipan	Saipan		23	18	7
2014	S.MARIAN	Tinian	Tinian		6	9	4
2014	N.MARIAN	AGS	Alamagan		3	5	3
2014	N.MARIAN	AGS	Guguan		5	4	2

Appendix 5: Quality control

Appendix 5.1 Observer training

Typically there are between 4–10 fish divers, or observers, in the field. These observers include a majority of CRED fish team divers, but occasionally partners from local agencies, for example, from the Hawaiian Division of Aquatic Resources, the U.S. Fish and Wildlife Service, and students from the University of Hawai‘i. New observers are trained in both fish identification and the survey technique; this includes a classroom component and in-water training. Prior to each survey cruise, all observers (new and experienced) must meet the minimum pass rate (90%) in a region-specific fish identification test. All observers also take part in in-water training exercises, typically on a monthly basis outside of the cruise season. Generally, the in-water training includes two dives, one to conduct a practice stationary point count (SPC) survey and another size estimation dive. The latter includes divers estimating the sizes of fish models in a mock SPC survey. Diver estimates are then calibrated against the known fish model sizes (for example see Figure A5.1).

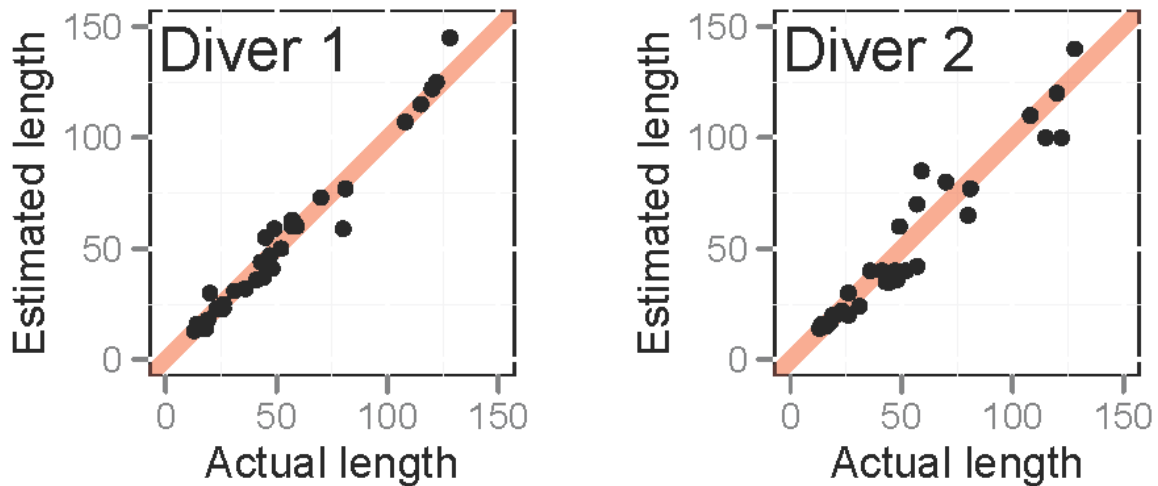


Figure A5.1 Example of size estimation dive training data for two divers. During the size estimation dives, diver accuracy is assessed by divers estimating the size of fish models of known lengths, which are haphazardly distributed throughout a mock SPC cylinder. The closer divers are to the red 1:1 line, the more accurate their estimated sizes.

Appendix 5.2 Observer cross-comparison

Estimates are compared between dive partner pairs to check for consistency between observers. This can be done for any parameter estimated, but here total fish biomass, species richness (number of unique species counted) and hard coral cover estimates are highlighted, three of the most frequently reported summary metrics from the stationary point count survey data. The difference between the estimates of each diver and those of their dive partner at each site is calculated and referred to here as diver performance. Real differences between dive partners are expected, as divers survey adjacent, not the same cylinder area. However, if there is no consistent bias in the estimates made by a diver, one would expect the median value of their performance to be close to zero i.e. with estimates in half of the counts being higher than their partner's estimates and half of the counts lower than their partner's estimates. Boxplots of diver performance, therefore, give: 1) a strong but general indication of relative bias, if there is not consistent bias, then the median differences between a single diver and their dive partners will be close to zero and; 2) an indication of how variable each divers' counts are compared to their dive partners – if a particular diver's performance varies extremely widely compared to their dive partners (i.e. several very high and/or several very low counts) that may be an indication of variability in their performance. As dive teams are regularly rotated throughout the course of a survey mission, measures of individual diver's counts reflect their performance relative to the entire pool of other divers participating in those surveys. These boxplots are routinely generated during and after field operations to give divers feedback on their performance relative to that of their colleagues and are summarized here by region (Figure A5.2 northern Mariana Islands 2014, Figure A5.3 southern Mariana Islands 2014, Figure A5.4 Northwestern Hawaiian Islands 2014, Figure A5.5 Pacific Remote Island Areas 2014).

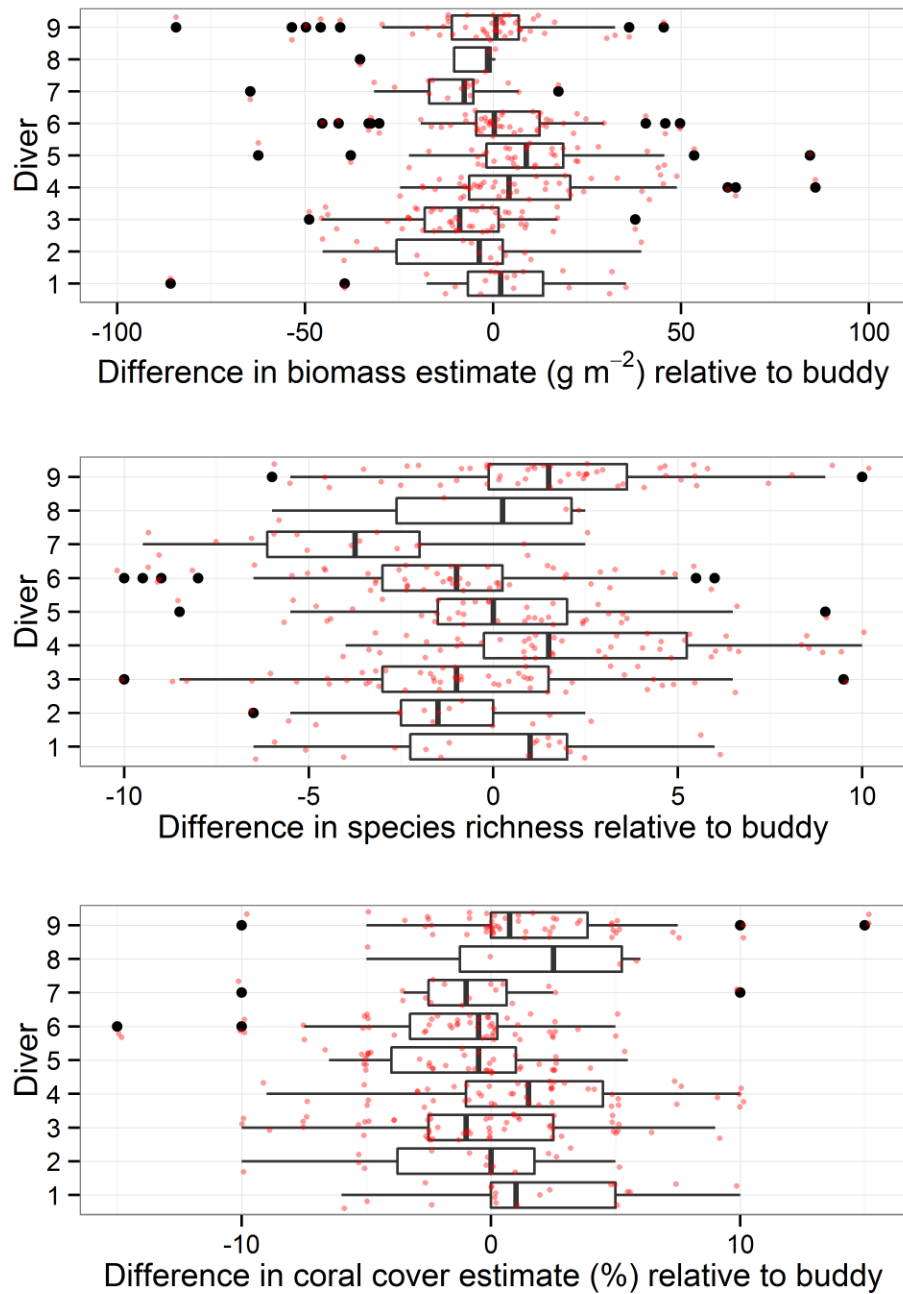


Figure A5.2 Northern Mariana Islands comparison of observer diver vs dive partner estimates for total fish biomass, species richness and hard coral cover during 2014 surveys. The boxplot shows the median difference (thick vertical line) in estimates for each diver, the box represents the location of 50% of the data. Lines extending from each box are 1.5 times the interquartile range which represents approximately 2 standard deviations; points greater than this (outliers) are plotted individually (black dots).

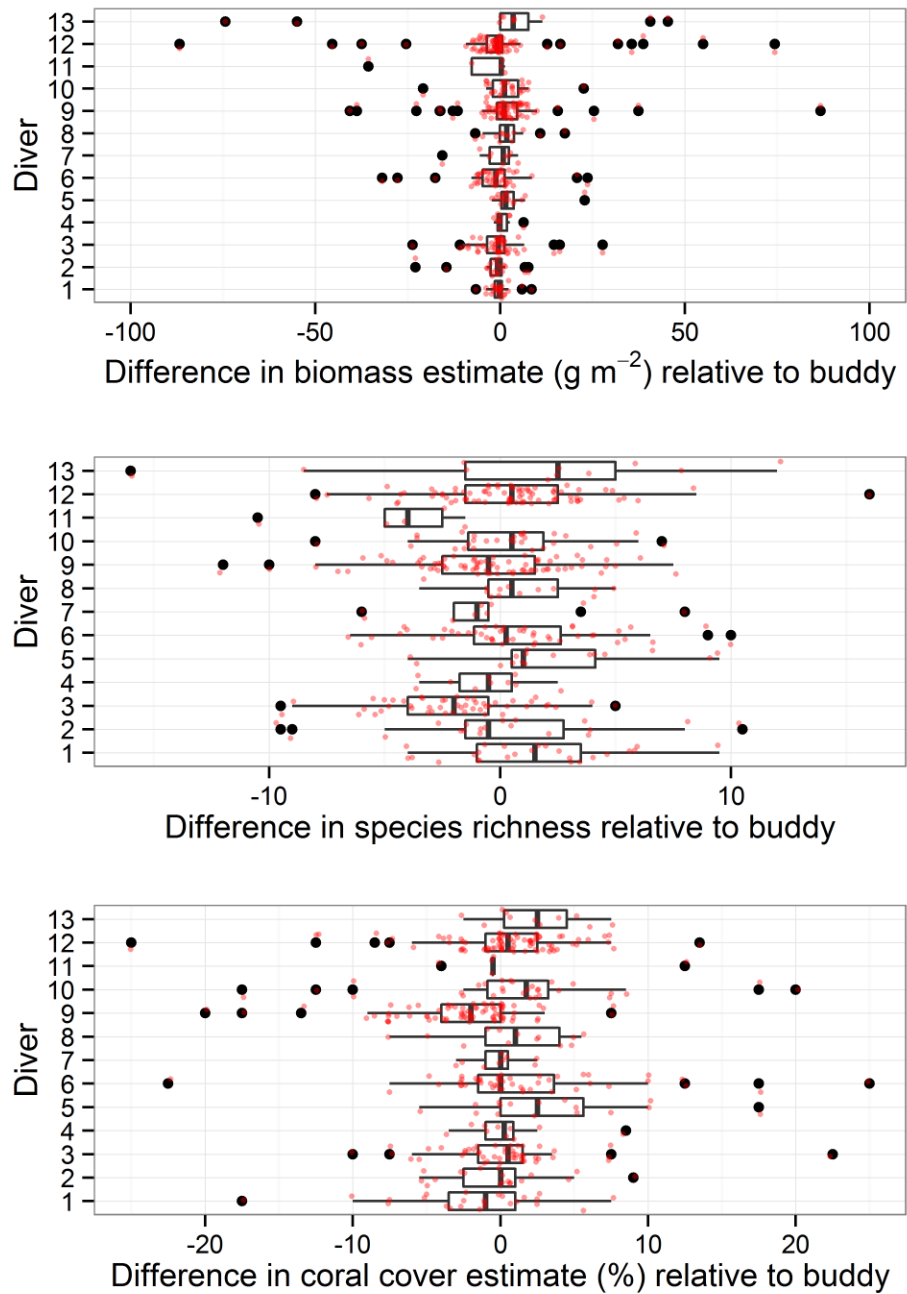


Figure A5.3 Southern Mariana Islands 2014 comparison of observer diver vs diver partner estimates for total fish biomass, species richness and hard coral cover during 2012 surveys. See Figure A5.2 legend for details.

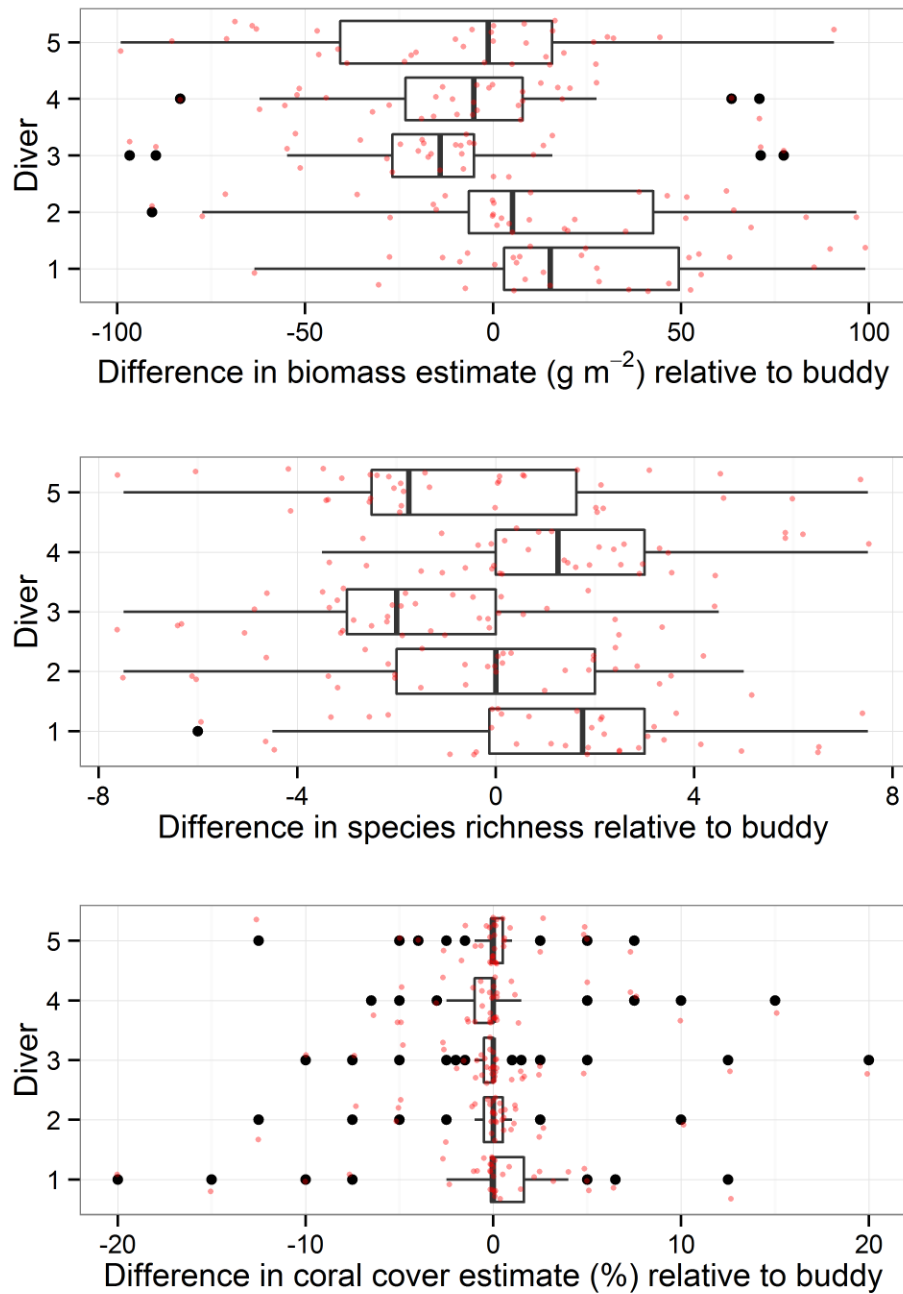


Figure A5.4 Northwestern Hawaiian Islands comparison of observer diver vs dive partner estimates for total fish biomass, species richness and hard coral cover during 2014 surveys. See Figure A5.2 legend for details. Note that the 2014 survey cruise in the NWHI was led by the PMNM. Although methods and design are identical between CRED and PMNM cruises, PMNM cruises involve divers with a wider range of experience levels than is typical for CRED cruises.

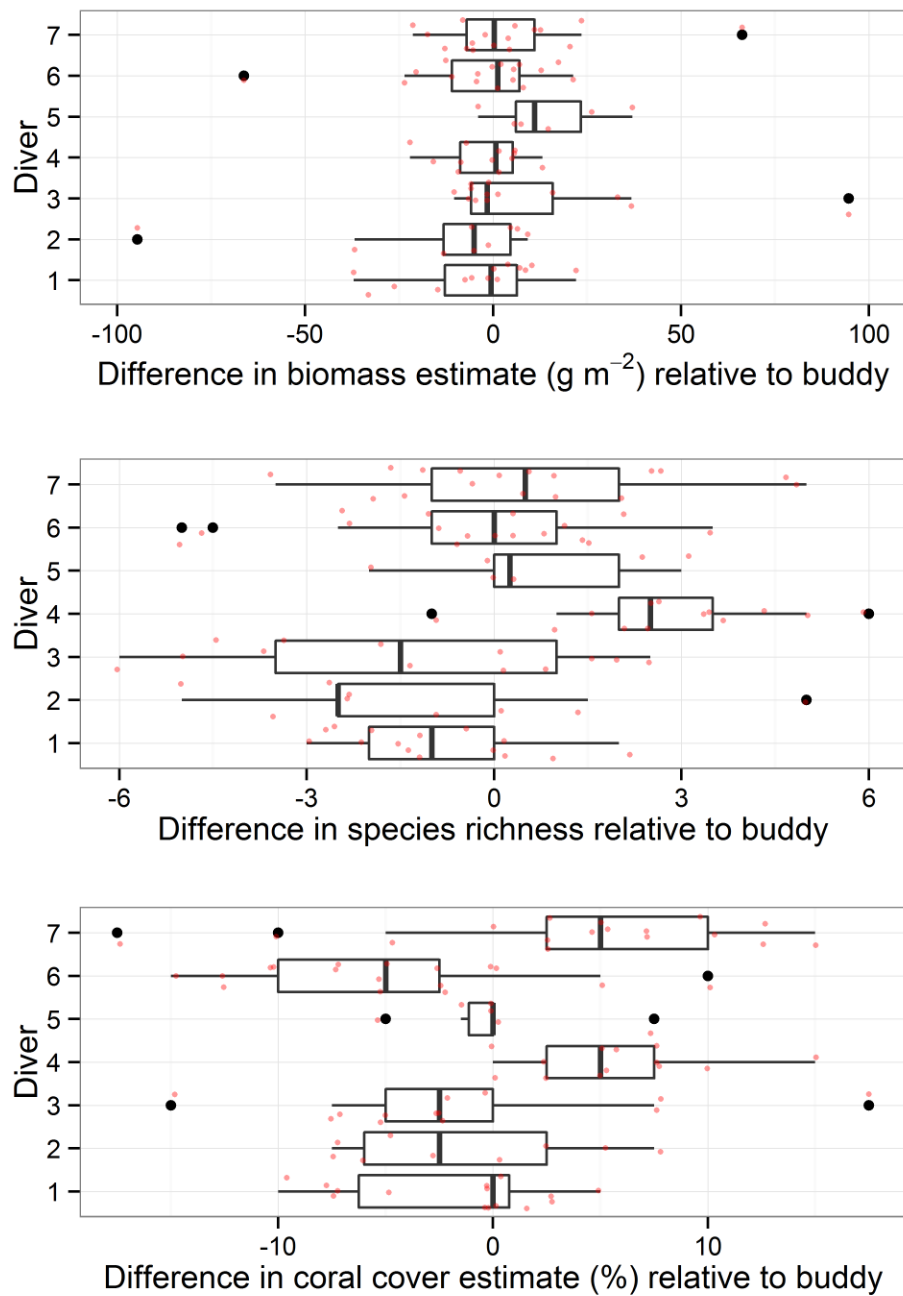


Figure A5.5 Pacific Remote Island Areas comparison of observer diver vs dive partner estimates for total fish biomass, species richness and hard coral cover during 2014 surveys. See Figure A5.2 legend for details.

Appendix 6: Species list

Table A.6. Species list ordered by abundance within consumer groups, showing length to weight parameters (LWA and LWB) used to calculate biomass per fish based on the estimated individual fish total length (Froese and Pauly 2010 and Kulbicki *et al.* 2005). The conversion factor (Con.factor) is used to translate fish lengths gathered by divers (as total length [TL]) into the length type (TL, fork length, standard length) that the species' length-to-weight parameters were developed for Freq.= number of observations in all regions since 2009 using the stationary point count method. Y indicates whether species have been recorded per region; only regions surveyed in 2014 are displayed.

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Secondary consumer	<i>Thalassoma duperrey</i>	Saddle wrasse	Labridae	0.0123	3.097	0.9	10095		Y	Y	Y
Secondary consumer	<i>Paracirrhites arcatus</i>	Arc-eye hawkfish	Cirrhitidae	0.0165	3.1253	1	6857	Y	Y	Y	Y
Secondary consumer	<i>Thalassoma quinquevittatum</i>	Fivestripe wrasse	Labridae	0.0139	3	1	6839	Y	Y	Y	Y
Secondary consumer	<i>Parupeneus multifasciatus</i>	Manybar goatfish	Mullidae	0.01136	3.21082	0.9	5509	Y	Y	Y	Y
Secondary consumer	<i>Plectroglyphidodon johnstonianus</i>	Johnston Island damsel	Pomacentridae	0.0612	2.635	1	4810	Y	Y	Y	Y
Secondary consumer	<i>Halichoeres ornatissimus</i>	Ornamented wrasse	Labridae	0.0133	3	1	4030	Y	Y	Y	Y
Secondary consumer	<i>Gomphosus varius</i>	Bird wrasse	Labridae	0.02437	2.70269	1	3735	Y	Y	Y	Y
Secondary consumer	<i>Plectroglyphidodon dickii</i>	Blackbar devil	Pomacentridae	0.0612	2.747	1	3266	Y	Y	Y	
Secondary consumer	<i>Sufflamen bursa</i>	Boomerang triggerfish	Balistidae	0.0216	3	1	3136	Y	Y	Y	Y
Secondary consumer	<i>Stethojulis balteata</i>	Belted wrasse	Labridae	0.015	3	1	3103		Y	Y	Y
Secondary consumer	<i>Balistapus undulatus</i>	Orange-lined triggerfish	Balistidae	0.0058	3.554	1	2897		Y	Y	
Secondary consumer	<i>Bodianus bilunulatus</i>	Tarry hogfish	Labridae	0.0146	3	1	2611		Y	Y	Y
Secondary consumer	<i>Coris venusta</i>	Elegant coris	Labridae	0.0065	3.254	1	2579		Y	Y	Y
Secondary consumer	<i>Thalassoma lutescens</i>	Yellow-brown wrasse	Labridae	0.013	3.04186	0.89	2546	Y	Y	Y	
Secondary consumer	<i>Halichoeres hortulanus</i>	Checkerboard wrasse	Labridae	0.0119	3.064	1	2416		Y	Y	
Secondary consumer	<i>Labroides dimidiatus</i>	Bluestreak cleaner wrasse	Labridae	0.00585	3.23093	1	2387	Y	Y	Y	
Secondary consumer	<i>Pseudocheilinus octotaenia</i>	Eight-lined wrasse	Labridae	0.0138	3.1563	1	2110	Y	Y	Y	Y
Secondary consumer	<i>Thalassoma ballieui</i>	Blacktail wrasse	Labridae	0.0123	3.097	0.98	1965		Y	Y	Y
Secondary consumer	<i>Zanclus cornutus</i>	Moorish idol	Zanclidae	0.0147	3.36990999	0.96	1613		Y	Y	Y
Secondary consumer	<i>Macropharyngodon geoffroy</i>	Geoffroy's wrasse	Labridae	0.0107	3.178	1	1557		Y	Y	Y
Secondary consumer	<i>Monotaxis grandoculis</i>	Humpnose big-eye bream	Lethrinidae	0.02296	3.02223	0.89	1509	Y	Y	Y	Y

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Secondary consumer	Macropharyngodon meleagris	Blackspotted wrasse	Labridae	0.0205	3	1	1401		Y	Y	
Secondary consumer	Parupeneus insularis	Twosaddle goatfish	Mullidae	0.0135	3.0671	1	1398	Y	Y	Y	Y
Secondary consumer	Chaetodon ornatissimus	Ornate butterflyfish	Chaetodontidae	0.0296	2.9895	1	1360	Y	Y	Y	Y
Secondary consumer	Oxycheilinus bimaculatus	Two-spot wrasse	Labridae	0.093	2.168	1	1248		Y	Y	Y
Secondary consumer	Chaetodon multicinctus	Pebbled butterflyfish	Chaetodontidae	0.045	2.814	1	1242		Y	Y	Y
Secondary consumer	Chaetodon reticulatus	Mailed butterflyfish	Chaetodontidae	0.0296	2.9895	1	1207	Y	Y	Y	
Secondary consumer	Plectroglyphidodon imparipennis	Brighteye damselfish	Pomacentridae	0.0612	2.691	1	1188	Y	Y	Y	Y
Secondary consumer	Forcipiger flavissimus	Longnose butterfly fish	Chaetodontidae	0.0125	3	1	1156	Y	Y	Y	Y
Secondary consumer	Coris gaimard	Yellowtail coris	Labridae	0.0109	3	1	1152		Y	Y	Y
Secondary consumer	Pseudocheilinus evanidus	Striated wrasse	Labridae	0.0049	3.51	1	1141		Y	Y	Y
Secondary consumer	Sargocentron tiere	Blue lined squirrelfish	Holocentridae	0.0234	3	1	1125	Y	Y	Y	
Secondary consumer	Rhinecanthus rectangulus	Wedge-tail triggerfish	Balistidae	0.0522	2.641	1	1035	Y	Y	Y	Y
Secondary consumer	Chaetodon quadrimaculatus	Fourspot butterflyfish	Chaetodontidae	0.0296	2.9895	1	1016	Y	Y	Y	Y
Secondary consumer	Labroides phthirophagus	Hawaiian cleaner wrasse	Labridae	0.0059	3.231	1	1003		Y	Y	Y
Secondary consumer	Lutjanus kasmira	Common bluestripe snapper	Lutjanidae	0.00842	3.24696	0.95	948		Y	Y	Y
Secondary consumer	Pseudocheilinus tetrataenia	Four-lined wrasse	Labridae	0.0138	3.1563	1	938	Y	Y	Y	Y
Secondary consumer	Labroides rubrolabiatus	Redlip cleaner wrasse	Labridae	0.0058	3.171	1	895	Y	Y	Y	
Secondary consumer	Epibulus insidiator	Slingjaw wrasse	Labridae	0.01614	3.08102	0.93	845	Y	Y	Y	Y
Secondary consumer	Chaetodon auriga	Threadfin butterflyfish	Chaetodontidae	0.0404	2.82943	1	812	Y	Y	Y	Y
Secondary consumer	Chaetodon punctatofasciatus	Spotband butterflyfish	Chaetodontidae	0.0296	2.9895	1	810	Y	Y	Y	
Secondary consumer	Chaetodon lunula	Raccoon butterflyfish	Chaetodontidae	0.0296	2.9895	1	766	Y	Y	Y	
Secondary consumer	Chaetodon fremblii	Bluestriped butterflyfish	Chaetodontidae	0.0296	2.9895	1	764		Y	Y	Y
Secondary consumer	Coris aygula	Clown coris	Labridae	0.00266	3.48857	1	757	Y	Y	Y	
Secondary consumer	Parupeneus pleurostigma	Sidespot goatfish	Mullidae	0.0119	3	1	751		Y	Y	Y
Secondary consumer	Halichoeres biocellatus	Red-lined wrasse	Labridae	0.0148	3	1	751	Y	Y	Y	
Secondary consumer	Pygoplites diacanthus	Royal angelfish	Pomacanthidae	0.0276	3	1	743		Y	Y	
Secondary consumer	Cirrhitops fasciatus	Redbarred hawkfish	Cirrhitidae	0.017	3	1	728		Y	Y	Y

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
consumer											
Secondary consumer	Valenciennea strigata	Blueband goby	Gobiidae	0.00929	3.0455	1	708		Y	Y	
Secondary consumer	Pseudocheilinus hexataenia	Sixline wrasse	Labridae	0.0167	3	1	705	Y	Y	Y	
Secondary consumer	Sufflamen fraenatum	Masked triggerfish	Balistidae	0.02881318	3.03482768	1	680		Y	Y	Y
Secondary consumer	Neocirrhites armatus	Flame hawkfish	Cirrhitidae	0.0165	3.1253	1	676	Y	Y	Y	
Secondary consumer	Hemigymnus fasciatus	Barred thicklip	Labridae	0.0171	3	1	673	Y	Y	Y	
Secondary consumer	Sufflamen chrysopterum	Halfmoon triggerfish	Balistidae	0.0153	3.152	1	643		Y	Y	
Secondary consumer	Labropsis xanthonota	Yellowback tubelip	Labridae	0.0076	3.105	1	612		Y	Y	
Secondary consumer	Pseudojuloides cerasinus	Smalltail wrasse	Labridae	0.0107	3.178	1	596		Y	Y	Y
Secondary consumer	Halichoeres margaritaceus	Pink-belly wrasse	Labridae	0.0106	3	1	596	Y	Y	Y	
Secondary consumer	Sargocentron caudimaculatum	Silverspot squirrelfish	Holocentridae	0.0232	2.9554	1	553		Y	Y	
Secondary consumer	Labroides bicolor	Bicolor cleaner wrasse	Labridae	0.0058	3.171	1	536	Y	Y	Y	
Secondary consumer	Chaetodon trifascialis	Chevron butterflyfish	Chaetodontidae	0.02578	2.96908	1	533	Y	Y	Y	Y
Secondary consumer	Anampses caeruleopunctatus	Bluespotted wrasse	Labridae	0.0105	3	1	519	Y	Y	Y	
Secondary consumer	Chaetodon citrinellus	Speckled butterflyfish	Chaetodontidae	0.0353	2.83414	1	511		Y	Y	
Secondary consumer	Anampses cuvier	Pearl wrasse	Labridae	0.0226	2.793	1	507		Y	Y	Y
Secondary consumer	Pomacanthus imperator	Emperor angelfish	Pomacanthidae	0.0276	3	1	497		Y	Y	
Secondary consumer	Lutjanus fulvus	Blacktail snapper	Lutjanidae	0.02106	2.97433	0.96	472	Y	Y	Y	
Secondary consumer	Thalassoma purpurum	Surge wrasse	Labridae	0.0259	3	1	452	Y	Y	Y	Y
Secondary consumer	Chaetodon lunulatus	Oval butterflyfish	Chaetodontidae	0.0296	2.9895	1	449		Y	Y	Y
Secondary consumer	Cheilinus trilobatus	Tripletail wrasse	Labridae	0.01623	3.05947	1	447	Y	Y	Y	
Secondary consumer	Chaetodon pelewensis	Sunset butterflyfish	Chaetodontidae	0.01533	3.29659	1	440		Y	Y	
Secondary consumer	Coris flavovittata	Yellowstripe coris	Labridae	0.0352	3	1	421		Y	Y	Y
Secondary consumer	Cantherhines dumerilii	Whitespotted filefish	Monacanthidae	0.0406	2.792	1	416	Y	Y	Y	Y
Secondary consumer	Cirrhitus pinnulatus	Stocky hawkfish	Cirrhitidae	0.0214	3	1	415		Y	Y	Y
Secondary consumer	Lutjanus gibbus	Humpback red snapper	Lutjanidae	0.01309	3.13752	0.89	394		Y	Y	
Secondary consumer	Cirrhitichthys falco	Dwarf hawkfish	Cirrhitidae	0.0172	2.977	1	383		Y	Y	

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Secondary consumer	Thalassoma trilobatum	Christmas wrasse	Labridae	0.0159	2.9718	1	339	Y	Y	Y	Y
Secondary consumer	Gnathodentex aureolineatus	Striped large-eye bream	Lethrinidae	0.02695338	3.06254326	0.91	339		Y	Y	
Secondary consumer	Chaetodon unimaculatus	Teardrop butterflyfish	Chaetodontidae	0.0533	2.83328	1	339	Y	Y	Y	Y
Secondary consumer	Mulloidichthys vanicolensis	Yellowfin goatfish	Mullidae	0.0099	3.015	1	329	Y	Y	Y	Y
Secondary consumer	Mulloidichthys flavolineatus	Yellowstripe goatfish	Mullidae	0.0089	3.0602	1	322		Y	Y	Y
Secondary consumer	Parapercis clathrata	Latticed sandperch	Pinguipedidae	0.0102	3.0463	1	312		Y	Y	
Secondary consumer	Anampses twistii	Yellowbreasted wrasse	Labridae	0.0147	3	1	310		Y	Y	
Secondary consumer	Forcipiger longirostris	Longnose butterflyfish	Chaetodontidae	0.0138	3	1	287		Y	Y	
Secondary consumer	Ostracion meleagris	Whitespotted boxfish	Ostraciidae	0.1141	2.5537	1	285	Y	Y	Y	Y
Secondary consumer	Chaetodon ephippium	Saddle butterflyfish	Chaetodontidae	0.02249	3.06092	1	276	Y	Y	Y	
Secondary consumer	Neoniphon sammara	Sammara squirrelfish	Holocentridae	0.02762	2.88835	0.92	272		Y	Y	Y
Secondary consumer	Sargocentron spiniferum	Sabre squirrelfish	Holocentridae	0.01541	3.11881	0.93	268	Y	Y	Y	Y
Secondary consumer	Pervagor spilosoma	Fantail filefish	Monacanthidae	0.025	2.946	1	267		Y	Y	Y
Secondary consumer	Plagiotremus goslinei	Biting blenny	Blenniidae	0.0018	3.581	0.98	258		Y	Y	Y
Secondary consumer	Halichoeres marginatus	Dusky wrasse	Labridae	0.013	3	1	255		Y	Y	
Secondary consumer	Bodianus axillaris	Axilspot hogfish	Labridae	0.0201	2.9992	1	249		Y	Y	
Secondary consumer	Malacanthus brevirostris	Quakerfish	Malacanthidae	0.0049	3	1	236		Y	Y	Y
Secondary consumer	Coris centralis	Central Pacific coris	Labridae	0.0065	3.254	1	232		Y	Y	
Secondary consumer	Anampses chrysocephalus	Red tail wrasse	Labridae	0.0226	2.793	1	230		Y	Y	Y
Secondary consumer	Apolemichthys trimaculatus	Threespot angelfish	Pomacanthidae	0.0669	2.724	1	228		Y	Y	
Secondary consumer	Plagiotremus tapeinosoma	Piano fangblenny	Blenniidae	0.00566	2.90832	0.98	223		Y	Y	
Secondary consumer	Bodianus loxozonus	Blackfin hogfish	Labridae	0.0201	2.9992	1	205		Y	Y	
Secondary consumer	Cheilinus oxycephalus	Snooty wrasse	Labridae	0.0155	3.058	1	195		Y	Y	
Secondary consumer	Heniochus chrysostomus	Threeband pennantfish	Chaetodontidae	0.01612999	3.26217	1	189		Y	Y	
Secondary consumer	Pseudodax moluccanus	Chiseltooth wrasse	Labridae	0.014	3.0097	1	185		Y	Y	
Secondary consumer	Oplegnathus punctatus	Spotted knifejaw	Oplegnathidae	0.0203	3	1	185	Y	Y	Y	Y
Secondary consumer	Plagiotremus ewaensis	Ewa blenny	Blenniidae	0.0018	3.581	0.95	178		Y	Y	Y

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
consumer											
Secondary consumer	Sargocentron diadema	Crown squirrelfish	Holocentridae	0.02505	2.95522	0.92	169		Y	Y	Y
Secondary consumer	Cirrhitichthys oxycephalus	Coral hawkfish	Cirrhitidae	0.0172	2.977	1	168		Y	Y	
Secondary consumer	Novaculichthys taeniourus	Rockmover wrasse	Labridae	0.013	2.91	1	164		Y	Y	Y
Secondary consumer	Pervagor aspricaudus	Orangetail filefish	Monacanthidae	0.025	2.946	1	157		Y	Y	Y
Secondary consumer	Halichoeres trimaculatus	Threespot wrasse	Labridae	0.02749	2.73584	1	157		Y	Y	
Secondary consumer	Chaetodon meyeri	Scrawled butterflyfish	Chaetodontidae	0.0296	2.9895	1	152		Y	Y	
Secondary consumer	Apolemichthys xanthopunctatus	Goldspotted angelfish	Pomacanthidae	0.0669	2.724	1	145		Y	Y	
Secondary consumer	Myripristis earlei	Earl's soldierfish	Holocentridae	0.02769	3.00336	0.92	144		Y	Y	
Secondary consumer	Exallias brevis	Leopard blenny	Blenniidae	0.0091	2.9904	1	143		Y	Y	Y
Secondary consumer	Pseudojuloides atavai	Polynesian wrasse	Labridae	0.0107	3.178	1	129	Y	Y	Y	
Secondary consumer	Chaetodon ulietensis	Pacific double-saddlebutterflyfish	Chaetodontidae	0.03114	2.87412	1	121	Y	Y	Y	
Secondary consumer	Hologymnosus doliatus	Pastel ring wrasse	Labridae	0.014	3.0097	1	114		Y	Y	
Secondary consumer	Parapercis schauinslandii	Redspotted sandperch	Pinguipedidae	0.0133	2.943	0.96	110		Y	Y	Y
Secondary consumer	Labroides pectoralis	Blackspot cleaner wrasse	Labridae	0.0058	3.171	1	110	Y	Y	Y	
Secondary consumer	Apolemichthys arcuatus	Banded angelfish	Pomacanthidae	0.0669	2.724	1	106		Y	Y	Y
Secondary consumer	Halichoeres melasmapomus	Cheekspot wrasse	Labridae	0.0126	3.0673	1	104		Y	Y	
Secondary consumer	Parupeneus porphyreus	Whitesaddle goatfish	Mullidae	0.0153	3	1	101		Y	Y	Y
Secondary consumer	Chaetodon vagabundus	Vagabond butterflyfish	Chaetodontidae	0.02776	2.97346	1	100		Y	Y	
Secondary consumer	Rhinecanthus aculeatus	Blackbar triggerfish	Balistidae	0.0522	2.641	1	96	Y	Y	Y	Y
Secondary consumer	Goniistius vittatus	Hawaiian morwong	Cheilodactylidae	0.0237	3.056	0.91	95		Y	Y	Y
Secondary consumer	Arothron meleagris	Guinea fowl puffer	Tetraodontidae	0.40816326	2.7027027	1	87	Y	Y	Y	Y
Secondary consumer	Bodianus prognathus	Longnose hogfish	Labridae	0.0108	3.173	1	81		Y	Y	
Secondary consumer	Aluterus scriptus	Scrawled filefish	Monacanthidae	0.0022	3	1	81	Y	Y	Y	
Secondary consumer	Hemigymnus melapterus	Blackeye thicklip	Labridae	0.02423	2.92262	1	79		Y	Y	
Secondary consumer	Sargocentron xantherythrum	Hawaiian squirrelfish	Holocentridae	0.0219	3.047	0.93	75		Y	Y	Y
Secondary consumer	Malacanthus latovittatus	Blue blanquillo	Malacanthidae	0.01	2.8763	1	75		Y	Y	

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Secondary consumer	Cheilinus chlorourus	Floral wrasse	Labridae	0.01972	2.99315	1	71		Y	Y	
Secondary consumer	Amanes scopas	Broom filefish	Monacanthidae	0.0228	2.8708	1	61		Y	Y	
Secondary consumer	Heniochus varius	Horned bannerfish	Chaetodontidae	0.025	3	1	59		Y	Y	
Secondary consumer	Pseudobalistes flavimarginatus	Yellowmargin triggerfish	Balistidae	0.1297	2.6061	1	56		Y	Y	
Secondary consumer	Heniochus monoceros	Masked bannerfish	Chaetodontidae	0.017	3.21058	1	55		Y	Y	
Secondary consumer	Anampses meleagrides	Spotted wrasse	Labridae	0.02261	2.79271	1	55		Y	Y	
Secondary consumer	Parupeneus barberinus	Dash-and-dot goatfish	Mullidae	0.01307	3.12248999	0.9	52	Y	Y	Y	
Secondary consumer	Labrichthys unilineatus	Tubelip wrasse	Labridae	0.015	3	1	51		Y	Y	
Secondary consumer	Cheilinus fasciatus	Redbreast wrasse	Labridae	0.0149	3	1	51	Y	Y	Y	
Secondary consumer	Scolopsis lineata	Striped monocle bream	Nemipteridae	0.0205	2.984	1	48		Y	Y	
Secondary consumer	Balistoides viridescens	Titan triggerfish	Balistidae	0.02442	3.01828	1	44		Y	Y	
Secondary consumer	Sebastapistes coniota	Humpback nohu	Scorpaenidae	0.0246	2.908	1	42		Y	Y	Y
Secondary consumer	Chaetodon bennetti	Bluelashed butterflyfish	Chaetodontidae	0.03839	2.88508	1	42		Y	Y	
Secondary consumer	Plagiotremus laudandus laudandus	Bicolour fangblenny	Blenniidae	0.0018	3.581	0.87	41		Y	Y	
Secondary consumer	Parapercis millepunctata	Black dotted sand perch	Pinguipedidae	0.0102	3.0463	1	41		Y	Y	
Secondary consumer	Stethojulis strigiventer	Three-line/Three-ribbon/Stripebelly wrasse	Labridae	0.01908	2.87626	1	40		Y	Y	
Secondary consumer	Plectorhinchus vittatus	Indian Ocean orientalsweetlips	Haemulidae	0.0144	3.03	1	38		Y	Y	
Secondary consumer	Lethrinus obsoletus	Orange-striped emperor	Lethrinidae	0.01733	3.02583	0.97	36	Y	Y	Y	
Secondary consumer	Cirrhitops hubbardi	Whitespotted hawkfish	Cirrhitidae	0.00929	3.268	1	35		Y	Y	
Secondary consumer	Cheilinus undulatus	Humphead wrasse	Labridae	0.01131	3.1362	1	34	Y	Y	Y	
Secondary consumer	Apolemichthys griffisi	Griffis angelfish	Pomacanthidae	0.0669	2.724	1	34		Y	Y	
Secondary consumer	Pseudocoris heteroptera	Torpedowrasse	Labridae	0.0107	3.178	0.99	32		Y	Y	
Secondary consumer	Pervagor janthinosoma	Blackbar filefish	Monacanthidae	0.007	3.262	1	32		Y	Y	
Secondary consumer	Neoniphon opercularis	Blackfin squirrelfish	Holocentridae	0.0094	3	1	31		Y	Y	
Secondary consumer	Anampses melanurus	White-spotted wrasse	Labridae	0.0105	3	1	30		Y	Y	
Secondary consumer	Oxymonacanthus longirostris	Harlequin filefish	Monacanthidae	0.0132	3	1	29		Y	Y	
Secondary consumer	Cheilio inermis	Cigar wrasse	Labridae	0.00349	3.08157	1	27		Y	Y	

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
consumer											
Secondary consumer	Bodianus mesothorax	Splitlevel hogfish	Labridae	0.0201	2.9992	1	27		Y	Y	
Secondary consumer	Arothron nigropunctatus	Blackspotted puffer	Tetraodontidae	0.0266	3	1	27		Y	Y	
Secondary consumer	Cheilodipterus quinquelineatus	Five-lined cardinalfish	Apogonidae	0.01607	2.99923	0.96	26		Y	Y	
Secondary consumer	Diodon hystrix	Spot-fin porcupinefish	Diodontidae	0.19343	2.47179	1	25	Y	Y	Y	Y
Secondary consumer	Bothus mancus	Flowery flounder	Bothidae	0.00981	3.189	1	25	Y	Y	Y	
Secondary consumer	Bodianus diana	Diana's hogfish	Labridae	0.0201	2.9992	1	25		Y	Y	
Secondary consumer	Balistoides conspicillum	Clown triggerfish	Balistidae	0.0058	3.554	1	25		Y	Y	
Secondary consumer	Lethrinus rubrioperculatus	Spotcheek emperor	Lethrinidae	0.01279	3.10807	0.91	24	Y	Y	Y	
Secondary consumer	Chaetodon melannotus	Blackback butterflyfish	Chaetodontidae	0.02669	3.0486	1	23		Y	Y	
Secondary consumer	Caracanthus typicus	Hawaiian orbicularvelvetfish	Caracanthidae	0.0089	3.323	1	20		Y	Y	Y
Secondary consumer	Sargocentron microstoma	Smallmouth squirrelfish	Holocentridae	0.0219	3.047	0.94	18		Y	Y	
Secondary consumer	Lethrinus harak	Thumbprint emperor	Lethrinidae	0.01701	3.04226	0.93	17		Y	Y	
Secondary consumer	Hologymnosus annulatus	Ring wrasse	Labridae	0.0065	3.25441	0.99	17		Y	Y	
Secondary consumer	Heniochus singularius	Singular bannerfish	Chaetodontidae	0.0301	3	1	17		Y	Y	
Secondary consumer	Cymolutes lecluse	Sharp-headed wrasse	Labridae	0.0107	3.178	1	17		Y	Y	Y
Secondary consumer	Caracanthus maculatus	Spotted coral croucher	Caracanthidae	0.0337	3	1	17		Y	Y	
Secondary consumer	Pterois antennata	Broadbarred firefish	Scorpaenidae	0.0189	3.011	1	16	Y	Y	Y	
Secondary consumer	Centropyge multifasciata	Barred angelfish	Pomacanthidae	0.0314	2.7995	1	15		Y	Y	
Secondary consumer	Arothron hispidus	White-spotted puffer	Tetraodontidae	0.06338	2.75597	1	15		Y	Y	
Secondary consumer	Pinguipedidae sp	Sandperch species	Pinguipedidae	0.01331	2.94268	0.96	14		Y	Y	
Secondary consumer	Plectorhinchus picus	Painted sweetlip	Haemulidae	0.01151	3.08892	0.96	14		Y	Y	
Secondary consumer	Halichoeres prosopion	Twotone wrasse	Labridae	0.0126	3.0673	1	14		Y	Y	
Secondary consumer	Neoniphon argenteus	Clearfin squirrelfish	Holocentridae	0.031649	2.82326	0.92	13		Y	Y	
Secondary consumer	Mulloidichthys mimicus	Mimic goatfish	Mullidae	0.0074	3.293	0.92	13		Y	Y	
Secondary consumer	Dendrochirus barberi	Hawaiian lionfish	Scorpaenidae	0.0246	2.908	1	13		Y	Y	Y
Secondary consumer	Chaetodon lineolatus	Lined butterflyfish	Chaetodontidae	0.06926	2.62151	1	13		Y	Y	

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Secondary consumer	Paracirrhites xanthus	Yellow hawkfish	Cirrhitidae	0.0165	3.1253	1	12		Y	Y	
Secondary consumer	Diodon holocanthus	Long-spine porcupinefish	Diodontidae	0.0678	2.784	1	12		Y	Y	
Secondary consumer	Pervagor marginalis	Blackmargin filefish	Monacanthidae	0.025	2.946	1	11		Y		
Secondary consumer	Bolbometopon muricatum	Green humphead parrotfish	Scaridae	0.0183	3.0421	1	11		Y		
Secondary consumer	Plagiotremus rhinorhynchus	Bluestriped fangblenny	Blenniidae	0.0012	3.792	0.94	10		Y	Y	
Secondary consumer	Ostracion whitleyi	Whitley's box	Ostraciidae	0.1288	2.519	1	10		Y	Y	
Secondary consumer	Aspidontus taeniatus	False cleanerfish	Blenniidae	0.02037181	3.23093426	1	10		Y	Y	
Secondary consumer	Aetobatus narinari	Spotted eagle ray	Myliobatidae	0.0059	3.13	1	10		Y	Y	
Secondary consumer	Parupeneus chrysonemus	Yellowbarbel goatfish	Mullidae	0.01136	3.21082	0.9	9		Y	Y	
Secondary consumer	Gymnothorax eurostus	Abbott's moray eel	Muraenidae	5.00E-04	3.303	1	9		Y	Y	Y
Secondary consumer	Parapercis sp	Sandperch species	Pinguipedidae	0.01331	2.94268	0.96	8		Y	Y	
Secondary consumer	Oplegnathus fasciatus	Barred knifejaw	Oplegnathidae	0.0266	3	1	8		Y	Y	Y
Secondary consumer	Amblyglyphidodon curacao	Staghorn damselfish	Pomacentridae	0.0126	3.43508	0.92	7		Y	Y	
Secondary consumer	Pseudocoris aurantiofasciata	Rust-banded wrasse	Labridae	0.0107	3.178	0.97	6	Y	Y	Y	
Secondary consumer	Pentapodus caninus	Small-toothed whiptail	Nemipteridae	0.0171	3.004	0.9	6		Y	Y	
Secondary consumer	Parupeneus crassilabris	Doublebar goatfish	Mullidae	0.0145	3.13	0.9	6		Y		
Secondary consumer	Myripristis violacea	Lattice soldierfish	Holocentridae	0.0364	2.94	0.905	6		Y	Y	
Secondary consumer	Echidna nebulosa	Snowflake moray	Muraenidae	0.00029	3.352	1	6		Y	Y	
Secondary consumer	Cheilodipterus artus	Wolf cardinalfish	Apogonidae	0.0038	3.59	0.96	6		Y		
Secondary consumer	Balistidae	Triggerfish species	Balistidae	0.019	3.07824	1	4		Y	Y	
Secondary consumer	Taeniura meyeni	Blotched fantail ray	Dasyatidae	0.0087	3	1	4		Y	Y	
Secondary consumer	Sargocentron ensifer	Yellow-striped squirrelfish	Holocentridae	0.0219	3.047	0.91	4		Y	Y	
Secondary consumer	Pteragogus enneacanthus	Cockerel wrasse	Labridae	0.0138	3.018	1	4		Y	Y	
Secondary consumer	Platax orbicularis	Orbicular batfish	Ephippidae	0.0443	2.951	1	4		Y		
Secondary consumer	Myrichthys magnificus	Magnificent snake eel	Ophichthidae	0.002	3	1	4		Y		Y
Secondary consumer	Iniistius pavo	Peacock wrasse	Labridae	0.0107	3.178	1	4		Y	Y	
Secondary consumer	Grammistes sexlineatus	Sixline soapfish	Serranidae	0.0205	3	1	4		Y	Y	

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
consumer											
Secondary consumer	<i>Coris dorsomacula</i>	Palebarred coris	Labridae	0.0065	3.254	1	4		Y	Y	
Secondary consumer	<i>Cirrhilabrus punctatus</i>	Dotted wrasse	Labridae	0.0138	3.018	1	4		Y	Y	
Secondary consumer	<i>Balistes polylepis</i>	Finescale triggerfish	Balistidae	0.019	3.078	0.93	4		Y		
Secondary consumer	<i>Scorpaenodes parvipinnis</i>	Lowfin scorpionfish	Scorpaenidae	0.02542	2.99886	1	3		Y		
Secondary consumer	<i>Rhinecanthus lunula</i>	Halfmoon picassofish	Balistidae	0.0321	2.87	1	3		Y		
Secondary consumer	<i>Psilogobius mainlandi</i>	Mainland's goby	Gobiidae	0.0264	2.623	1	3		Y		Y
Secondary consumer	<i>Mulloidichthys pfluegeri</i>	Orange goatfish	Mullidae	0.0126	3.0494	1	3		Y		
Secondary consumer	<i>Lactoria fornasini</i>	Thornback cowfish	Ostraciidae	0.4029	1.928	1	3		Y		Y
Secondary consumer	<i>Iniistius aeneitensis</i>	Yellowblotch razorfish	Labridae	0.0107	3.178	1	3		Y		Y
Secondary consumer	<i>Hoplolatilus starcki</i>	Bluehead tilefish	Malacanthidae	0.0049	3	1	3		Y		
Secondary consumer	<i>Cymolutes praetextatus</i>	Knifefish	Labridae	0.0107	3.178	1	3		Y		Y
Secondary consumer	<i>Sebastapistes cyanostigma</i>	Yellowspotted scorpionfish	Scorpaenidae	0.0246	2.908	1	2		Y		
Secondary consumer	<i>Sargocentron punctatissimum</i>	Speckled squirrelfish	Holocentridae	0.0219	3.047	0.93	2	Y	Y		Y
Secondary consumer	<i>Paraluteres prionurus</i>	Blacksaddle filefish	Monacanthidae	0.007	3.262	1	2		Y		Y
Secondary consumer	<i>Gymnomuraena zebra</i>	Zebra moray	Muraenidae	5.00E-04	3.303	1	2		Y		Y
Secondary consumer	<i>Fusigobius duospilus</i>	Barenape goby	Gobiidae	0.0096	3.0187	1	2		Y		
Secondary consumer	<i>Chaetodon rafflesii</i>	Latticed butterflyfish	Chaetodontidae	0.0296	2.9895	1	2		Y		
Secondary consumer	<i>Chaetodon flavocoronatus</i>	Yellow-crowned butterflyfish	Chaetodontidae	0.045	2.814	1	2		Y		
Secondary consumer	<i>Amblycirrhitus bimacula</i>	Twospot hawkfish	Cirrhitidae	0.00929	3.268	1	2		Y		Y
Secondary consumer	<i>Upeneus taeniopterus</i>	Finstripe goatfish	Mullidae	0.0103	3.215	0.9	1		Y		
Secondary consumer	<i>Stethojulis trilineata</i>	Fourline wrasse	Labridae	0.0072	3.257	1	1		Y		Y
Secondary consumer	<i>Pteragogus cryptus</i>	Cryptic wrasse	Labridae	0.0138	3.018	1	1		Y		Y
Secondary consumer	<i>Pseudocheilinus ocellatus</i>	Whitebarred wrasse	Labridae	0.0107	3.178	1	1	Y	Y		Y
Secondary consumer	<i>Polydactylus sexfilis</i>	Sixfinger threadfin	Polynemidae	0.0135	3.117	0.82	1		Y		
Secondary consumer	<i>Platax teira</i>	Tiera batfish	Ephippidae	0.0425	2.975	1	1		Y		
Secondary consumer	<i>Plectorhinchus gibbosus</i>	Harry hotlips	Haemulidae	0.02261	2.961959	1	1		Y		Y

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Secondary consumer	Pervagor melanocephalus	Redtail filefish	Monacanthidae	0.025	2.946	1	1		Y		
Secondary consumer	Neoniphon aurolineatus	Yellowstriped squirrelfish	Holocentridae	0.0288	2.867	0.9	1		Y	Y	
Secondary consumer	Istigobius decoratus	Decorated goby	Gobiidae	0.0227	2.686	1	1		Y		
Secondary consumer	Iniistius umbrilatus	Razor wrasse fish	Labridae	0.0107	3.178	1	1		Y	Y	
Secondary consumer	Gymnothorax melatremus	Dwarf moray	Muraenidae	0.0013	3	1	1		Y		
Secondary consumer	Gobiodon citrinus	Poison goby	Gobiidae	0.0577	2.439	1	1		Y	Y	
Secondary consumer	Dasyatidae	Stingray species	Dasyatidae	0.00937	3.35249	1	1		Y	Y	
Secondary consumer	Chaetodon tinkeri	Hawaiian butterflyfish	Chaetodontidae	0.045	2.814	1	1		Y		
Secondary consumer	Choerodon jordani	Blackwedge tuskfish	Labridae	0.0151	3.122	1	1		Y		
Secondary consumer	Brotula multibarata	Goatsbeard brotula	Ophidiidae	9.00E-04	4.47	1	1		Y	Y	
Secondary consumer	Belonoperca chabanaudi	Arrowhead soapfish	Serranidae	0.0134	3.031	1	1		Y		
Secondary consumer	Arothron stellatus	Starry toadfish	Tetraodontidae	0.0915	2.67239	1	1		Y	Y	
Secondary consumer	Arothron mappa	Map puffer	Tetraodontidae	0.0307	2.8499	1	1		Y		
Primary consumer	Acanthurus nigrofusus	Brown surgeonfish	Acanthuridae	0.02637	3.02837	0.91	8488	Y	Y	Y	Y
Primary consumer	Stegastes fasciolatus	Pacific gregory	Pomacentridae	0.0349	2.9109	1	6090	Y	Y	Y	Y
Primary consumer	Ctenochaetus striatus	Striated surgeonfish	Acanthuridae	0.02313	3.06347	0.91	5390	Y	Y	Y	
Primary consumer	Chlorurus sordidus	Daisy parrotfish	Scaridae	0.02431	2.96931	1	5308	Y	Y	Y	Y
Primary consumer	Acanthurus nigricans	Whitecheek surgeonfish	Acanthuridae	0.067	2.669	1	5039	Y	Y	Y	
Primary consumer	Centropyge flavissima	Lemonpeel angelfish	Pomacanthidae	0.0314	2.7995	1	4508	Y	Y	Y	
Primary consumer	Naso lituratus	Orangespine unicornfish	Acanthuridae	0.0085	3.25	0.97	4451	Y	Y	Y	Y
Primary consumer	Melichthys vidua	Pinktail triggerfish	Balistidae	0.0058	3.554	1	4323	Y	Y	Y	Y
Primary consumer	Ctenochaetus strigosus	Spotted surgeonfish	Acanthuridae	0.022	3	1	3975		Y	Y	Y
Primary consumer	Acanthurus nigroris	Bluelined surgeonfish	Acanthuridae	0.021	2.9435	1	3242	Y	Y	Y	Y
Primary consumer	Acanthurus olivaceus	Orangespot surgeonfish	Acanthuridae	0.03839	3.055	0.86	3036	Y	Y	Y	Y
Primary consumer	Ctenochaetus cyanocheilus	Bluelip bristletooth	Acanthuridae	0.0233	3.0559	1	2595	Y	Y	Y	
Primary consumer	Acanthurus triostegus	Convict surgeonfish	Acanthuridae	0.08306	2.56968	0.87	2591	Y	Y	Y	Y
Primary	Zebrasoma flavescens	Yellow tang	Acanthuridae	0.0148	3.16	1	2475	Y	Y	Y	Y

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
consumer											
Primary consumer	Chlorurus perspicillatus	Spectacled parrotfish	Scaridae	0.0204	3	1	2132		Y	Y	Y
Primary consumer	Canthigaster jactator	Hawaiian whitespotted toby	Tetraodontidae	0.0424	2.822	1	2005		Y	Y	Y
Primary consumer	Centropyge potteri	Russet angelfish	Pomacanthidae	0.0745	2.577	1	1897		Y	Y	Y
Primary consumer	Acanthurus lineatus	Lined surgeonfish	Acanthuridae	0.0412	2.85	1	1771		Y	Y	
Primary consumer	Scarus rubroviolaceus	Ember parrotfish	Scaridae	0.0136	3.109	1	1660		Y	Y	Y
Primary consumer	Acanthurus leucopareius	Whitebar surgeonfish	Acanthuridae	0.0028	3	1	1650		Y	Y	Y
Primary consumer	Chrysiptera brownriggii	Surge damselfish	Pomacentridae	0.0294	2.95049999	1	1601	Y	Y	Y	
Primary consumer	Naso unicornis	Bluespine unicornfish	Acanthuridae	0.01788	3.03545	0.96	1583	Y	Y	Y	Y
Primary consumer	Scarus psittacus	Common parrotfish	Scaridae	0.01045	3.31871	0.97	1465	Y	Y	Y	Y
Primary consumer	Scarus forsteni	Forsten's parrotfish	Scaridae	0.01859	3.0455	1	1413	Y	Y	Y	
Primary consumer	Centropyge shepardi	Mango angelfish	Pomacanthidae	0.0745	2.577	1	1396		Y	Y	
Primary consumer	Scarus dubius	Regal parrot	Scaridae	0.0222	2.971	0.97	1332		Y	Y	Y
Primary consumer	Centropyge loricula	Flame angel	Pomacanthidae	0.0314	2.7995	1	1264	Y	Y	Y	
Primary consumer	Ctenochaetus marginatus	Striped-fin surgeonfish	Acanthuridae	0.0237	3.056	0.95	1159		Y	Y	
Primary consumer	Stegastes aureus	Golden gregory	Pomacentridae	0.0349	2.9109	1	981		Y	Y	
Primary consumer	Acanthurus achilles	Achilles tang	Acanthuridae	0.025	3	1	878	Y	Y	Y	Y
Primary consumer	Scaridae	Parrotfish species	Scaridae	0.02337	2.95646	0.97	870	Y	Y	Y	Y
Primary consumer	Chromis iomelas	Half-and-half chromis	Pomacentridae	0.01505	3.38293	0.9	739		Y	Y	
Primary consumer	Acanthurus blochii	Ringtail surgeonfish	Acanthuridae	0.02506	3.03193	0.93	731		Y	Y	Y
Primary consumer	Chrysiptera taupou	Southseas devil	Pomacentridae	0.02199	3.00115	0.97	716		Y	Y	
Primary consumer	Ctenochaetus hawaiiensis	Chevron tang	Acanthuridae	0.0162	3.0123	1	695	Y	Y	Y	Y
Primary consumer	Acanthurus pyroferus	Chocolate surgeonfish	Acanthuridae	0.018	3	1	689		Y	Y	
Primary consumer	Chrysiptera traceyi	Tracey's demoiselle	Pomacentridae	0.026	2.926	0.96	661		Y	Y	
Primary consumer	Zebрасoma veliferum	Sailfin tang	Acanthuridae	0.03425	2.86581	1	555	Y	Y	Y	Y
Primary consumer	Cirripectes vanderbilti	Scarface blenny	Blenniidae	0.0061	2.9963	1	526		Y	Y	Y
Primary consumer	Ctenochaetus binotatus	Twospot surgeonfish	Acanthuridae	0.03916	2.87463	0.91	522		Y	Y	

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Primary consumer	Scarus frenatus	Bridled parrotfish	Scaridae	0.03203348	3.06	0.88	514		Y	Y	
Primary consumer	Centropyge bispinosa	Twospined angelfish	Pomacanthidae	0.03787336	2.45798686	1	513		Y	Y	
Primary consumer	Centropyge heraldi	Yellow angelfish	Pomacanthidae	0.0277	3	1	474		Y	Y	
Primary consumer	Cirripectes variolosus	Red-speckled blenny	Blenniidae	0.0061	2.9963	1	461	Y	Y	Y	
Primary consumer	Calotomus carolinus	Carolines parrotfish	Scaridae	0.0122	3.167	1	451		Y	Y	Y
Primary consumer	Chlorurus microrhinos	Steephead parrots	Scaridae	0.0273	2.93	0.93	447	Y	Y	Y	
Primary consumer	Acanthurus dussumieri	Eyestripe surgeonfish	Acanthuridae	0.04256	2.86826	0.93	417		Y	Y	Y
Primary consumer	Zebрасoma scopas	Twotone tang	Acanthuridae	0.02905	2.99274	1	378		Y	Y	
Primary consumer	Chlorurus japanensis	Palecheek parrotfish	Scaridae	0.0224	3.0394	1	323		Y	Y	
Primary consumer	Scarus oviceps	Dark capped parrotfish	Scaridae	0.018	3	1	316	Y	Y	Y	
Primary consumer	Chlorurus frontalis	Tan-faced parrotfish	Scaridae	0.0224	3.0394	1	307	Y	Y	Y	
Primary consumer	Canthigaster solandri	Spotted sharpnose	Tetraodontidae	0.02989	2.97881	1	306	Y	Y	Y	
Primary consumer	Canthigaster coronata	Crowned puffer	Tetraodontidae	0.0424	2.822	1	286		Y	Y	Y
Primary consumer	Scarus schlegeli	Yellowband parrotfish	Scaridae	0.02306	2.96919	0.98	272		Y	Y	
Primary consumer	Plectroglyphidodon phoenixensis	Phoenix devil	Pomacentridae	0.0612	2.691	1	263	Y	Y	Y	
Primary consumer	Scarus sp	Scarus genus species	Scaridae	0.02337	2.95646	0.97	254		Y	Y	
Primary consumer	Acanthurus guttatus	Whitespotted surgeonfish	Acanthuridae	0.0029	3	1	242	Y	Y	Y	
Primary consumer	Ctenochaetus flavicauda	Pale-tailed/Whitetail bristletooth	Acanthuridae	0.0233	3.0559	1	233		Y	Y	
Primary consumer	Canthigaster amboinensis	Spider-eye puffer	Tetraodontidae	0.0197	2.9174	1	229	Y	Y	Y	
Primary consumer	Cantherhines pardalis	Honeycomb filefish	Monacanthidae	0.017	3.07	1	205		Y	Y	
Primary consumer	Scarus tricolor	Tricolour parrotfish	Scaridae	0.01859	3.0455	1	193		Y	Y	
Primary consumer	Acanthurus sp	Acanthurus species	Acanthuridae	0.02803	2.98288	0.9	192	Y	Y	Y	Y
Primary consumer	Cantherhines sandwichiensis	Sandwich isle file	Monacanthidae	0.007	3.262	1	179		Y	Y	Y
Primary consumer	Centropyge fisheri	Orange angelfish	Pomacanthidae	0.0745	2.577	1	162		Y	Y	Y
Primary consumer	Acanthurus xanthopterus	Yellowfin surgeonfish	Acanthuridae	0.02673	2.98449	0.87	154		Y	Y	
Primary consumer	Abudefduf sordidus	Blackspot sergeant	Pomacentridae	0.0246	3	1	151	Y	Y	Y	
Primary	Stegastes nigricans	Dusky farmerfish	Pomacentridae	0.03841	3.01	0.94	146	Y	Y	Y	

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
consumer											
Primary consumer	Calotomus zonarchus	Yellowbar parrot	Scaridae	0.0222	2.971	1	143		Y	Y	Y
Primary consumer	Acanthurus nigricauda	Epaulette surgeonfish	Acanthuridae	0.01678	3.16772	0.84	132	Y	Y	Y	
Primary consumer	Zebrasoma rostratum	Longnose surgeonfish	Acanthuridae	0.0285	2.9923	1	130		Y	Y	
Primary consumer	Chaetodon mertensii	Atoll butterflyfish	Chaetodontidae	0.0043	3.79338	1	124		Y	Y	
Primary consumer	Chromis amboinensis	Ambon chromis	Pomacentridae	0.0258	3	1	111		Y	Y	
Primary consumer	Stegastes albifasciatus	Whitebar gregory	Pomacentridae	0.0296	3	1	105	Y	Y	Y	
Primary consumer	Chrysiptera biocellata	Twinspot damselfish	Pomacentridae	0.0239	3	1	103		Y	Y	
Primary consumer	Scarus globiceps	Globehead parrotfish	Scaridae	0.0155	3	1	94	Y	Y	Y	
Primary consumer	Acanthurus maculiceps	White-freckled surgeonfish	Acanthuridae	0.027	2.945	0.83	91		Y	Y	
Primary consumer	Kyphosus pacificus	Grey sea chub	Kyphosidae	0.0275	2.86	1	87		Y	Y	
Primary consumer	Acanthurus leucocheilus	Palelipped surgeonfish	Acanthuridae	0.0261	3.024	0.9	76		Y	Y	
Primary consumer	Acanthuridae	Surgeonfish species	Acanthuridae	0.02803	2.98288	0.9	73		Y	Y	
Primary consumer	Plectroglyphidodon leucozonus	Singlebar devil	Pomacentridae	0.0297	2.936	0.92	68		Y	Y	
Primary consumer	Scarus altipinnis	Filament-finned parrotfish	Scaridae	0.0184	3.02932	0.98	67		Y	Y	
Primary consumer	Naso tonganus	Bulbnose unicornfish	Acanthuridae	0.0085	3.25	1	61		Y	Y	
Primary consumer	Cirripectes polyzona	Barred blenny	Blenniidae	0.0021	3	1	59		Y	Y	
Primary consumer	Centropyge bicolor	Bicolor angelfish	Pomacanthidae	0.0211	3	1	55		Y	Y	
Primary consumer	Scarus spinus	Greensnout parrotfish	Scaridae	0.01859	3.0455	1	53		Y	Y	
Primary consumer	Acanthurus albipectoralis	Whitefin surgeonfish	Acanthuridae	0.028	2.983	0.91	53		Y	Y	
Primary consumer	Chrysiptera glauca	Grey demoiselle	Pomacentridae	0.0217	3	1	49		Y	Y	
Primary consumer	Scarus niger	Dusky parrotfish	Scaridae	0.01335	3.15996	0.98	42		Y	Y	
Primary consumer	Kyphosus cinerascens	Blue seachub	Kyphosidae	0.0275	2.86	1	39		Y	Y	
Primary consumer	Siganus argenteus	Streamlined spinefoot	Siganidae	0.0109	3.15419	0.9	38		Y	Y	
Primary consumer	Ctenochaetus sp	Bristletooth	Acanthuridae	0.02371	3.05581	0.92	38	Y	Y	Y	
Primary consumer	Cetoscarus ocellatus	Bicolour parrotfish	Scaridae	0.0157	3	1	37		Y	Y	
Primary consumer	Scarus ghobban	Blue-barred parrotfish	Scaridae	0.0165	3.04116	0.97	30	Y	Y	Y	

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Primary consumer	<i>Stegastes lividus</i>	Blunt snout gregory	Pomacentridae	0.0349	2.9109	1	27		Y		
Primary consumer	<i>Plectroglyphidodon sindonis</i>	Rock damselfish	Pomacentridae	0.0297	2.936	0.9	25		Y		
Primary consumer	<i>Kyphosus sandwicensis</i>	Pacific chub	Kyphosidae	0.0275	2.86	1	24		Y	Y	
Primary consumer	<i>Canthigaster valentini</i>	Valentini's sharpnosepuffer	Tetraodontidae	0.03667	2.94319	1	24		Y	Y	
Primary consumer	<i>Hipposcarus longiceps</i>	Pacific longnoseparrotfish	Scaridae	0.0198	3	1	22		Y	Y	
Primary consumer	<i>Cantherhines verecundus</i>	Shy filefish	Monacanthidae	0.007	3.262	1	21		Y	Y	
Primary consumer	<i>Canthigaster janthinoptera</i>	Honeycomb toby	Tetraodontidae	0.0424	2.822	1	20	Y	Y	Y	
Primary consumer	<i>Scarus festivus</i>	Festive parrotfish	Scaridae	0.0222	2.971	0.95	19		Y	Y	
Primary consumer	<i>Chaetodon semeion</i>	Dotted butterflyfish	Chaetodontidae	0.0296	2.9895	1	19		Y	Y	
Primary consumer	<i>Chanos chanos</i>	Milkfish	Chanidae	0.00474	3.38911	0.84	19		Y	Y	
Primary consumer	<i>Scarus dimidiatus</i>	Yellowbarred parrotfish	Scaridae	0.02337	2.956	1	15		Y	Y	
Primary consumer	<i>Scarus xanthopleura</i>	Red parrotfish	Scaridae	0.0188	3.026	0.94	14		Y	Y	
Primary consumer	<i>Scarus fuscocaudalis</i>	Darktail parrotfish	Scaridae	0.0222	2.971	0.97	14		Y	Y	
Primary consumer	<i>Abudefduf septemfasciatus</i>	Banded sergeant	Pomacentridae	0.02947836	3.15196904	0.93	14		Y	Y	
Primary consumer	<i>Amblygobius phalaena</i>	Banded goby	Gobiidae	0.01838	2.83356999	1	9		Y	Y	
Primary consumer	<i>Kyphosus vaigiensis</i>	Brassy chub	Kyphosidae	0.01998	3.03696	0.95	8		Y	Y	
Primary consumer	<i>Centropyge vrolikii</i>	Pearlscale angelfish	Pomacanthidae	0.0745	2.577	1	8		Y	Y	
Primary consumer	<i>Centropyge interruptus</i>	Japanese angelfish	Pomacanthidae	0.0745	2.577	1	8		Y	Y	
Primary consumer	<i>Ostracion cubicus</i>	Yellow boxfish	Ostraciidae	0.128819	2.51949	1	6		Y	Y	
Primary consumer	<i>Siganus spinus</i>	Little spinefoot	Siganidae	0.015	3.093	0.97	5		Y	Y	
Primary consumer	<i>Naso brachycentron</i>	Humpback unicornfish	Acanthuridae	0.02656209	3.0354541	0.9	4		Y	Y	
Primary consumer	<i>Canthigaster epilampra</i>	Lantern toby	Tetraodontidae	0.0424	2.822	1	4		Y		
Primary consumer	<i>Canthigaster bennetti</i>	Bennett's sharpnose puffer	Tetraodontidae	0.0424	2.822	1	4		Y	Y	
Primary consumer	<i>Kyphosus hawaiiensis</i>	Hawaiian chub	Kyphosidae	0.0275	2.86	1	3		Y	Y	
Primary consumer	<i>Cirripectes obscurus</i>	Gargantuan blenny	Blenniidae	0.013	3.15	1	3		Y	Y	
Primary consumer	<i>Cirripectes stigmaticus</i>	Red-streaked blenny	Blenniidae	0.0207	2.906	1	2		Y		
Primary	<i>Siganus punctatus</i>	Goldspotted spinefoot	Siganidae	0.00949	3.27616	0.89	1		Y		

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
consumer											
Primary consumer	Centropyge multicolor	Multicolor angelfish	Pomacanthidae	0.0745	2.577	1	1		Y		
Primary consumer	Canthigaster rivulata	Brown-lined puffer	Tetraodontidae	0.0424	2.822	1	1		Y	Y	
Planktivores	Pomacentrus vaiuli	Ocellate damselfish	Pomacentridae	0.0472	2.77525	0.95	4058		Y	Y	
Planktivores	Chromis vanderbilti	Vanderbilt's chromis	Pomacentridae	0.0258	3	1	3558	Y	Y	Y	Y
Planktivores	Chromis margaritifer	Bicolor chromis	Pomacentridae	0.0258	3	1	2776		Y	Y	
Planktivores	Chromis acares	Midget chromis	Pomacentridae	0.0258	3	1	2494	Y	Y	Y	Y
Planktivores	Chromis agilis	Agile chromis	Pomacentridae	0.0035	3	1	2126	Y	Y	Y	Y
Planktivores	Melichthys niger	Black triggerfish	Balistidae	0.0058	3.554	1	1683	Y	Y	Y	Y
Planktivores	Plectroglyphidodon lacrymatus	Whitespotted devil	Pomacentridae	0.0612	2.635	1	1624	Y	Y	Y	
Planktivores	Chromis xanthura	Paletail chromis	Pomacentridae	0.009	2.773	1	1532		Y	Y	
Planktivores	Chromis hanui	Hawaiian bicolor chromis	Pomacentridae	0.0229	3.175	0.89	1485		Y	Y	Y
Planktivores	Thalassoma amblycephalum	Bluntheaded wrasse	Labridae	0.0095	3	1	1317		Y	Y	
Planktivores	Myripristis berndti	Blotcheye soldierfish	Holocentridae	0.02769	3.00336	0.92	1218	Y	Y	Y	Y
Planktivores	Pomachromis guamensis	Guam damsel	Pomacentridae	0.0209	3.191	0.92	1136		Y	Y	
Planktivores	Dascyllus reticulatus	Reticulate dascyllus	Pomacentridae	0.03111	3.13271	0.95	1115		Y	Y	
Planktivores	Pseudanthias pascualus	Amethyst anthias	Serranidae	0.00959	3	1	1045	Y	Y	Y	
Planktivores	Dascyllus albisella	Hawaiian dascyllus	Pomacentridae	0.0462	2.911	1	1037		Y	Y	Y
Planktivores	Chromis ovalis	Hawaiian chromis	Pomacentridae	0.0229	3.175	0.88	907		Y	Y	Y
Planktivores	Chaetodon miliaris	Millet butterflyfish	Chaetodontidae	0.0296	2.9895	1	859		Y	Y	Y
Planktivores	Nemateleotris magnifica	Fire goby	Microdesmidae	0.0091	3	1	850	Y	Y	Y	
Planktivores	Acanthurus thompsoni	Thompson's surgeonfish	Acanthuridae	0.0153	3	1	835	Y	Y	Y	Y
Planktivores	Naso hexacanthus	Sleek unicornfish	Acanthuridae	0.04244108	2.854	0.88	759	Y	Y	Y	Y
Planktivores	Blenniidae	Blenny species	Blenniidae	0.00218	3.90064	1	750		Y	Y	
Planktivores	Pseudanthias olivaceus	Olive anthias	Serranidae	0.0177	2.9969	1	660		Y	Y	
Planktivores	Pseudanthias bartlettorum	Bartlett's anthias	Serranidae	0.00959	3	1	563		Y	Y	
Planktivores	Stethojulis bandanensis	Red shoulder wrasse	Labridae	0.03035	2.581	1	558	Y	Y	Y	
Planktivores	Naso brevirostris	Spotted unicornfish	Acanthuridae	0.01065	3.24297	1	556	Y	Y	Y	Y
Planktivores	Cirrhitilabrus katherinae	Katherine's wrasse	Labridae	0.014	3.0097	1	506		Y	Y	
Planktivores	Pomacentrus brachialis	Charcoal damsel	Pomacentridae	0.0066	3.312	1	498		Y	Y	

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Planktivores	<i>Ptereleotris evides</i>	Blackfin dartfish	Ptereleotridae	0.0091	3	1	490		Y	Y	
Planktivores	<i>Macolor niger</i>	Black and white snapper	Lutjanidae	0.0145	3	1	477		Y	Y	
Planktivores	<i>Pomacentrus coelestis</i>	Neon damselfish	Pomacentridae	0.037	2.63	1	467		Y	Y	
Planktivores	<i>Pempheris oualensis</i>	Silver sweeper	Pempheridae	0.0133	3	1	466		Y	Y	
Planktivores	<i>Caesio teres</i>	Yellow and bluebackfusilier	Caesionidae	0.0195	3.0117	1	448		Y	Y	
Planktivores	<i>Chaetodon kleinii</i>	Sunburst butterflyfish	Chaetodontidae	0.0296	2.9895	1	439		Y	Y	Y
Planktivores	<i>Abudefduf abdominalis</i>	Green damselfish	Pomacentridae	0.0226	3.132	0.89	414		Y	Y	Y
Planktivores	<i>Pomachromis richardsoni</i>	Richardson's reef-damsel	Pomacentridae	0.028	3.024	0.91	379		Y	Y	
Planktivores	<i>Abudefduf vaigiensis</i>	Indo-Pacific sergeant	Pomacentridae	0.03	2.8	1	370	Y	Y	Y	Y
Planktivores	<i>Myripristis kuntzei</i>	Shoulderbar soldierfish	Holocentridae	0.00991	3.46765	0.88	369		Y	Y	Y
Planktivores	<i>Myripristis amaena</i>	Brick soldierfish	Holocentridae	0.01576	3.26114	0.89	341		Y	Y	Y
Planktivores	<i>Dascyllus auripinnis</i>	Gold-fin dascyllus?	Pomacentridae	0.0327	2.8561	1	341		Y	Y	
Planktivores	<i>Naso vlamingii</i>	Bignose unicornfish	Acanthuridae	0.0085	3.25	1	319		Y	Y	
Planktivores	<i>Lepidozygus tapeinosoma</i>	Fusilier damselfish	Pomacentridae	0.00959	3	1	309		Y	Y	
Planktivores	<i>Macolor macularis</i>	Midnight snapper	Lutjanidae	0.0145	3	1	304		Y	Y	
Planktivores	<i>Pterocaesio tile</i>	Dark-banded fusilier	Caesionidae	0.0112	3	1	302		Y	Y	
Planktivores	<i>Odonus niger</i>	Redtoothed triggerfish	Balistidae	0.0119	3	1	300		Y	Y	
Planktivores	<i>Chromis verater</i>	Threespot chromis	Pomacentridae	0.0229	3.175	0.95	267		Y	Y	Y
Planktivores	<i>Dascyllus trimaculatus</i>	Threespot dascyllus	Pomacentridae	0.03132	3.04325	0.98	249		Y	Y	
Planktivores	<i>Ptereleotris heteroptera</i>	Blacktail goby	Ptereleotridae	0.0091	3	1	244		Y	Y	Y
Planktivores	<i>Meiacanthus atrodorsalis</i>	Forktail blenny	Blenniidae	0.0074	3	1	227		Y	Y	
Planktivores	<i>Amphiprion chrysopterus</i>	Orange-fin anemonefish	Pomacentridae	0.0145	3	1	215		Y	Y	
Planktivores	<i>Luzonichthys whitleyi</i>	Whitley's splitfin	Serranidae	0.00959	3	1	213		Y	Y	
Planktivores	<i>Ecsenius bicolor</i>	Bicolor blenny	Blenniidae	0.02391	2.58307	0.93	209		Y	Y	
Planktivores	<i>Hemitaenichthys thompsoni</i>	Thompson's butterflyfish	Chaetodontidae	0.0342	3	1	206	Y	Y	Y	
Planktivores	<i>Ptereleotris zebra</i>	Chinese zebra goby	Ptereleotridae	0.0091	3	1	191		Y	Y	
Planktivores	<i>Dascyllus aruanus</i>	Whitetail dascyllus	Pomacentridae	0.04151	2.98888	0.96	185		Y	Y	
Planktivores	<i>Cirrhitilabrus eximius</i>	Exquisite wrasse	Labridae	0.014	3.0097	1	159		Y	Y	
Planktivores	<i>Pomacentrus philippinus</i>	Philippine damsel	Pomacentridae	0.0231	3.058	0.945	155		Y	Y	
Planktivores	<i>Thalassoma hardwicke</i>	Sixbar wrasse	Labridae	0.01783	2.97765	0.93	153		Y	Y	

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Planktivores	Thalassoma lunare	Moon wrasse	Labridae	0.0211	2.83173999	0.9	149		Y	Y	
Planktivores	Xanthichthys auromarginatus	Gilded triggerfish	Balistidae	0.0277	2.9321	1	112		Y	Y	Y
Planktivores	Apogon kollopterus	Iridescent cardinalfish	Apogonidae	0.0101	3.31416	0.93	111		Y	Y	
Planktivores	Hemitaenichthys polylepis	Pyramid butterflyfish	Chaetodontidae	0.0265	3	1	107		Y	Y	Y
Planktivores	Paracanthurus hepatus	Palette surgeonfish	Acanthuridae	0.0237	3.056	0.98	105		Y	Y	
Planktivores	Decapterus macarellus	Mackerel scad	Carangidae	0.0078	3.14	1	105	Y	Y	Y	Y
Planktivores	Chromis alpha	Yellow-speckled chromis	Pomacentridae	0.0202	2.9595	1	95		Y	Y	
Planktivores	Genicanthus personatus	Masked angelfish	Pomacanthidae	0.0669	2.724	0.97	94		Y	Y	Y
Planktivores	Chromis viridis	Blue green damselfish	Pomacentridae	0.03507	2.89965	0.91	93		Y	Y	
Planktivores	Heniochus diphreutes	False moorish idol	Chaetodontidae	0.0252	3.082	1	82		Y	Y	Y
Planktivores	Acanthurus mata	Elongate surgeonfish	Acanthuridae	0.02224	3.00795	0.94	78		Y	Y	
Planktivores	Neopomacentrus metallicus	Metallic demoiselle	Pomacentridae	0.0258	2.933	0.84	75		Y	Y	
Planktivores	Xanthichthys mento	Redtail triggerfish	Balistidae	0.0277	2.9321	1	65	Y	Y	Y	Y
Planktivores	Gunnellichthys curiosus	Curious wormfish	Microdesmidae	0.0059	3.231	1	64		Y	Y	Y
Planktivores	Spratelloides delicatulus	Delicate round herring	Clupeidae	0.00929	3.314	0.94	50		Y	Y	Y
Planktivores	Caesio caerulea	Blue and gold fusilier	Caesionidae	0.01996	2.99141	0.86	47		Y	Y	
Planktivores	Apogonidae	Apogonidae species	Apogonidae	0.01545	3.12126	0.95	46		Y	Y	
Planktivores	Pseudanthias bicolor	Bicolor anthias	Serranidae	0.0155	3.121	0.84	44		Y	Y	
Planktivores	Myripristis vittata	Whitetip soldierfish	Holocentridae	0.0276	3.03	0.88	44		Y	Y	Y
Planktivores	Amphiprion clarkii	Yellowtail clownfish	Pomacentridae	0.0189	3.19	0.96	44		Y	Y	
Planktivores	Pterocaesio marri	Marr's fusilier	Caesionidae	0.0101	3.152	1	42		Y	Y	
Planktivores	Amphiprion melanopus	Fire clownfish	Pomacentridae	0.01545	3.29798	0.99	36		Y	Y	
Planktivores	Abudefduf sexfasciatus	Scissortail sergeant	Pomacentridae	0.02128	3.15197	0.88	36		Y	Y	
Planktivores	Pseudanthias dispar	Peach fairy basslet	Serranidae	0.0177	2.9969	1	35		Y		
Planktivores	Xanthichthys caeruleolineatus	Bluelined triggerfish	Balistidae	0.019	3.078	0.92	32		Y	Y	
Planktivores	Heteropriacanthus cruentatus	Glasseye	Priacanthidae	0.02793	2.82313	1	32		Y	Y	Y
Planktivores	Cirrhitilabrus jordani	Flame wrasse	Labridae	0.0107	3.178	1	31		Y	Y	
Planktivores	Apogon angustatus	Broadstriped cardinalfish	Apogonidae	0.00493	3.78006	0.94	31		Y	Y	
Planktivores	Apogon apogonoides	Short-tooth cardinal	Apogonidae	0.0155	3.121	0.96	30		Y	Y	
Planktivores	Acanthurus nubilus	Bluelinedsurgeon	Acanthuridae	0.021	2.9435	1	30	Y	Y	Y	

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Planktivores	Apogon sp	Apogon species	Apogonidae	0.01545	3.12126	0.95	28		Y	Y	
Planktivores	Myripristis adusta	Shadowfin soldierfish	Holocentridae	0.0249	3.0416	1	26		Y	Y	
Planktivores	Chromis ternatensis	Ternate chromis	Pomacentridae	0.01597	3.408	0.88	25		Y	Y	
Planktivores	Naso annulatus	Whitemargin unicornfish	Acanthuridae	0.05103	2.71537	0.95	23		Y	Y	
Planktivores	Bodianus anthioides	Lyretail hogfish	Labridae	0.0201	2.9992	1	21		Y	Y	
Planktivores	Pseudanthias cooperi	Red-bar anthias	Serranidae	0.0155	3.121	0.89	20		Y	Y	
Planktivores	Myripristis woodsi	Whitespot soldierfish	Holocentridae	0.0149	3	1	20		Y		
Planktivores	Priacanthus meeki	Hawaiian bigeye	Priacanthidae	0.0294	2.8069	0.98	15		Y	Y	
Planktivores	Amphiprion perideraion	Pink anemonefish	Pomacentridae	0.0189	3.19	1	14		Y	Y	
Planktivores	Ptereleotris microlepis	Blue gudgeon	Ptereleotridae	0.0059	3.231	0.98	13		Y	Y	
Planktivores	Pseudanthias thompsoni	Hawaiian anthias	Serranidae	0.0155	3.121	0.85	13		Y	Y	Y
Planktivores	Pseudocoris yamashiroi	Redspot wrasse	Labridae	0.0107	3.178	0.99	11		Y	Y	
Planktivores	Manta birostris	Giant manta	Myliobatidae	0.0164	3	1	11		Y	Y	
Planktivores	Chromis leucura	Whitetail chromis	Pomacentridae	0.0229	3.175	0.91	11		Y	Y	Y
Planktivores	Myripristis murdjan	Pinecone soldierfish	Holocentridae	0.0276	3.03	0.9	10		Y	Y	
Planktivores	Encrasicholina purpurea	Hawaiian anchovy	Engraulidae	0.00929	3.314	0.94	10		Y	Y	
Planktivores	Chromis lepidolepis	Scaly chromis	Pomacentridae	0.19498	1.9385	0.92	10		Y		
Planktivores	Genicanthus watanabei	Blackedged angelfish	Pomacanthidae	0.0669	2.724	0.78	9		Y	Y	
Planktivores	Naso caesius	Gray unicornfish	Acanthuridae	0.03259999	2.9029	1	8		Y	Y	
Planktivores	Myripristis chryseres	Yellowfin soldierfish	Holocentridae	0.0276	3.03	0.9	7		Y	Y	Y
Planktivores	Chromis weberi	Weber's chromis	Pomacentridae	0.0229	3.175	0.85	7		Y	Y	
Planktivores	Chromis fumea	Smokey chromis	Pomacentridae	0.0144	3.351	0.8695	7		Y	Y	
Planktivores	Apogon novemfasciatus	Sevenstriped cardinalfish	Apogonidae	0.00863	3.41355	0.95	7		Y	Y	
Planktivores	Kuhlia sandvicensis	Hawaiian flagtail	Kuhliidae	0.016	3.034	0.93	6		Y	Y	Y
Planktivores	Amblyeleotris fasciata	Red-banded/Barred shrimpgoby	Gobiidae	0.0264	2.623	1	6		Y	Y	
Planktivores	Ecsenius opsifrontalis	Comical blenny	Blenniidae	0.0307	2.451	1	5		Y	Y	
Planktivores	Blenniella chrysospilos	Red-spotted blenny	Blenniidae	0.0078	3	1	5		Y		
Planktivores	Apogon maculiferus	Spotted cardinalfish	Apogonidae	0.0155	3.121	0.95	5		Y	Y	
Planktivores	Selar crumenophthalmus	Bigeye scad	Carangidae	0.0097	3.19378	0.9	3		Y		
Planktivores	Pseudanthias ventralis hawaiiensis	Longfin anthias	Serranidae	0.0209	3.191	0.92	3		Y		

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Planktivores	<i>Corythoichthys flavofasciatus</i>	Network pipefish	Syngnathidae	0.001	3	1	3		Y	Y	
Planktivores	<i>Chromis caudalis</i>	Blue-axil chromis	Pomacentridae	0.0229	3.175	0.87	3		Y	Y	
Planktivores	<i>Amblyeleotris guttata</i>	Spotted prawn-goby	Gobiidae	0.0129	3	1	3		Y		
Planktivores	<i>Oxycirrhites typus</i>	Longnose hawkfish	Cirrhitidae	0.00929	3.268	0.97	2		Y		
Planktivores	<i>Naso maculatus</i>	Spotted unicornfish	Acanthuridae	0.0202	2.956	0.94	2		Y	Y	
Planktivores	<i>Ecsenius midas</i>	Persian blenny	Blenniidae	0.0239	2.584	0.87	2		Y		
Planktivores	<i>Chrysiptera cyanea</i>	Sapphire devil	Pomacentridae	0.0294	2.95049999	1	2		Y		
Planktivores	<i>Archamia biguttata</i>	Twinspot cardinalfish	Apogonidae	0.01545	3.12126	0.95	2		Y		
Planktivores	<i>Pseudanthias pleurotaenia</i>	Square-spot fairy basslet	Serranidae	0.0155	3.121	0.86	1		Y		
Planktivores	<i>Pristilepis oligolepis</i>	Spinyface soldier	Holocentridae	0.0276	3.03	0.94	1		Y	Y	
Planktivores	<i>Pomacentrus pavo</i>	Sapphire damsel	Pomacentridae	0.02518	2.97153	0.86	1		Y	Y	
Planktivores	Syngnathidae	Pipefish sp	Syngnathidae	4.00E-04	4.12011	1	1		Y	Y	
Planktivores	<i>Nemateleotris helfrichi</i>	Helfrich's dartfish	Microdesmidae	0.0091	3	1	1		Y	Y	
Planktivores	<i>Hyporhamphus acutus acutus</i>	Pacific halfbeak	Hemiramphidae	7.00E-04	3.575	0.94	1		Y		
Planktivores	<i>Doryrhamphus excisus excisus</i>	Bluestripe pipefish	Syngnathidae	4.00E-04	4.12	1	1		Y	Y	
Planktivores	<i>Chromis atripectoralis</i>	Black Axil Chromis	Pomacentridae	0.0179	3.291	0.8434783	1		Y	Y	
Planktivores	<i>Caesio lunaris</i>	Lunar fusilier	Caesionidae	0.0195	3.0117	1	1		Y		
Planktivores	<i>Apogon fraenatus</i>	Bridled cardinalfish	Apogonidae	0.01302	3.16529	0.97	1		Y	Y	
Planktivores	<i>Apogon exostigma</i>	Narrowstripe cardinalfish	Apogonidae	0.01635	3.06879	0.95	1		Y		
Piscivores	<i>Cephalopholis urodeta</i>	Darkfin hind	Serranidae	0.02822	2.81775	1	4077	Y	Y	Y	
Piscivores	<i>Cephalopholis argus</i>	Peacock hind	Serranidae	0.00929	3.18074	1	3167	Y	Y	Y	Y
Piscivores	<i>Oxycheilinus unifasciatus</i>	Ringtail maori wrasse	Labridae	0.01689	3	1	2769	Y	Y	Y	Y
Piscivores	<i>Lutjanus bohar</i>	Two-spot red snapper	Lutjanidae	0.01563	3.05865	0.96	2294		Y	Y	
Piscivores	<i>Paracirrhites forsteri</i>	Blackside hawkfish	Cirrhitidae	0.0165	3.1253	1	2202	Y	Y	Y	Y
Piscivores	<i>Aphareus furca</i>	Small toothed jobfish	Lutjanidae	0.0105	3	1	1620	Y	Y	Y	Y
Piscivores	<i>Caranx melampygus</i>	Bluefin trevally	Carangidae	0.02866	2.974	0.89	1487	Y	Y	Y	Y
Piscivores	<i>Aprion virescens</i>	Green jobfish	Lutjanidae	0.02297	2.88627	0.9	1084		Y	Y	Y
Piscivores	<i>Parupeneus cyclostomus</i>	Goldsaddle goatfish	Mullidae	0.0124	3	1	887	Y	Y	Y	Y
Piscivores	<i>Paracirrhites hemistictus</i>	Whitespot hawkfish	Cirrhitidae	0.0165	3.1253	1	732	Y	Y	Y	
Piscivores	<i>Caranx ignobilis</i>	Giant trevally	Carangidae	0.023	2.977	0.89	610		Y	Y	Y

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Piscivores	Cephalopholis miniata	Coral hind	Serranidae	0.01066	3.1141	1	567		Y	Y	
Piscivores	Epinephelus fasciatus	Blacktip grouper	Serranidae	0.01383	3.04066	1	518	Y	Y	Y	
Piscivores	Caranx lugubris	Black jack	Carangidae	0.0198	3.001	0.9	441	Y	Y	Y	
Piscivores	Carcharhinus amblyrhynchos	Grey reef shark	Carcharhinidae	0.0023	3.373	0.85	435	Y	Y	Y	Y
Piscivores	Variola louti	Yellow-edged lyretail	Serranidae	0.01219	3.07913	0.88	275		Y	Y	
Piscivores	Gracila albomarginata	Masked grouper	Serranidae	0.0152	3.0063	1	260		Y	Y	
Piscivores	Lutjanus monostigma	Onespot snapper	Lutjanidae	0.02218	2.91252	0.98	247	Y	Y	Y	
Piscivores	Aulostomus chinensis	Chinese trumpetfish	Aulostomidae	0.00021	3.51443	1	222	Y	Y	Y	Y
Piscivores	Triaenodon obesus	Whitetip reef shark	Carcharhinidae	0.0018	3.34393	0.8	214		Y	Y	Y
Piscivores	Oxycheilinus digramma	Cheeklined wrasse	Labridae	0.0145	3	1	178	Y	Y	Y	
Piscivores	Carangoides orthogrammus	Island trevally	Carangidae	0.01559	3.02562	0.89	177	Y	Y	Y	Y
Piscivores	Synodontidae	Lizardfish species	Synodontidae	0.00848	3.0777	0.94	153		Y	Y	
Piscivores	Epinephelus hexagonatus	Starspotted grouper	Serranidae	0.0132	3.0372	1	143	Y	Y	Y	
Piscivores	Elagatis bipinnulata	Rainbow runner	Carangidae	0.0135	2.92	0.77	135		Y	Y	
Piscivores	Carcharhinus galapagensis	Galapagos shark	Carcharhinidae	0.0023	3.373	0.85	99		Y	Y	Y
Piscivores	Fistularia commersonii	Bluespotted cornetfish	Fistulariidae	5.00E-04	3.048	1	96	Y	Y	Y	
Piscivores	Cephalopholis spiloparaea	Strawberry hind	Serranidae	0.0164	3.0303	1	94	Y	Y	Y	
Piscivores	Gymnothorax meleagris	Turkey moray	Muraenidae	0.0021	3	1	83		Y	Y	Y
Piscivores	Scomberoides lysan	Doublespotted queenfish	Carangidae	0.01085	2.92302	0.88	71	Y	Y	Y	
Piscivores	Epinephelus retouti	Red-tipped grouper	Serranidae	0.0122	3.053	1	63		Y	Y	
Piscivores	Gymnothorax flavimarginatus	Yellow-edged moray	Muraenidae	4.00E-04	3.35	1	61		Y	Y	
Piscivores	Epinephelus merra	Honeycomb grouper	Serranidae	0.01584	2.96636	1	60	Y	Y	Y	
Piscivores	Epinephelus melanostigma	One-blotch grouper	Serranidae	0.01629999	3	1	59		Y	Y	
Piscivores	Epinephelus polyphekadion	Camouflage grouper	Serranidae	0.00833	3.16576	1	55	Y	Y	Y	
Piscivores	Carcharhinus melanopterus	Blacktip reef shark	Carcharhinidae	0.00136	3.34	1	49		Y	Y	
Piscivores	Epinephelus tauvina	Greasy grouper	Serranidae	0.0156	2.957	1	48	Y	Y	Y	
Piscivores	Cephalopholis leopardus	Leopard hind	Serranidae	0.0149	3	1	46		Y	Y	
Piscivores	Caranx sexfasciatus	Bigeye trevally	Carangidae	0.0198	2.986	0.91	43	Y	Y	Y	Y
Piscivores	Epinephelus spilotoceps	Foursaddle grouper	Serranidae	0.0041	3.346	1	41	Y	Y	Y	
Piscivores	Aethaloperca rogaa	Redmouth grouper	Serranidae	0.0134	3.031	1	41		Y	Y	

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Piscivores	<i>Sphyaena barracuda</i>	Great barracuda	Sphyaenidae	0.00617	3.01095	0.89	40	Y	Y	Y	Y
Piscivores	<i>Epinephelus macrospilos</i>	Snubnose grouper	Serranidae	0.0132	3.03072	1	39		Y	Y	
Piscivores	<i>Gymnothorax breedeni</i>	Blackcheek moray	Muraenidae	5.00E-04	3.303	1	37		Y	Y	
Piscivores	<i>Gymnosarda unicolor</i>	Dogtooth tuna	Scombridae	0.0105	3.065	0.89	36		Y	Y	
Piscivores	<i>Lethrinus xanthurus</i>	Yellowlip emperor	Lethrinidae	0.02007	2.9639	0.94	33		Y	Y	
Piscivores	<i>Seriola dumerili</i>	Greater amberjack	Carangidae	0.0221	2.94	1	32	Y	Y	Y	Y
Piscivores	<i>Cephalopholis sonnerati</i>	Tomato hind	Serranidae	0.00661	3.27655	1	32		Y	Y	
Piscivores	<i>Carangoides ferdau</i>	Blue trevally	Carangidae	0.03683	2.85116	0.86	32		Y	Y	
Piscivores	<i>Cephalopholis sexmaculata</i>	Sixblotch hind	Serranidae	0.0164	3.0303	1	30		Y	Y	
Piscivores	<i>Lethrinus olivaceus</i>	Longface emperor	Lethrinidae	0.02936	2.85064	0.97	27	Y	Y	Y	
Piscivores	<i>Gymnothorax javanicus</i>	Giant moray	Muraenidae	5.00E-04	3.303	1	27	Y	Y	Y	
Piscivores	<i>Epinephelus howlandi</i>	Blacksaddle grouper	Serranidae	0.01525	2.99909	1	25	Y	Y	Y	
Piscivores	<i>Plectropomus laevis</i>	Blacksaddled coral grouper	Serranidae	0.00591	3.23774	0.97	24		Y	Y	
Piscivores	<i>Pterois sphex</i>	Hawaiian turkeyfish	Scorpaenidae	0.0246	2.908	1	20		Y	Y	Y
Piscivores	<i>Epinephelus maculatus</i>	Highfin grouper	Serranidae	0.01104	3.06197	1	19		Y	Y	
Piscivores	<i>Synodus ulae</i>	Red lizard fish	Synodontidae	0.0085	3.078	0.94	18		Y	Y	
Piscivores	<i>Sphyaena qenie</i>	Blackfin barracuda	Sphyaenidae	0.0056	3	0.92	18		Y	Y	
Piscivores	<i>Platybelone argalus</i>	Keeltail needlefish	Belonidae	0.0011	3.101	0.98	17		Y	Y	Y
Piscivores	<i>Synodus binotatus</i>	Two-spot lizard fish	Synodontidae	0.0064	3	1	12		Y	Y	Y
Piscivores	<i>Synodus variegatus</i>	Variegated lizardfish	Synodontidae	0.00314	3.4838	0.96	11		Y	Y	
Piscivores	<i>Lutjanus semicinctus</i>	Black-banded snapper	Lutjanidae	0.00398	3.42802	0.98	10		Y	Y	
Piscivores	<i>Gymnothorax undulatus</i>	Undulated moray	Muraenidae	0.0016	3	1	10		Y	Y	
Piscivores	<i>Tylosurus crocodilus</i>	Houndneedlefish	Belonidae	0.00057	3.28481	0.97	9		Y	Y	
Piscivores	<i>Synodus dermatogenys</i>	Sand lizardfish	Synodontidae	0.0067	3.201	0.95	7		Y	Y	
Piscivores	<i>Nebrius ferrugineus</i>	Tawny nurse shark	Ginglymostomatidae	0.001	3.566	0.782	7		Y	Y	
Piscivores	<i>Cheilodipterus macrodon</i>	Large toothed cardinalfish	Apogonidae	0.0054	3.4328	0.94	7		Y	Y	
Piscivores	<i>Variola albimarginata</i>	White-edged lyretail	Serranidae	0.02414142	3.06625252	0.87	6		Y	Y	
Piscivores	<i>Scorpaenopsis diabolus</i>	False stonefish	Scorpaenidae	0.0246	2.908	1	6		Y	Y	
Piscivores	<i>Euthynnus affinis</i>	Kawakawa	Scombridae	0.03	3.109	1	6		Y	Y	Y
Piscivores	<i>Anyperodon leucogrammicus</i>	Slender grouper	Serranidae	0.0014	3.548	1	6		Y	Y	

Consumer group	Species	Common name	Common family	LW A	LW B	Con. factor	Freq.	PRIA	N. Mariana	S. Mariana	NWHI
Piscivores	Trachinotus bailloni	Smallspotted dart	Carangidae	0.0311	2.7347	1	5	Y	Y	Y	
Piscivores	Pogonoperca punctata	Spotted soapfish	Serranidae	0.0152	3.0063	1	5		Y		
Piscivores	Plectropomus areolatus	Squaretail coralgroup	Serranidae	0.0107	3.086	1	5		Y	Y	
Piscivores	Epinephelus socialis	Surge grouper	Serranidae	0.0122	3.053	1	5		Y		
Piscivores	Epinephelus quernus	Hawaiian grouper	Serranidae	0.0181	3	1	5		Y	Y	
Piscivores	Sphyrna helleri	Heller's barracuda	Sphyrnidae	0.00561	3.019	0.93	4		Y	Y	
Piscivores	Gymnothorax steindachneri	Steindachner's moray eel	Muraenidae	5.00E-04	3.303	1	4		Y	Y	
Piscivores	Thunnus albacares	Yellowfin tuna	Scombridae	0.0214	2.974	0.94	3		Y		
Piscivores	Scorpaenopsis cacopsis	Titan scorpionfish	Scorpaenidae	0.0246	2.908	1	3		Y	Y	
Piscivores	Enchelycore pardalis	Leopard moray eel	Muraenidae	0.0246	2.908	1	3		Y	Y	
Piscivores	Caranx papuensis	Brassy trevally	Carangidae	0.02354	2.923	0.8849558	3		Y		
Piscivores	Sphyrna lewini	Scalloped hammerhead	Sphyrnidae	0.00415	3.2387	0.77	2		Y		
Piscivores	Saurida gracilis	Gracile lizardfish	Synodontidae	0.00657	3.16493	0.94	2		Y	Y	
Piscivores	Pterois volitans	Red lionfish	Scorpaenidae	0.0189	3.011	1	2		Y	Y	
Piscivores	Pseudocaranx dentex	White trevally	Carangidae	0.0271	2.88598	0.9	2		Y	Y	Y
Piscivores	Heterocongrinae	Garden eel species	Congridae	0.001695	2.975545	1	2		Y	Y	
Piscivores	Sarda orientalis	Striped bonito	Scombridae	0.0217	2.97	0.906	1		Y		
Piscivores	Saurida flamma	Orangemouth lizardfish	Synodontidae	0.008	3.059	0.94	1		Y	Y	
Piscivores	Sphyrnidae	Hammerhead species	Sphyrnidae	0.0042	3.239	0.77	1		Y		
Piscivores	Grammatocynus bilineatus	Double-lined mackerel	Scombridae	0.0065	3	1	1		Y		
Piscivores	Congridae	Conger eel species	Congridae	0.001695	2.975545	1	1		Y		
Piscivores	Antennarius commerson	Commerson's frogfish	Antennariidae	0.0236	3.293	1	1		Y		

Appendix 7: Random stratified sites surveyed at each island per year

Table A.7 The total number of sites surveyed per island (ordered by region) per year under the depth stratified random sampling design, using the stationary point count method to survey the fish assemblage.

Region	Island	2009	2010	2011	2012	2013	2014	Total
NWHI	Kure	43	25		20			88
NWHI	Midway	53		30			34	117
NWHI	Pearl & Hermes		41	18	31			90
NWHI	Lisianski	19	25	9	25		28	106
NWHI	Laysan	14		23				37
NWHI	Gardner			12				12
NWHI	Maro	39		25				64
NWHI	French Frigate		27	8	15		27	77
NWHI	Necker	13		8				21
NWHI	Nihoa			8				8
Main HI	Ni'ihau		16			26		42
Main HI	Kaua'i		26			37		63
Main HI	O'ahu		40		35	64		139
Main HI	Moloka'i		10		50	39		99
Main HI	Lāna'i		16		29	29		74
Main HI	Maui		33		49	34		116
Main HI	Hawai'i		43			58		101
Mariana Arch.	Farallon de Pajaros	7		12			11	30
Mariana Arch.	Maug	21		30			40	91
Mariana Arch.	Asuncion	13		20			21	54
Mariana Arch.	Agrihan	14		20				34
Mariana Arch.	Pagan	21		29			43	93
Mariana Arch.	Ala-Gug-Sar	19		24			33	76
Mariana Arch.	Saipan	23		30			48	101
Mariana Arch.	Tinian	14		19			19	52
Mariana Arch.	Aguijan	6		13			10	29
Mariana Arch.	Rota	14		24			28	66
Mariana Arch.	Guam	25		133			93	251
PRIA	Wake	29		30			45	104
PRIA	Johnston		39		35			74
PRIA	Kingman		33		49			82
PRIA	Palmyra		40		42			82
PRIA	Howland		16		39			55
PRIA	Baker		21		24			45
PRIA	Jarvis		30		42			72
Am.Samoa	Swains		24		38			62
Am.Samoa	Ofu & Olosega		30		30			60
Am.Samoa	Ta'ū		24		22			46
Am.Samoa	Tutuila		127		85			212
Am.Samoa	Rose		34		48			82

Appendix 8: Site level data

Table A.8 Site level data for regions surveyed in 2014. Displaying region, island, date surveyed, site number, geographic co-ordinates, depth (m), fish biomass by consumer group and size class and percentage hard coral cover. Pri. consumers = primary consumers, sec.consumers = secondary consumers, TL = total length, FFS = French Frigate, FDP = Farallon de Pajaros.

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)							Benthos	
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0–20 cm TL	20–50 cm TL	>50 cm TL	Hard coral (%)
2014	NWHI	FFS	8/14/2014	FFS-4062	23.84483	-166.135	25.7	45.966	6.619	121.912	0.836	175.333	19.237	34.183	121.912	9
2014	NWHI	FFS	8/14/2014	FFS-4043	23.87805	-166.237	4.15	59.036	4.181	41.377	3.515	108.109	45.000	12.986	41.377	0.5
2014	NWHI	FFS	8/14/2014	FFS-4079	23.87405	-166.305	14.7	14.949	17.562	12.449	3.618	48.579	10.879	30.151	7.549	30
2014	NWHI	FFS	8/14/2014	FFS-4009	23.86569	-166.194	25.45	18.221	24.711	82.672	50.000	193.996	28.979	69.447	95.569	15
2014	NWHI	FFS	8/14/2014	FFS-4020	23.88059	-166.221	16.3	3.502	4.171	28.401	0.024	36.098	2.955	4.742	28.401	4
2014	NWHI	FFS	8/14/2014	FFS-4091	23.87927	-166.252	4.6	1.055	3.207	109.229	0.893	114.383	4.163	0.991	109.229	6.5
2014	NWHI	FFS	8/14/2014	FFS-4012	23.87875	-166.281	7.9	38.473	5.914	188.095	11.482	243.964	15.211	46.350	182.403	8.5
2014	NWHI	FFS	8/14/2014	FFS-4051	23.86123	-166.332	13.4	25.878	18.411	47.918	9.485	101.692	24.987	18.703	58.002	21.5
2014	NWHI	FFS	8/15/2014	FFS-4067	23.8109	-166.069	21.8	8.724	5.971	51.145	50.000	209.535	9.791	110.000	50.172	5
2014	NWHI	FFS	8/15/2014	FFS-4018	23.80643	-166.086	5.45	59.379	32.582	23.047	14.739	129.746	21.941	107.805	0.000	5
2014	NWHI	FFS	8/15/2014	FFS-4064	23.79342	-166.069	11.35	26.947	40.000	17.559	50.000	164.361	16.200	110.000	25.722	22.5
2014	NWHI	FFS	8/15/2014	FFS-4073	23.74757	-166.051	22.15	3.096	3.381	111.285	35.820	153.582	4.003	45.614	103.964	1
2014	NWHI	FFS	8/15/2014	FFS-4093	23.71545	-166.055	13.2	16.936	3.837	20.008	0.180	40.962	6.043	17.152	17.767	2
2014	NWHI	FFS	8/15/2014	FFS-4008	23.68992	-166.062	15.5	11.442	9.025	59.979	2.420	82.867	6.603	48.809	27.455	1
2014	NWHI	FFS	8/15/2014	FFS-4087	23.68261	-166.071	6.35	6.740	4.688	1.692	2.193	15.313	10.590	4.723	0.000	2
2014	NWHI	FFS	8/15/2014	FFS-4016	23.63347	-166.107	7.55	0.987	2.513	8.191	0.087	11.778	2.160	1.427	8.191	1
2014	NWHI	FFS	8/15/2014	FFS-4054	23.63481	-166.186	22.25	9.175	32.948	350.000	50.000	450.000	45.000	109.476	350.000	70

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	NWHI	FFS	8/16/2014	FFS-4047	23.82265	-166.323	27.2	0.135	2.726	11.407	0.224	14.492	1.285	3.062	10.145	1
2014	NWHI	FFS	8/16/2014	FFS-4040	23.8084	-166.295	15.35	11.118	11.625	17.767	2.961	43.471	19.840	10.211	13.419	65
2014	NWHI	FFS	8/16/2014	FFS-4014	23.80199	-166.261	14	21.076	2.981	350.000	1.792	450.000	26.089	2.017	350.000	32.5
2014	NWHI	FFS	8/16/2014	FFS-4048	23.77228	-166.26	11.3	24.943	22.901	5.866	10.879	64.589	22.932	41.657	0.000	22.5
2014	NWHI	FFS	8/16/2014	FFS-4098	23.76261	-166.242	18.1	9.917	7.934	9.798	5.794	33.444	21.720	11.724	0.000	47.5
2014	NWHI	FFS	8/16/2014	FFS-4069	23.73333	-166.271	26.65	12.927	4.954	350.000	1.512	450.000	11.495	13.055	350.000	5
2014	NWHI	FFS	8/16/2014	FFS-4042	23.85758	-166.198	2.3	71.678	17.996	10.494	0.914	101.081	11.036	57.576	32.469	5
2014	NWHI	FFS	8/16/2014	FFS-4030	23.83941	-166.15	2.05	0.248	1.269	0.000	0.000	1.517	1.517	0.000	0.000	1.5
2014	NWHI	FFS	8/16/2014	FFS-4059	23.84357	-166.161	1.65	0.128	0.776	0.047	0.000	0.952	0.952	0.000	0.000	1
2014	NWHI	FFS	8/16/2014	FFS-4084	23.78558	-166.244	12.3	15.399	4.577	27.855	7.455	55.287	11.639	31.268	12.380	37.5
2014	NWHI	Lisianski	8/24/2014	LIS-4029	25.90535	-173.923	19.75	6.576	1.998	350.000	3.196	450.000	12.060	0.661	350.000	40
2014	NWHI	Lisianski	8/24/2014	LIS-4014	25.94365	-173.88	13.85	9.522	7.201	350.000	11.943	450.000	21.833	35.275	350.000	62.5
2014	NWHI	Lisianski	8/24/2014	LIS-4002	26.00608	-173.878	15.4	6.203	2.126	214.367	0.263	222.960	5.244	8.164	209.552	35
2014	NWHI	Lisianski	8/24/2014	LIS-4058	25.93768	-173.947	25.15	9.243	3.634	350.000	1.160	450.000	13.130	1.349	350.000	55
2014	NWHI	Lisianski	8/24/2014	LIS-4036	25.94417	-173.933	8.35	16.212	6.751	116.379	3.460	142.802	17.108	15.789	109.905	22.5
2014	NWHI	Lisianski	8/24/2014	LIS-4001	25.97517	-173.968	8.2	17.955	7.597	172.943	1.110	199.605	19.627	7.346	172.632	10
2014	NWHI	Lisianski	8/24/2014	LIS-4091	25.99556	-173.988	7.75	17.171	12.034	215.481	0.248	244.935	17.679	18.232	209.024	9
2014	NWHI	Lisianski	8/24/2014	LIS-4037	26.01828	-173.988	8.05	1.024	5.315	152.176	0.125	158.641	4.010	2.455	152.176	1
2014	NWHI	Lisianski	8/24/2014	LIS-4079	26.00336	-173.956	2.55	1.231	1.445	32.888	0.035	35.600	4.169	5.925	25.506	1
2014	NWHI	Lisianski	8/24/2014	LIS-4007	26.00404	-174.018	16	19.439	6.822	13.409	7.067	46.738	18.166	20.380	8.191	35

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	NWHI	Lisianski	8/25/2014	LIS-4005	25.9843	-174.005	22.1	33.911	6.576	66.972	1.609	109.068	14.881	32.087	62.099	12.5
2014	NWHI	Lisianski	8/25/2014	LIS-4008	26.03164	-174.009	11.15	26.149	8.647	45.904	1.195	81.896	14.699	27.401	39.796	2
2014	NWHI	Lisianski	8/25/2014	LIS-4020	26.02681	-173.969	4.1	2.337	1.363	161.559	0.324	165.584	4.025	0.000	161.559	2.5
2014	NWHI	Lisianski	8/25/2014	LIS-4042	26.02011	-173.939	2.75	0.121	0.542	0.000	0.000	0.663	0.663	0.000	0.000	1.5
2014	NWHI	Lisianski	8/25/2014	LIS-4098	26.064	-174.036	25	23.895	9.516	3.208	2.646	39.266	13.134	26.131	0.000	10
2014	NWHI	Lisianski	8/25/2014	LIS-4089	26.05427	-174.016	14.3	22.104	6.059	181.236	2.266	211.665	16.804	19.202	175.659	30
2014	NWHI	Lisianski	8/25/2014	LIS-4087	26.07951	-173.992	12.35	16.032	5.309	5.730	1.546	28.617	13.135	15.483	0.000	20
2014	NWHI	Lisianski	8/25/2014	LIS-4030	26.09267	-173.967	13.1	14.358	5.585	275.949	1.800	297.692	10.599	11.145	275.949	17.5
2014	NWHI	Lisianski	8/25/2014	LIS-4043	26.09493	-173.941	20.4	5.020	7.876	1.503	0.303	14.702	5.277	9.425	0.000	55
2014	NWHI	Lisianski	8/25/2014	LIS-4076	26.06549	-173.975	3.2	8.626	6.406	18.829	0.389	34.250	11.391	4.076	18.782	1
2014	NWHI	Lisianski	8/26/2014	LIS-4078	26.081	-173.94	15.05	20.550	3.497	5.610	0.930	30.588	12.710	17.878	0.000	16.5
2014	NWHI	Lisianski	8/26/2014	LIS-4034	26.06642	-173.919	14.3	37.277	16.781	11.225	0.966	66.250	10.062	22.729	33.459	18.5
2014	NWHI	Lisianski	8/26/2014	LIS-4065	26.06496	-173.894	19.95	23.953	3.836	128.325	4.208	160.322	18.565	16.514	125.243	40
2014	NWHI	Lisianski	8/26/2014	LIS-4094	26.04736	-173.892	19.2	10.947	4.432	240.777	1.812	257.968	7.732	13.214	237.023	37.5
2014	NWHI	Lisianski	8/26/2014	LIS-4068	26.01264	-174.028	18.75	14.906	8.300	20.495	1.923	45.625	13.618	12.369	19.638	17.5
2014	NWHI	Lisianski	8/26/2014	LIS-4035	25.9962	-173.85	21.4	11.647	11.094	169.188	0.480	192.410	13.725	10.006	168.679	60
2014	NWHI	Lisianski	8/26/2014	LIS-4019	26.01988	-173.876	13.85	15.420	3.522	31.554	0.212	50.708	7.014	12.375	31.320	35
2014	NWHI	Lisianski	8/26/2014	LIS-4067	26.0634	-173.959	3.15	10.209	1.354	14.309	0.432	26.304	11.130	0.865	14.309	42.5
2014	NWHI	Midway	8/19/2014	MID-4087	28.21675	-177.31	25.35	54.023	40.000	350.000	13.033	450.000	45.000	82.015	350.000	1.5
2014	NWHI	Midway	8/19/2014	MID-4063	28.20226	-177.319	15.95	76.749	40.000	133.294	33.361	296.485	45.000	110.000	128.878	2

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	NWHI	Midway	8/19/2014	MID-4088	28.2028	-177.418	2	18.195	16.087	0.283	0.127	34.691	8.925	25.767	0.000	1
2014	NWHI	Midway	8/19/2014	MID-4018	28.19654	-177.385	2.5	0.115	0.811	0.002	0.010	0.939	0.939	0.000	0.000	1
2014	NWHI	Midway	8/19/2014	MID-4099	28.2315	-177.308	29.95	0.269	1.850	32.527	1.803	36.449	1.728	5.575	29.145	0
2014	NWHI	Midway	8/19/2014	MID-4010	28.23955	-177.318	4.15	36.095	15.574	15.119	40.514	107.302	28.378	78.924	0.000	5
2014	NWHI	Midway	8/19/2014	MID-4050	28.21959	-177.311	15.35	62.525	23.531	7.600	19.787	113.442	26.450	81.935	5.058	1
2014	NWHI	Midway	8/19/2014	MID-4062	28.19496	-177.335	16.3	40.922	32.375	20.577	5.214	99.088	16.795	57.242	25.052	1
2014	NWHI	Midway	8/19/2014	MID-4085	28.19573	-177.376	19.95	53.168	14.490	20.958	50.000	187.283	37.318	110.000	20.958	1
2014	NWHI	Midway	8/19/2014	MID-4009	28.19763	-177.366	13.55	85.000	5.077	143.529	10.921	443.875	20.107	110.000	143.529	6.5
2014	NWHI	Midway	8/19/2014	MID-4090	28.20034	-177.357	4.55	85.000	11.431	0.633	3.429	136.927	9.771	110.000	0.000	1.5
2014	NWHI	Midway	8/20/2014	MID-4080	28.2865	-177.359	27.7	29.325	35.002	131.900	13.421	209.648	18.541	65.602	125.505	1
2014	NWHI	Midway	8/20/2014	MID-4066	28.27883	-177.378	8.5	85.000	9.693	26.992	4.104	136.455	24.331	88.466	23.658	4.5
2014	NWHI	Midway	8/20/2014	MID-4023	28.26608	-177.405	15.35	31.957	2.192	31.493	0.565	66.207	5.537	35.519	25.151	2
2014	NWHI	Midway	8/20/2014	MID-4089	28.27174	-177.382	1.5	45.283	28.187	0.228	0.000	73.698	7.092	66.606	0.000	6.5
2014	NWHI	Midway	8/20/2014	MID-4069	28.25765	-177.413	16.3	28.203	6.498	129.835	2.122	166.658	9.632	77.097	79.930	1.5
2014	NWHI	Midway	8/20/2014	MID-4068	28.25277	-177.42	24.7	6.279	12.531	1.101	2.650	22.560	10.110	12.450	0.000	2
2014	NWHI	Midway	8/20/2014	MID-4032	28.24815	-177.407	4.9	85.000	12.893	0.141	5.009	121.692	36.126	75.963	9.603	2
2014	NWHI	Midway	8/20/2014	MID-4048	28.25179	-177.322	22.45	13.194	23.959	15.897	2.242	55.292	11.480	33.667	10.145	1
2014	NWHI	Midway	8/20/2014	MID-4072	28.27395	-177.342	15.05	47.311	4.587	17.229	1.198	70.325	16.770	26.172	27.383	1.5
2014	NWHI	Midway	8/20/2014	MID-4056	28.28006	-177.368	5.7	54.683	14.105	139.845	17.574	226.207	37.451	49.746	139.011	1
2014	NWHI	Midway	8/20/2014	MID-4093	28.27429	-177.381	1.4	2.249	15.174	0.186	0.164	17.773	9.843	7.930	0.000	2

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	NWHI	Midway	8/21/2014	MID-4094	28.22268	-177.43	23.8	85.000	13.538	2.538	9.062	116.723	21.593	86.041	9.089	1
2014	NWHI	Midway	8/21/2014	MID-4092	28.20296	-177.429	27.2	40.441	28.295	236.128	10.120	314.985	20.570	56.364	238.050	1
2014	NWHI	Midway	8/21/2014	MID-4007	28.21738	-177.424	7.45	50.775	5.926	1.344	17.040	75.085	45.000	25.579	0.000	0.5
2014	NWHI	Midway	8/21/2014	MID-4059	28.22622	-177.419	5.65	58.364	26.924	6.642	6.790	98.719	10.048	75.498	13.174	1
2014	NWHI	Midway	8/21/2014	MID-4036	28.24145	-177.42	11.85	58.094	7.841	340.066	4.461	410.462	13.138	39.437	350.000	0
2014	NWHI	Midway	8/21/2014	MID-4096	28.25321	-177.413	11.2	28.134	2.807	1.717	2.143	34.801	7.850	26.951	0.000	1
2014	NWHI	Midway	8/21/2014	MID-4041	28.24088	-177.426	21.8	77.716	7.625	80.894	3.110	169.345	12.718	66.696	89.932	1.5
2014	NWHI	Midway	8/21/2014	MID-4070	28.22993	-177.421	9.5	28.517	32.563	0.397	1.616	63.094	11.415	42.124	9.556	2
2014	NWHI	Midway	8/21/2014	MID-4051	28.24459	-177.414	3.95	57.821	20.089	0.000	0.319	78.229	8.607	69.622	0.000	1
2014	NWHI	Midway	8/22/2014	MID-4071	28.18955	-177.399	22.8	66.687	4.179	160.845	50.000	301.451	18.484	110.000	163.712	2
2014	NWHI	Midway	8/22/2014	MID-4091	28.1938	-177.383	10.85	85.000	38.137	43.457	20.741	236.431	45.000	110.000	29.827	1
2014	NWHI	Midway	8/22/2014	MID-4058	28.19818	-177.345	11	47.501	16.024	22.082	5.450	91.058	16.891	55.905	18.261	6
2014	PRIAs	Wake	3/16/2014	WAK-0168	19.27107	166.649	17.35	23.004	6.455	9.883	0.912	40.255	13.572	26.683	0.000	22.5
2014	PRIAs	Wake	3/16/2014	WAK-0301	19.27485	166.6412	23	8.496	7.955	9.688	3.429	29.568	14.417	11.410	3.742	40
2014	PRIAs	Wake	3/16/2014	WAK-0153	19.28551	166.6154	3.45	11.278	6.318	2.552	0.296	20.444	11.353	7.333	1.758	20
2014	PRIAs	Wake	3/16/2014	WAK-0174	19.28961	166.6108	13.1	14.890	8.297	4.726	0.903	28.816	10.676	18.140	0.000	22.5
2014	PRIAs	Wake	3/16/2014	WAK-0285	19.28441	166.617	13.2	25.505	6.168	5.853	3.181	40.708	15.102	25.605	0.000	35
2014	PRIAs	Wake	3/16/2014	WAK-0280	19.27958	166.6295	21.8	6.032	9.447	10.114	13.096	38.688	12.290	26.398	0.000	72.5
2014	PRIAs	Wake	3/16/2014	WAK-0246	19.2727	166.6471	13.15	23.061	12.636	6.303	0.462	42.463	15.486	26.976	0.000	25
2014	PRIAs	Wake	3/16/2014	WAK-0236	19.28353	166.6187	4.55	14.021	5.544	0.883	1.629	22.076	13.266	8.810	0.000	25

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	PRIAs	Wake	3/17/2014	WAK-0154	19.30706	166.5937	20.9	28.025	6.028	12.929	50.000	99.928	45.000	41.990	0.000	37.5
2014	PRIAs	Wake	3/17/2014	WAK-0302	19.32132	166.6039	3.95	9.409	1.401	1.074	2.635	14.520	8.846	5.674	0.000	17.5
2014	PRIAs	Wake	3/17/2014	WAK-0263	19.30821	166.5938	2.6	44.789	10.125	13.144	1.364	69.422	15.723	53.699	0.000	15
2014	PRIAs	Wake	3/17/2014	WAK-0267	19.3026	166.5951	13.4	19.936	17.191	20.367	5.339	62.833	28.842	17.369	16.622	30
2014	PRIAs	Wake	3/17/2014	WAK-0172	19.32573	166.6104	22	49.609	16.447	12.764	1.179	79.998	13.751	66.247	0.000	27.5
2014	PRIAs	Wake	3/17/2014	WAK-0252	19.3236	166.6057	12.5	35.688	12.910	58.436	0.802	107.836	16.080	44.180	47.576	32.5
2014	PRIAs	Wake	3/17/2014	WAK-0176	19.3164	166.5989	4.6	10.631	5.083	6.068	7.775	29.557	15.310	14.247	0.000	20
2014	PRIAs	Wake	3/17/2014	WAK-0266	19.31375	166.5955	4.75	5.714	2.628	3.784	0.006	12.132	7.358	4.775	0.000	12.5
2014	PRIAs	Wake	3/17/2014	WAK-0192	19.30582	166.5942	12.2	28.688	40.000	227.540	2.353	309.623	18.947	110.000	86.222	70
2014	PRIAs	Wake	3/18/2014	WAK-0205	19.31936	166.6232	20.7	9.370	3.554	12.886	2.600	28.410	9.680	16.522	2.208	10
2014	PRIAs	Wake	3/18/2014	WAK-0189	19.313	166.6502	16	85.000	5.084	15.412	3.504	179.405	21.135	110.000	10.428	15
2014	PRIAs	Wake	3/18/2014	WAK-0278	19.31318	166.6479	5.5	24.670	1.551	2.790	0.055	29.067	4.270	24.797	0.000	12.5
2014	PRIAs	Wake	3/18/2014	WAK-0180	19.31614	166.6401	16	11.294	8.951	8.124	3.993	32.362	12.006	20.356	0.000	32.5
2014	PRIAs	Wake	3/18/2014	WAK-0166	19.31456	166.6469	25	46.669	7.083	90.122	13.773	157.648	26.104	57.708	73.836	22.5
2014	PRIAs	Wake	3/18/2014	WAK-0287	19.31512	166.6419	6	9.649	3.714	1.791	10.623	25.777	22.635	3.142	0.000	9
2014	PRIAs	Wake	3/18/2014	WAK-0183	19.31525	166.6323	13.2	10.212	8.316	6.532	1.232	26.293	9.434	16.859	0.000	37.5
2014	PRIAs	Wake	3/18/2014	WAK-0272	19.31482	166.6301	5.25	6.495	3.850	2.330	5.064	17.739	12.807	4.932	0.000	32.5
2014	PRIAs	Wake	3/18/2014	WAK-0258	19.31579	166.6276	13.8	17.087	5.871	2.987	1.502	27.447	12.676	14.771	0.000	42.5
2014	PRIAs	Wake	3/18/2014	WAK-0241	19.32235	166.6214	20.5	24.580	8.691	10.466	1.346	45.082	7.990	37.092	0.000	45
2014	PRIAs	Wake	3/18/2014	WAK-0199	19.31573	166.6336	22.25	13.831	5.653	49.688	2.788	71.961	11.218	26.025	34.719	30

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	PRIAs	Wake	3/18/2014	WAK-0265	19.31611	166.6415	24.2	85.000	3.866	22.403	5.450	121.422	16.709	98.420	6.293	27.5
2014	PRIAs	Wake	3/19/2014	WAK-0259	19.29699	166.6533	21.8	22.113	10.752	21.119	5.025	59.009	12.182	42.795	4.032	22.5
2014	PRIAs	Wake	3/19/2014	WAK-0198	19.29931	166.6516	14.2	34.911	10.677	9.208	2.684	57.480	8.616	48.863	0.000	35
2014	PRIAs	Wake	3/19/2014	WAK-0212	19.29794	166.6521	6.2	33.542	1.300	6.420	12.349	53.611	16.594	37.017	0.000	15
2014	PRIAs	Wake	3/19/2014	WAK-0147	19.27703	166.6568	12.85	15.008	4.285	2.295	4.546	26.134	13.841	12.293	0.000	20
2014	PRIAs	Wake	3/19/2014	WAK-0226	19.26738	166.6565	19.1	29.337	8.419	39.236	3.267	80.258	17.318	62.941	0.000	55
2014	PRIAs	Wake	3/19/2014	WAK-0160	19.3099	166.6526	24.65	85.000	9.787	16.487	3.698	215.201	5.827	110.000	0.000	30
2014	PRIAs	Wake	3/19/2014	WAK-0242	19.29435	166.6545	6	1.607	0.629	0.811	0.695	3.743	3.743	0.000	0.000	17.5
2014	PRIAs	Wake	3/19/2014	WAK-0171	19.28921	166.657	14.1	4.685	4.093	16.672	4.415	29.865	12.380	17.485	0.000	47.5
2014	PRIAs	Wake	3/19/2014	WAK-0206	19.29025	166.6565	5.35	2.268	0.732	25.862	0.117	28.979	3.117	4.733	21.129	12.5
2014	PRIAs	Wake	3/19/2014	WAK-0204	19.28371	166.6562	11	11.121	5.990	1.278	0.120	18.509	6.344	12.165	0.000	35
2014	PRIAs	Wake	3/19/2014	WAK-0281	19.27682	166.6566	5.15	44.975	1.998	1.683	0.712	49.368	12.208	37.161	0.000	16.5
2014	PRIAs	Wake	3/19/2014	WAK-0208	19.28936	166.6573	27.25	16.943	8.962	8.219	7.029	41.153	13.534	27.618	0.000	30
2014	PRIAs	Wake	3/19/2014	WAK-0289	19.28175	166.6565	22.9	39.107	8.954	13.494	6.260	67.815	15.450	52.365	0.000	20
2014	PRIAs	Wake	3/19/2014	WAK-0275	19.27082	166.6517	3	22.577	5.934	2.907	0.087	31.506	16.121	15.385	0.000	30
2014	PRIAs	Wake	3/20/2014	WAK-0167	19.29191	166.6079	4.45	55.682	15.007	4.713	4.116	79.518	27.157	52.361	0.000	20
2014	PRIAs	Wake	3/20/2014	WAK-0182	19.28686	166.6129	23.5	7.882	4.070	5.325	7.480	24.758	11.180	13.578	0.000	47.5
2014	S.MARIAN	Aguijan	4/8/2014	AGU-0200	14.85691	145.5473	23.6	19.674	3.597	4.520	3.962	31.753	18.580	13.173	0.000	12.5
2014	S.MARIAN	Aguijan	4/8/2014	AGU-0144	14.86164	145.5615	3.75	18.897	3.275	0.487	1.496	24.155	17.617	6.538	0.000	27.5
2014	S.MARIAN	Aguijan	4/8/2014	AGU-0133	14.86695	145.5729	20	31.178	31.876	33.346	15.482	111.883	33.782	35.636	42.465	2

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	S.MARIAN	Aguijan	4/8/2014	AGU-0130	14.84862	145.5375	8.45	14.654	2.027	1.229	0.554	18.465	13.747	4.718	0.000	7.5
2014	S.MARIAN	Aguijan	4/8/2014	AGU-0202	14.85945	145.5554	12.5	9.178	1.876	25.325	2.682	39.061	12.241	1.999	24.822	9.5
2014	S.MARIAN	Aguijan	4/8/2014	AGU-0120	14.86552	145.5786	14.9	1.996	1.256	0.329	0.781	4.362	4.362	0.000	0.000	10
2014	S.MARIAN	Aguijan	4/8/2014	AGU-0127	14.84366	145.5659	20.7	1.027	1.013	0.049	1.390	3.479	3.479	0.000	0.000	4
2014	S.MARIAN	Aguijan	4/8/2014	AGU-0142	14.84228	145.5542	15	5.244	1.467	10.688	22.995	40.393	16.734	23.658	0.000	15
2014	S.MARIAN	Aguijan	4/8/2014	AGU-0134	14.8475	145.5373	5.4	5.571	3.664	0.884	2.312	12.431	12.431	0.000	0.000	37.5
2014	S.MARIAN	Aguijan	4/8/2014	AGU-0138	14.82925	145.5302	20.15	2.413	1.803	1.803	16.469	22.489	8.089	14.400	0.000	10.5
2014	S.MARIAN	Guam	3/25/2014	GUA-1084	13.57211	144.8224	22.5	6.642	3.593	0.172	1.593	12.000	10.059	1.941	0.000	10
2014	S.MARIAN	Guam	3/25/2014	GUA-1125	13.55106	144.809	4.85	5.034	1.770	0.478	0.166	7.449	7.449	0.000	0.000	17.5
2014	S.MARIAN	Guam	3/25/2014	GUA-1056	13.5245	144.8013	11.05	11.791	12.547	8.569	26.139	59.046	34.780	22.452	1.813	32.5
2014	S.MARIAN	Guam	3/25/2014	GUA-1053	13.51001	144.7835	21.05	5.834	3.554	0.000	1.552	10.940	7.843	3.097	0.000	3
2014	S.MARIAN	Guam	3/25/2014	GUA-1080	13.62336	144.834	22	4.738	1.632	0.121	0.383	6.874	4.225	2.649	0.000	10
2014	S.MARIAN	Guam	3/25/2014	GUA-1093	13.60607	144.8337	11.95	5.966	4.972	0.824	1.257	13.020	12.585	0.435	0.000	7.5
2014	S.MARIAN	Guam	3/25/2014	GUA-1134	13.58279	144.8309	8.6	12.761	2.607	1.587	0.432	17.387	10.780	6.607	0.000	15
2014	S.MARIAN	Guam	3/25/2014	GUA-1062	13.5176	144.7989	6.9	8.683	3.684	0.220	0.188	12.774	10.854	1.920	0.000	7.5
2014	S.MARIAN	Guam	3/25/2014	GUA-1098	13.4881	144.7644	12.15	2.096	1.593	1.704	0.916	6.309	4.743	1.566	0.000	42.5
2014	S.MARIAN	Guam	3/26/2014	GUA-0955	13.24512	144.7334	21	6.806	12.311	2.265	2.241	23.622	15.243	8.380	0.000	4.5
2014	S.MARIAN	Guam	3/26/2014	GUA-1141	13.23552	144.6536	5.1	13.240	6.214	0.874	1.763	22.091	17.445	4.646	0.000	20
2014	S.MARIAN	Guam	3/26/2014	GUA-1128	13.23855	144.6394	4.1	6.434	2.150	1.405	0.377	10.366	9.440	0.926	0.000	3
2014	S.MARIAN	Guam	3/26/2014	GUA-1086	13.22889	144.641	20.4	14.919	10.703	1.820	2.325	29.767	17.114	12.653	0.000	3

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	S.MARIAN	Guam	3/26/2014	GUA-0954	13.28117	144.7645	22.3	5.718	10.927	1.559	1.026	19.230	10.169	3.326	5.736	8.5
2014	S.MARIAN	Guam	3/26/2014	GUA-1008	13.26117	144.7433	6.05	6.459	1.836	0.251	0.620	9.165	8.666	0.499	0.000	30
2014	S.MARIAN	Guam	3/26/2014	GUA-1003	13.25333	144.7387	5.7	5.566	2.244	0.000	0.530	8.340	5.998	2.342	0.000	21.5
2014	S.MARIAN	Guam	3/26/2014	GUA-0963	13.24426	144.7249	10.85	5.504	0.823	1.195	0.099	7.621	6.791	0.830	0.000	3.5
2014	S.MARIAN	Guam	3/26/2014	GUA-1115	13.23864	144.6604	10.15	2.453	0.853	0.996	0.796	5.098	4.093	1.006	0.000	14.5
2014	S.MARIAN	Guam	3/27/2014	GUA-1082	13.35997	144.6356	20.7	2.299	1.226	0.432	0.201	4.157	4.157	0.000	0.000	3
2014	S.MARIAN	Guam	3/27/2014	GUA-1121	13.36391	144.6444	4.95	3.433	1.568	0.041	0.097	5.139	4.377	0.762	0.000	4.5
2014	S.MARIAN	Guam	3/27/2014	GUA-1077	13.31465	144.6439	21.05	1.235	2.668	84.316	0.250	88.468	3.852	0.596	84.020	4.5
2014	S.MARIAN	Guam	3/27/2014	GUA-1113	13.3092	144.6518	13	9.179	7.443	0.925	1.935	19.482	17.824	1.658	0.000	9
2014	S.MARIAN	Guam	3/27/2014	GUA-1122	13.29992	144.6569	4.25	4.308	8.217	0.341	0.566	13.431	8.533	4.897	0.000	8
2014	S.MARIAN	Guam	3/27/2014	GUA-1079	13.38481	144.6464	19.1	2.847	3.047	1.917	0.937	8.748	4.524	4.224	0.000	1.5
2014	S.MARIAN	Guam	3/27/2014	GUA-1066	13.33673	144.6332	21.75	0.488	0.717	2.310	0.676	4.190	1.957	2.234	0.000	1
2014	S.MARIAN	Guam	3/27/2014	GUA-1111	13.34989	144.6395	13.75	5.646	2.744	2.780	1.059	12.229	6.288	5.940	0.000	3.5
2014	S.MARIAN	Guam	3/27/2014	GUA-1109	13.28808	144.6537	12.5	0.525	2.102	0.847	0.369	3.843	3.258	0.585	0.000	4
2014	S.MARIAN	Guam	3/27/2014	GUA-1107	13.25916	144.6531	4.9	3.243	0.689	0.199	0.072	4.203	3.537	0.666	0.000	15
2014	S.MARIAN	Guam	3/27/2014	GUA-1103	13.27537	144.6623	3.65	2.059	1.663	2.441	0.885	7.048	4.992	2.056	0.000	27.5
2014	S.MARIAN	Guam	3/28/2014	GUA-0959	13.40107	144.7842	20.85	7.267	11.490	0.440	3.720	22.918	20.385	2.532	0.000	9.5
2014	S.MARIAN	Guam	3/28/2014	GUA-1005	13.34214	144.7739	4.15	7.571	3.593	0.667	0.104	11.935	11.021	0.914	0.000	6.5
2014	S.MARIAN	Guam	3/28/2014	GUA-0973	13.32663	144.7759	13.4	6.246	2.850	37.199	0.125	46.421	8.667	1.496	36.259	3
2014	S.MARIAN	Guam	3/28/2014	GUA-0948	13.28811	144.7681	19	4.481	5.249	0.317	1.487	11.535	10.704	0.832	0.000	6

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	S.MARIAN	Guam	3/28/2014	GUA-0958	13.43301	144.8123	19.7	5.003	5.740	1.260	0.321	12.323	7.861	4.462	0.000	17.5
2014	S.MARIAN	Guam	3/28/2014	GUA-0981	13.36839	144.7782	12.05	11.610	1.578	0.188	0.097	13.473	9.149	4.324	0.000	11
2014	S.MARIAN	Guam	3/28/2014	GUA-0964	13.31383	144.7737	16.95	4.132	1.038	0.279	0.099	5.548	4.420	1.128	0.000	3
2014	S.MARIAN	Guam	3/28/2014	GUA-1009	13.30416	144.7741	5.4	14.331	4.291	0.357	0.045	19.024	9.021	10.003	0.000	27.5
2014	S.MARIAN	Guam	3/28/2014	GUA-0988	13.29235	144.7687	13.05	32.186	2.015	0.571	0.220	34.992	8.109	15.986	10.897	12.5
2014	S.MARIAN	Guam	3/29/2014	GUA-0944	13.4669	144.859	22.6	2.846	1.152	1.062	2.940	8.000	6.054	1.946	0.000	6
2014	S.MARIAN	Guam	3/29/2014	GUA-0971	13.47941	144.8677	14.5	4.496	1.703	0.523	0.517	7.239	7.239	0.000	0.000	5.5
2014	S.MARIAN	Guam	3/29/2014	GUA-0992	13.48836	144.8755	5.6	9.178	3.387	0.477	3.394	16.436	15.685	0.750	0.000	6.5
2014	S.MARIAN	Guam	3/29/2014	GUA-0949	13.52104	144.9295	22.25	4.902	2.453	1.270	0.433	9.057	7.323	1.734	0.000	4
2014	S.MARIAN	Guam	3/29/2014	GUA-0945	13.44993	144.8367	24.05	6.720	2.818	1.006	2.411	12.954	8.433	4.521	0.000	17.5
2014	S.MARIAN	Guam	3/29/2014	GUA-0970	13.51633	144.9202	14.95	47.713	2.645	2.122	0.952	53.431	11.306	42.125	0.000	22.5
2014	S.MARIAN	Guam	3/29/2014	GUA-1023	13.5529	144.941	14.8	2.517	2.121	7.913	0.646	13.196	4.700	8.496	0.000	9
2014	S.MARIAN	Guam	3/29/2014	GUA-1028	13.5666	144.9407	4.8	31.557	4.083	0.297	4.527	40.464	18.249	11.318	10.897	29.5
2014	S.MARIAN	Guam	3/29/2014	GUA-1012	13.57691	144.9513	20.35	1.040	1.973	0.778	0.825	4.617	4.617	0.000	0.000	6.5
2014	S.MARIAN	Guam	3/30/2014	GUA-1022	13.59824	144.9605	23.75	3.347	1.033	152.598	0.864	157.842	5.926	6.474	145.442	5
2014	S.MARIAN	Guam	3/30/2014	GUA-1031	13.6012	144.9354	5.05	27.038	9.286	31.366	5.329	73.019	16.605	26.177	30.237	15
2014	S.MARIAN	Guam	3/30/2014	GUA-1013	13.61763	144.9053	14.75	4.777	3.242	0.344	2.225	10.587	8.353	2.235	0.000	21.5
2014	S.MARIAN	Guam	3/30/2014	GUA-1083	13.64122	144.888	21.55	7.720	2.558	2.349	1.360	13.986	10.638	3.349	0.000	17.5
2014	S.MARIAN	Guam	3/30/2014	GUA-1026	13.5955	144.957	7	35.285	5.973	0.924	8.328	50.510	15.167	35.343	0.000	20
2014	S.MARIAN	Guam	3/30/2014	GUA-1011	13.60174	144.9476	22.1	10.321	7.532	12.995	2.142	32.989	11.716	14.782	6.492	26.5

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	S.MARIAN	Guam	3/30/2014	GUA-1010	13.61367	144.9077	21.5	10.162	11.555	4.179	4.985	30.882	14.712	14.538	1.632	25
2014	S.MARIAN	Guam	3/30/2014	GUA-1105	13.65065	144.8783	19.25	2.849	2.227	0.829	0.334	6.240	4.332	1.908	0.000	5.5
2014	S.MARIAN	Guam	3/30/2014	GUA-1117	13.65305	144.8727	5.6	1.364	2.225	0.333	0.918	4.840	4.840	0.000	0.000	18
2014	S.MARIAN	Guam	3/30/2014	GUA-1123	13.65346	144.8724	5.55	2.303	1.632	0.372	0.031	4.338	3.906	0.432	0.000	22.5
2014	S.MARIAN	Guam	3/30/2014	GUA-1074	13.65984	144.8614	26.6	9.766	11.205	0.451	5.049	26.471	22.341	4.130	0.000	9
2014	S.MARIAN	Guam	3/31/2014	GUA-1081	13.37905	144.643	23.75	4.415	1.717	0.568	0.207	6.907	6.136	0.770	0.000	5.5
2014	S.MARIAN	Guam	3/31/2014	GUA-1143	13.3821	144.6465	4.2	9.439	3.130	0.261	0.427	13.257	13.257	0.000	0.000	5.5
2014	S.MARIAN	Guam	3/31/2014	GUA-1090	13.39289	144.6551	9.55	4.820	1.261	0.419	0.147	6.647	5.486	1.161	0.000	13.5
2014	S.MARIAN	Guam	3/31/2014	GUA-1138	13.41116	144.6542	5.6	4.801	5.627	0.470	0.714	11.613	7.338	4.274	0.000	11
2014	S.MARIAN	Guam	4/4/2014	GUA-1038	13.47263	144.6912	21.6	3.568	1.253	2.157	0.356	7.334	3.290	4.044	0.000	5
2014	S.MARIAN	Guam	4/4/2014	GUA-1039	13.47157	144.6913	13.95	4.837	1.460	2.850	0.174	9.321	6.677	2.644	0.000	14
2014	S.MARIAN	Guam	4/4/2014	GUA-1047	13.4791	144.7003	3.8	10.446	3.536	0.405	0.478	14.865	14.865	0.000	0.000	22.5
2014	S.MARIAN	Guam	4/4/2014	GUA-1046	13.48065	144.7045	5.55	3.634	2.377	2.248	2.253	10.512	8.555	1.957	0.000	7.5
2014	S.MARIAN	Guam	4/4/2014	GUA-1094	13.46775	144.6568	13.4	12.089	2.892	2.031	3.292	20.304	17.638	2.666	0.000	32.5
2014	S.MARIAN	Guam	4/4/2014	GUA-1037	13.48188	144.7025	22.75	16.717	1.041	1.250	8.629	27.637	7.631	20.006	0.000	2
2014	S.MARIAN	Guam	4/4/2014	GUA-1043	13.47917	144.7082	8.2	7.470	4.254	0.615	0.137	12.476	8.482	3.994	0.000	11.5
2014	S.MARIAN	Guam	4/4/2014	GUA-1087	13.4849	144.7385	21.4	6.906	7.319	11.103	4.559	29.887	17.000	12.886	0.000	37.5
2014	S.MARIAN	Guam	4/4/2014	GUA-1073	13.48423	144.7552	11.3	13.216	5.150	0.634	1.665	20.666	16.160	4.506	0.000	40
2014	S.MARIAN	Guam	4/4/2014	GUA-1140	13.48852	144.7658	4.2	8.926	2.204	0.165	1.547	12.841	12.548	0.293	0.000	15
2014	S.MARIAN	Guam	4/4/2014	GUA-1063	13.51085	144.7926	3.3	12.446	4.082	0.625	0.451	17.605	17.359	0.246	0.000	25

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	S.MARIAN	Guam	9/29/2014	GUA-1179	13.24486	144.7187	14.6	16.085	25.276	26.055	4.925	72.342	16.610	34.077	21.654	11
2014	S.MARIAN	Guam	9/29/2014	GUA-1167	13.24088	144.7118	14.6	2.621	3.556	0.836	0.716	7.729	4.847	2.882	0.000	2
2014	S.MARIAN	Guam	9/29/2014	GUA-1160	13.2412	144.7074	9.85	2.397	4.308	0.781	0.505	7.991	7.694	0.297	0.000	7.5
2014	S.MARIAN	Guam	9/29/2014	GUA-1185	13.24107	144.7014	4.85	9.568	5.620	0.110	0.201	15.500	13.457	2.043	0.000	5.5
2014	S.MARIAN	Guam	9/29/2014	GUA-1202	13.24156	144.7028	6.05	15.667	7.119	2.929	4.934	30.649	19.137	11.512	0.000	16
2014	S.MARIAN	Guam	9/29/2014	GUA-1147	13.24019	144.7091	18.5	6.923	2.361	1.964	2.506	13.752	10.370	3.383	0.000	1.5
2014	S.MARIAN	Guam	9/29/2014	GUA-1156	13.2408	144.7039	14.6	28.643	40.000	5.391	5.033	93.199	37.974	55.226	0.000	12.5
2014	S.MARIAN	Guam	9/30/2014	GUA-1145	13.24176	144.7159	19.4	12.700	3.863	1.810	1.721	20.093	7.583	12.510	0.000	2
2014	S.MARIAN	Guam	9/30/2014	GUA-1148	13.2396	144.7024	22.1	24.042	11.332	10.991	5.600	51.966	22.225	29.740	0.000	9
2014	S.MARIAN	Guam	9/30/2014	GUA-1159	13.24032	144.699	11.15	4.324	2.583	3.678	2.372	12.956	6.517	6.440	0.000	7.5
2014	S.MARIAN	Guam	9/30/2014	GUA-1193	13.2393	144.6999	15.6	4.613	2.659	3.512	1.655	12.439	8.824	3.614	0.000	2.5
2014	S.MARIAN	Guam	9/30/2014	GUA-1191	13.24116	144.6993	5.65	16.468	5.553	5.947	0.505	28.473	15.207	13.266	0.000	12.5
2014	S.MARIAN	Guam	9/30/2014	GUA-1197	13.24108	144.6951	5.9	5.480	2.162	2.159	0.472	10.274	9.182	1.092	0.000	10
2014	S.MARIAN	Guam	9/30/2014	GUA-1166	13.24015	144.6995	10.7	7.438	1.984	1.053	0.409	10.884	7.184	3.700	0.000	5
2014	S.MARIAN	Guam	9/30/2014	GUA-1203	13.24197	144.7071	3.3	18.047	3.767	6.599	4.024	32.437	17.184	8.594	6.659	12.5
2014	S.MARIAN	Guam	10/5/2014	GUA-1151	13.24111	144.7153	22.4	3.560	1.643	34.782	20.652	60.637	22.781	20.632	17.224	1
2014	S.MARIAN	Guam	10/5/2014	GUA-1146	13.24055	144.7067	23.65	4.434	2.435	1.176	0.751	8.796	8.796	0.000	0.000	2
2014	S.MARIAN	Guam	10/5/2014	GUA-1183	13.24344	144.7152	10	1.834	1.242	3.451	0.266	6.792	4.136	2.656	0.000	2.5
2014	S.MARIAN	Guam	10/5/2014	GUA-1182	13.24158	144.7095	13	19.775	20.126	4.006	6.077	49.984	24.491	25.493	0.000	5
2014	S.MARIAN	Guam	10/5/2014	GUA-1171	13.2415	144.7046	10.85	8.344	4.356	3.230	2.137	18.068	11.157	6.911	0.000	7.5

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	S.MARIAN	Rota	4/5/2014	ROT-0210	14.1562	145.1471	25.25	32.730	6.761	13.643	6.824	59.958	13.876	22.375	23.706	11.5
2014	S.MARIAN	Rota	4/5/2014	ROT-0237	14.16243	145.1543	5.45	1.772	1.040	0.340	0.226	3.378	3.378	0.000	0.000	12.5
2014	S.MARIAN	Rota	4/5/2014	ROT-0207	14.18751	145.2104	21.45	4.447	8.507	0.110	0.366	13.430	4.449	8.981	0.000	7.5
2014	S.MARIAN	Rota	4/5/2014	ROT-0273	14.17886	145.2032	5.25	10.750	2.389	0.917	0.239	14.295	12.697	1.598	0.000	40
2014	S.MARIAN	Rota	4/5/2014	ROT-0208	14.17533	145.1849	23.3	8.656	7.171	10.225	22.346	48.397	30.416	17.981	0.000	12.5
2014	S.MARIAN	Rota	4/5/2014	ROT-0234	14.17779	145.1916	12.8	7.164	3.270	2.027	0.436	12.897	10.493	2.403	0.000	7.5
2014	S.MARIAN	Rota	4/5/2014	ROT-0206	14.19372	145.2221	16.95	1.303	3.311	0.750	0.305	5.669	4.857	0.812	0.000	0.5
2014	S.MARIAN	Rota	4/5/2014	ROT-0256	14.20146	145.2609	11	5.027	5.415	1.530	1.037	13.010	4.536	8.474	0.000	3
2014	S.MARIAN	Rota	4/5/2014	ROT-0272	14.20136	145.2376	16.4	0.066	0.837	0.320	0.056	1.279	1.279	0.000	0.000	1
2014	S.MARIAN	Rota	4/6/2014	ROT-0254	14.11402	145.2095	21.9	5.134	2.400	2.024	1.519	11.077	8.501	2.576	0.000	10
2014	S.MARIAN	Rota	4/6/2014	ROT-0253	14.11317	145.1802	14.6	85.000	2.703	1.276	0.721	227.841	11.376	110.000	0.000	5
2014	S.MARIAN	Rota	4/6/2014	ROT-0238	14.12574	145.1672	5.75	8.744	2.543	1.277	0.773	13.337	8.936	4.401	0.000	6
2014	S.MARIAN	Rota	4/6/2014	ROT-0248	14.12747	145.1662	12.5	4.447	1.038	0.862	0.496	6.843	6.354	0.489	0.000	6.5
2014	S.MARIAN	Rota	4/6/2014	ROT-0255	14.11246	145.1977	15.3	11.089	6.301	1.161	1.875	20.426	8.449	11.977	0.000	3
2014	S.MARIAN	Rota	4/6/2014	ROT-0279	14.11411	145.188	4.9	6.772	2.423	0.062	0.307	9.565	7.246	2.319	0.000	4.5
2014	S.MARIAN	Rota	4/6/2014	ROT-0251	14.11362	145.1845	21.4	21.511	5.022	15.078	13.424	55.035	28.066	26.970	0.000	6.5
2014	S.MARIAN	Rota	4/6/2014	ROT-0240	14.12192	145.1675	11.1	7.313	5.639	1.152	0.808	14.912	8.725	6.186	0.000	2.5
2014	S.MARIAN	Rota	4/6/2014	ROT-0260	14.12653	145.1673	5.75	8.114	4.949	2.454	0.810	16.327	9.754	6.573	0.000	0.5
2014	S.MARIAN	Rota	4/7/2014	ROT-0233	14.15108	145.1424	10.25	4.354	1.583	0.473	0.455	6.864	6.269	0.595	0.000	10.5
2014	S.MARIAN	Rota	4/7/2014	ROT-0235	14.1412	145.1344	5.4	10.907	1.360	0.594	0.258	13.119	13.119	0.000	0.000	17.5

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	S.MARIAN	Rota	4/7/2014	ROT-0224	14.12187	145.1302	9.85	2.034	1.728	0.084	0.553	4.399	4.399	0.000	0.000	6.5
2014	S.MARIAN	Rota	4/7/2014	ROT-0232	14.13585	145.1508	10.65	8.638	4.867	0.592	0.548	14.645	14.645	0.000	0.000	5
2014	S.MARIAN	Rota	4/7/2014	ROT-0220	14.13268	145.1539	25	7.453	11.434	2.234	2.970	24.091	10.208	13.883	0.000	7.5
2014	S.MARIAN	Rota	4/7/2014	ROT-0209	14.1112	145.1658	22.9	7.387	4.448	1.456	0.610	13.900	10.371	3.529	0.000	2.5
2014	S.MARIAN	Rota	4/7/2014	ROT-0229	14.13556	145.1271	21.35	18.663	2.336	30.208	50.000	119.767	13.914	77.554	28.299	3
2014	S.MARIAN	Rota	4/7/2014	ROT-0249	14.13468	145.1384	4.55	11.722	5.817	0.172	0.882	18.593	15.006	3.588	0.000	17.5
2014	S.MARIAN	Rota	4/7/2014	ROT-0215	14.13589	145.1534	5.35	8.108	2.375	0.560	0.428	11.471	8.019	3.452	0.000	4
2014	S.MARIAN	Rota	4/7/2014	ROT-0216	14.13012	145.1595	15.4	13.833	2.754	1.000	1.449	19.036	10.024	9.012	0.000	1
2014	S.MARIAN	Saipan	4/11/2014	SAI-0600	15.10397	145.7269	21.95	10.835	4.931	1.712	1.502	18.979	13.598	5.381	0.000	9
2014	S.MARIAN	Saipan	4/11/2014	SAI-0509	15.10417	145.7333	13.6	6.864	4.011	1.149	2.813	14.836	11.541	3.295	0.000	9
2014	S.MARIAN	Saipan	4/11/2014	SAI-0598	15.09768	145.7428	23.15	10.989	6.859	0.648	3.423	21.919	16.805	5.114	0.000	50
2014	S.MARIAN	Saipan	4/11/2014	SAI-0545	15.10565	145.7248	11.5	8.242	4.622	2.254	5.267	20.384	16.999	2.102	1.283	42.5
2014	S.MARIAN	Saipan	4/11/2014	SAI-0604	15.10963	145.7058	3.8	3.565	3.331	0.508	0.707	8.111	8.111	0.000	0.000	37.5
2014	S.MARIAN	Saipan	4/11/2014	SAI-0601	15.11636	145.6963	7.75	7.789	3.570	1.174	5.470	18.004	15.860	2.144	0.000	42.5
2014	S.MARIAN	Saipan	4/11/2014	SAI-0491	15.12866	145.6826	19.9	4.111	2.541	1.707	1.500	9.859	7.196	2.663	0.000	6
2014	S.MARIAN	Saipan	4/11/2014	SAI-0548	15.1337	145.6848	11.7	4.760	1.333	0.337	1.079	7.508	6.556	0.951	0.000	5.5
2014	S.MARIAN	Saipan	4/12/2014	SAI-0493	15.21716	145.787	25.6	4.575	5.092	3.576	2.675	15.918	7.383	8.535	0.000	7.5
2014	S.MARIAN	Saipan	4/12/2014	SAI-0527	15.18738	145.7813	12.1	5.203	3.816	0.245	0.690	9.954	8.248	1.706	0.000	35
2014	S.MARIAN	Saipan	4/12/2014	SAI-0611	15.15692	145.7506	4.75	8.279	3.659	6.275	0.361	18.574	10.385	2.247	5.942	15
2014	S.MARIAN	Saipan	4/12/2014	SAI-0474	15.15863	145.7557	22.6	11.579	4.295	0.312	2.018	18.204	11.632	6.571	0.000	1.5

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	S.MARIAN	Saipan	4/12/2014	SAI-0436	15.18159	145.7874	24.35	10.986	3.464	0.269	2.786	17.505	11.183	6.323	0.000	30
2014	S.MARIAN	Saipan	4/12/2014	SAI-0607	15.17776	145.7871	10.5	6.335	4.602	0.248	0.024	11.209	11.209	0.000	0.000	35
2014	S.MARIAN	Saipan	4/12/2014	SAI-0457	15.15326	145.7709	22.55	9.720	4.052	2.692	1.692	18.156	9.983	8.173	0.000	3.5
2014	S.MARIAN	Saipan	4/12/2014	SAI-0535	15.15769	145.7687	16.05	7.491	4.455	1.048	2.973	15.967	15.967	0.000	0.000	52.5
2014	S.MARIAN	Saipan	4/12/2014	SAI-0608	15.13695	145.7433	11	9.080	3.762	1.055	3.763	17.659	12.764	4.895	0.000	26
2014	S.MARIAN	Saipan	4/13/2014	SAI-0589	15.255	145.812	21.05	49.245	4.337	1.010	3.344	57.935	8.100	4.989	44.846	1.5
2014	S.MARIAN	Saipan	4/13/2014	SAI-0531	15.26122	145.8289	15.15	9.072	8.125	3.682	1.094	21.972	13.947	8.025	0.000	12.5
2014	S.MARIAN	Saipan	4/13/2014	SAI-0549	15.28295	145.8027	15.45	9.349	3.577	1.223	25.982	40.132	12.562	27.570	0.000	3
2014	S.MARIAN	Saipan	4/13/2014	SAI-0579	15.27519	145.8297	22.75	3.163	13.394	25.476	16.378	58.411	20.402	16.797	21.212	1.5
2014	S.MARIAN	Saipan	4/13/2014	SAI-0586	15.28645	145.82	5.45	12.453	2.998	0.488	1.529	17.468	17.468	0.000	0.000	37.5
2014	S.MARIAN	Saipan	4/13/2014	SAI-0490	15.26984	145.7851	21.95	2.090	1.546	0.703	1.618	5.958	5.958	0.000	0.000	6
2014	S.MARIAN	Saipan	4/17/2014	SAI-0460	15.24841	145.7067	20.25	2.024	2.903	0.271	0.493	5.691	5.691	0.000	0.000	6
2014	S.MARIAN	Saipan	4/17/2014	SAI-0564	15.19014	145.7033	4.25	2.050	3.889	0.000	0.189	6.128	6.128	0.000	0.000	20
2014	S.MARIAN	Saipan	4/17/2014	SAI-0507	15.17866	145.6971	14.95	6.129	1.938	0.322	1.628	10.017	7.081	2.935	0.000	9
2014	S.MARIAN	Saipan	4/17/2014	SAI-0459	15.17092	145.6935	23.6	5.563	1.890	1.801	16.496	25.750	9.143	16.607	0.000	11.5
2014	S.MARIAN	Saipan	4/17/2014	SAI-0441	15.1431	145.6807	21.8	1.452	0.764	0.366	1.000	3.582	3.582	0.000	0.000	15
2014	S.MARIAN	Saipan	4/17/2014	SAI-0483	15.15487	145.6853	21.5	8.223	8.459	1.527	1.961	20.171	14.247	5.924	0.000	22.5
2014	S.MARIAN	Saipan	4/17/2014	SAI-0526	15.22663	145.6898	9.55	16.555	2.191	0.560	0.464	19.770	19.183	0.588	0.000	10
2014	S.MARIAN	Saipan	4/17/2014	SAI-0498	15.24261	145.6994	22.7	4.675	1.800	0.539	0.553	7.567	7.567	0.000	0.000	12.5
2014	S.MARIAN	Saipan	4/17/2014	SAI-0537	15.16202	145.6932	11.2	5.936	1.114	0.041	1.642	8.733	7.922	0.811	0.000	30

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	S.MARIAN	Saipan	4/17/2014	SAI-0418	15.18732	145.6825	27.6	1.099	0.586	0.000	0.340	2.026	2.026	0.000	0.000	10
2014	S.MARIAN	Saipan	4/18/2014	SAI-0594	15.26884	145.8319	20	2.401	1.229	1.415	1.318	6.362	5.182	1.181	0.000	1.5
2014	S.MARIAN	Saipan	4/18/2014	SAI-0466	15.22754	145.797	26.85	2.383	3.861	0.616	4.469	11.328	6.756	4.572	0.000	1.5
2014	S.MARIAN	Saipan	4/18/2014	SAI-0480	15.25543	145.7595	23.95	6.717	2.352	1.117	2.535	12.721	8.575	4.147	0.000	3
2014	S.MARIAN	Saipan	4/18/2014	SAI-0585	15.28129	145.8007	11	2.950	3.823	1.424	0.864	9.060	7.475	1.586	0.000	3.5
2014	S.MARIAN	Saipan	4/18/2014	SAI-0583	15.27665	145.8273	9.65	15.714	2.646	0.000	0.560	18.920	4.462	0.000	14.458	2
2014	S.MARIAN	Saipan	4/18/2014	SAI-0559	15.25958	145.8177	3.4	27.788	7.533	0.204	0.145	35.670	20.075	15.595	0.000	27.5
2014	S.MARIAN	Saipan	4/18/2014	SAI-0575	15.2155	145.7831	6.5	23.969	3.512	1.233	5.420	34.134	21.692	12.442	0.000	16.5
2014	S.MARIAN	Saipan	4/18/2014	SAI-0430	15.2566	145.7355	21.95	6.196	2.074	1.134	0.956	10.360	8.629	1.732	0.000	6
2014	S.MARIAN	Saipan	4/18/2014	SAI-0568	15.27569	145.7935	21.5	24.011	22.587	20.165	12.335	79.098	31.590	17.962	29.546	6.5
2014	S.MARIAN	Saipan	4/18/2014	SAI-0529	15.28706	145.8159	15.15	11.691	11.502	0.333	13.961	37.488	30.495	6.992	0.000	14.5
2014	S.MARIAN	Saipan	4/18/2014	SAI-0596	15.25671	145.8146	4.85	12.627	6.528	12.298	2.696	34.149	16.954	6.476	10.719	27.5
2014	S.MARIAN	Saipan	4/18/2014	SAI-0516	15.24794	145.81	20.05	5.238	1.653	1.559	1.277	9.727	8.407	1.320	0.000	33.5
2014	S.MARIAN	Saipan	4/18/2014	SAI-0597	15.23509	145.8029	14.3	10.788	2.987	2.271	0.462	16.508	8.458	8.050	0.000	6
2014	S.MARIAN	Saipan	5/7/2014	SAI-0542	15.2169	145.6914	16.45	1.098	1.114	0.000	0.961	3.173	3.173	0.000	0.000	1.5
2014	S.MARIAN	Saipan	5/7/2014	SAI-0433	15.21204	145.6777	29.55	4.425	2.319	2.814	0.305	9.862	7.974	1.888	0.000	8.5
2014	S.MARIAN	Tinian	4/9/2014	TIN-0197	15.05641	145.6598	22.5	0.939	1.264	0.000	0.179	2.382	1.644	0.737	0.000	0.5
2014	S.MARIAN	Tinian	4/9/2014	TIN-0225	15.02573	145.6547	15.1	13.612	1.904	2.306	0.889	18.711	9.026	9.685	0.000	5
2014	S.MARIAN	Tinian	4/9/2014	TIN-0256	15.02	145.6582	5.3	9.088	3.234	0.219	0.283	12.824	9.536	3.288	0.000	20
2014	S.MARIAN	Tinian	4/9/2014	TIN-0227	14.94738	145.6613	21	5.931	6.441	2.631	3.831	18.834	11.229	6.628	0.978	9

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	S.MARIAN	Tinian	4/9/2014	TIN-0213	15.0657	145.6561	15.15	17.376	7.600	1.452	3.911	30.340	21.297	9.042	0.000	7.5
2014	S.MARIAN	Tinian	4/9/2014	TIN-0194	15.03078	145.6536	23.35	6.282	2.732	3.259	2.357	14.630	10.819	3.810	0.000	12.5
2014	S.MARIAN	Tinian	4/9/2014	TIN-0200	15.00331	145.6742	22.75	1.519	2.573	1.074	5.032	10.197	9.015	1.182	0.000	2
2014	S.MARIAN	Tinian	4/9/2014	TIN-0262	14.99212	145.6708	16.1	2.580	1.503	0.337	0.249	4.670	4.670	0.000	0.000	3.5
2014	S.MARIAN	Tinian	4/9/2014	TIN-0261	14.93494	145.6517	15.9	2.968	1.792	0.470	3.709	8.939	8.315	0.624	0.000	8
2014	S.MARIAN	Tinian	4/10/2014	TIN-0182	14.96658	145.6092	24.5	1.882	1.695	1.984	1.136	6.697	4.832	1.865	0.000	9
2014	S.MARIAN	Tinian	4/10/2014	TIN-0259	15.0122	145.5864	5.95	10.385	4.258	0.766	1.021	16.430	8.169	8.261	0.000	10
2014	S.MARIAN	Tinian	4/10/2014	TIN-0187	15.04098	145.5945	23.35	9.120	5.489	0.455	7.773	22.836	15.860	6.976	0.000	22.5
2014	S.MARIAN	Tinian	4/10/2014	TIN-0241	15.06238	145.6053	12	10.718	3.323	1.905	1.695	17.642	12.335	5.307	0.000	7.5
2014	S.MARIAN	Tinian	4/10/2014	TIN-0258	14.95481	145.6277	3	1.226	3.159	0.003	5.435	9.823	4.022	5.801	0.000	3.5
2014	S.MARIAN	Tinian	4/10/2014	TIN-0233	14.98374	145.6084	10.45	13.169	12.088	0.657	1.635	27.549	21.968	5.580	0.000	17.5
2014	S.MARIAN	Tinian	4/10/2014	TIN-0181	15.00636	145.5849	22.4	1.686	3.201	3.473	6.337	14.697	10.237	4.459	0.000	14
2014	S.MARIAN	Tinian	4/10/2014	TIN-0257	15.03828	145.5922	5.95	5.415	2.550	0.478	1.035	9.478	9.478	0.000	0.000	54
2014	S.MARIAN	Tinian	4/10/2014	TIN-0186	15.07544	145.6135	21.05	15.124	2.184	0.813	1.392	19.513	13.119	6.393	0.000	67.5
2014	S.MARIAN	Tinian	4/10/2014	TIN-0217	15.07044	145.6116	13.3	9.625	5.399	0.614	5.745	21.384	19.938	1.445	0.000	13.5
2014	N.MARIAN	Asuncion	4/24/2014	ASC-0193	19.70793	145.404	9.1	16.354	6.020	32.013	8.805	63.192	16.099	37.930	9.163	2
2014	N.MARIAN	Asuncion	4/24/2014	ASC-0196	19.70221	145.4164	16.25	11.866	12.336	49.682	16.518	90.402	21.952	28.746	39.705	12.5
2014	N.MARIAN	Asuncion	4/24/2014	ASC-0191	19.69152	145.4204	20.75	6.943	7.963	25.980	50.000	126.616	33.435	85.846	7.335	32.5
2014	N.MARIAN	Asuncion	4/24/2014	ASC-0202	19.68443	145.4172	4.7	15.681	2.392	17.907	3.384	39.364	6.056	25.093	8.215	1.5
2014	N.MARIAN	Asuncion	4/24/2014	ASC-0187	19.6763	145.4098	8.95	12.304	6.388	4.670	1.145	24.507	20.927	3.580	0.000	42.5

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	N.MARIAN	Asuncion	4/24/2014	ASC-0145	19.67536	145.4072	18.55	3.361	12.926	213.418	37.307	267.012	21.528	45.293	200.190	30
2014	N.MARIAN	Asuncion	4/24/2014	ASC-0169	19.70667	145.3966	23.65	4.649	9.502	9.417	27.662	51.230	35.079	16.151	0.000	20
2014	N.MARIAN	Asuncion	4/24/2014	ASC-0158	19.70523	145.413	17	12.232	9.199	19.990	21.476	62.896	19.489	32.688	10.719	20
2014	N.MARIAN	Asuncion	4/24/2014	ASC-0182	19.69157	145.4191	15.2	5.053	3.729	5.275	0.519	14.576	4.526	10.050	0.000	1.5
2014	N.MARIAN	Asuncion	4/24/2014	ASC-0161	19.6813	145.4154	14.45	12.177	11.760	16.120	28.308	68.365	19.022	38.623	10.719	11.5
2014	N.MARIAN	Asuncion	4/25/2014	ASC-0150	19.67507	145.3987	19.9	4.858	3.972	11.133	2.696	22.659	13.122	9.537	0.000	30
2014	N.MARIAN	Asuncion	4/25/2014	ASC-0153	19.68702	145.3875	22.8	10.293	5.733	5.628	50.000	90.163	45.000	26.602	0.000	32.5
2014	N.MARIAN	Asuncion	4/25/2014	ASC-0139	19.67435	145.4035	21	6.518	4.061	24.675	2.462	37.716	11.043	15.954	10.719	22.5
2014	N.MARIAN	Asuncion	4/25/2014	ASC-0195	19.67494	145.4006	11.4	5.470	2.297	62.499	0.156	70.421	5.860	46.951	17.611	12.5
2014	N.MARIAN	Asuncion	4/25/2014	ASC-0176	19.68126	145.3891	12.75	13.225	3.812	7.581	3.806	28.424	13.898	14.526	0.000	45
2014	N.MARIAN	Asuncion	4/25/2014	ASC-0207	19.69589	145.3908	4.45	37.083	7.898	2.735	5.254	52.971	25.334	27.636	0.000	3
2014	N.MARIAN	Asuncion	4/25/2014	ASC-0173	19.67504	145.4043	11.55	50.121	38.928	25.238	50.000	213.830	45.000	110.000	10.719	6.5
2014	N.MARIAN	Asuncion	4/25/2014	ASC-0177	19.67646	145.3985	8.05	25.257	11.400	16.830	11.964	65.452	32.642	32.810	0.000	17.5
2014	N.MARIAN	Asuncion	4/25/2014	ASC-0206	19.68395	145.3897	4	39.510	9.782	3.351	2.147	54.790	30.442	24.348	0.000	2.5
2014	N.MARIAN	Asuncion	4/25/2014	ASC-0170	19.68514	145.3877	14.7	21.214	7.833	8.443	32.233	69.723	25.819	43.904	0.000	32.5
2014	N.MARIAN	Asuncion	4/25/2014	ASC-0179	19.69868	145.3912	14.65	59.637	11.827	23.558	42.174	137.196	45.000	46.051	12.498	30
2014	N.MARIAN	FDP	4/26/2014	FDP-0116	20.54291	144.8854	23	9.430	4.170	27.047	50.000	111.678	15.056	85.902	10.719	4
2014	N.MARIAN	FDP	4/26/2014	FDP-0146	20.54743	144.886	5.85	13.704	9.883	6.109	18.763	48.459	24.171	24.288	0.000	2
2014	N.MARIAN	FDP	4/26/2014	FDP-0132	20.55011	144.9024	17.1	16.461	14.478	62.464	1.604	95.007	18.964	35.526	40.517	2
2014	N.MARIAN	FDP	4/26/2014	FDP-0126	20.53819	144.8997	15.3	32.030	10.423	10.928	5.220	58.602	25.380	23.863	9.359	25

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	N.MARIAN	FDP	4/26/2014	FDP-0134	20.53515	144.893	14.6	13.663	17.568	74.746	16.295	122.273	20.671	50.534	51.068	22.5
2014	N.MARIAN	FDP	4/26/2014	FDP-0135	20.53675	144.8871	10.75	22.516	9.492	47.612	21.123	100.743	26.322	53.066	21.355	15
2014	N.MARIAN	FDP	4/26/2014	FDP-0130	20.55	144.8864	12.9	10.687	13.047	21.160	41.530	86.425	19.643	55.646	11.135	7.5
2014	N.MARIAN	FDP	4/26/2014	FDP-0115	20.55365	144.894	20.45	13.869	1.869	15.265	3.502	34.505	7.390	13.421	13.693	0.5
2014	N.MARIAN	FDP	4/26/2014	FDP-0144	20.54359	144.9027	10.55	34.834	7.194	13.179	0.000	55.208	11.065	31.084	13.059	2
2014	N.MARIAN	FDP	4/26/2014	FDP-0152	20.53621	144.8908	5.8	60.139	4.225	11.621	5.747	81.732	33.622	37.391	10.719	0.5
2014	N.MARIAN	FDP	4/26/2014	FDP-0119	20.54625	144.9049	21.75	16.574	22.922	2.812	13.850	56.158	31.462	24.696	0.000	5
2014	N.MARIAN	Maug	4/28/2014	MAU-0186	20.0114	145.2186	17.15	47.648	7.257	16.805	1.159	72.869	26.831	46.038	0.000	2
2014	N.MARIAN	Maug	4/28/2014	MAU-0294	20.01779	145.2124	13.75	15.981	2.949	6.976	12.611	38.518	20.307	18.211	0.000	8.5
2014	N.MARIAN	Maug	4/28/2014	MAU-0281	20.02784	145.2115	13.8	18.845	7.238	27.958	18.533	72.574	22.033	33.328	17.212	13
2014	N.MARIAN	Maug	4/28/2014	MAU-0282	20.02929	145.2241	23.35	4.542	2.494	3.105	14.227	24.368	18.657	5.712	0.000	60
2014	N.MARIAN	Maug	4/28/2014	MAU-0218	20.01808	145.23	11.2	18.114	8.959	4.297	5.003	36.373	21.769	14.605	0.000	12.5
2014	N.MARIAN	Maug	4/28/2014	MAU-0284	20.01615	145.2146	21.85	4.475	2.349	0.755	3.772	11.352	9.153	2.199	0.000	15
2014	N.MARIAN	Maug	4/28/2014	MAU-0334	20.02396	145.2103	5.05	52.914	7.563	2.720	9.912	73.110	19.005	43.209	10.897	12.5
2014	N.MARIAN	Maug	4/28/2014	MAU-0285	20.03005	145.2126	11.75	18.178	22.783	24.629	31.776	97.366	23.914	62.732	10.719	3.5
2014	N.MARIAN	Maug	4/28/2014	MAU-0279	20.02054	145.23	18.9	6.778	2.693	7.638	7.886	24.996	15.714	2.362	6.920	22.5
2014	N.MARIAN	Maug	5/3/2014	MAU-0297	20.01068	145.221	23.1	15.821	7.346	24.771	41.559	89.497	24.934	50.707	13.856	40
2014	N.MARIAN	Maug	5/3/2014	MAU-0340	20.01361	145.2095	2.95	33.888	9.938	8.952	1.902	54.681	23.813	30.869	0.000	11
2014	N.MARIAN	Maug	5/3/2014	MAU-0278	20.01745	145.2067	21.6	16.119	5.761	23.378	50.000	100.762	45.000	47.139	0.000	42.5
2014	N.MARIAN	Maug	5/3/2014	MAU-0193	20.02169	145.2069	13.3	11.163	8.380	16.053	50.000	96.807	45.000	16.043	0.000	67.5

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	N.MARIAN	Maug	5/3/2014	MAU-0230	20.02949	145.2093	9.25	15.990	8.019	9.699	2.112	35.820	22.843	11.693	1.283	11
2014	N.MARIAN	Maug	5/3/2014	MAU-0199	20.02529	145.2074	11.9	20.716	3.705	6.197	8.611	39.228	21.468	17.760	0.000	20
2014	N.MARIAN	Maug	5/3/2014	MAU-0202	20.01861	145.2075	10.2	11.229	5.842	12.043	3.745	32.859	15.504	15.529	1.825	25
2014	N.MARIAN	Maug	5/3/2014	MAU-0226	20.01137	145.2095	15.35	19.718	6.363	18.576	12.258	56.915	26.341	21.978	8.596	45
2014	N.MARIAN	Maug	5/3/2014	MAU-0217	20.00965	145.2168	11.5	7.498	4.472	2.218	4.854	19.043	14.873	4.170	0.000	45
2014	N.MARIAN	Maug	5/3/2014	MAU-0188	20.01121	145.2268	16.2	10.540	7.918	17.156	14.531	50.145	28.705	21.441	0.000	60
2014	N.MARIAN	Maug	5/4/2014	MAU-0215	20.03425	145.2151	13.6	9.073	4.188	0.804	0.798	14.864	11.362	3.502	0.000	30
2014	N.MARIAN	Maug	5/4/2014	MAU-0341	20.03567	145.2222	5.4	45.296	8.376	16.083	5.375	75.129	22.152	44.762	8.215	17.5
2014	N.MARIAN	Maug	5/4/2014	MAU-0293	20.03623	145.2252	21.65	5.992	8.861	3.108	4.657	22.618	17.431	5.186	0.000	25
2014	N.MARIAN	Maug	5/4/2014	MAU-0198	20.02739	145.2362	15.9	23.900	5.868	8.323	11.668	49.760	15.208	34.551	0.000	20
2014	N.MARIAN	Maug	5/4/2014	MAU-0292	20.03109	145.209	25.85	9.797	8.427	16.186	13.862	48.271	13.025	29.477	5.769	47.5
2014	N.MARIAN	Maug	5/4/2014	MAU-0216	20.03578	145.2182	10	4.800	3.266	3.047	1.563	12.676	9.976	2.700	0.000	21
2014	N.MARIAN	Maug	5/4/2014	MAU-0192	20.03712	145.2205	17.55	11.139	5.742	8.960	1.227	27.068	12.868	14.200	0.000	32.5
2014	N.MARIAN	Maug	5/4/2014	MAU-0299	20.03425	145.2292	19.4	9.894	3.561	16.947	3.088	33.490	12.481	11.511	9.498	32.5
2014	N.MARIAN	Maug	5/4/2014	MAU-0225	20.03114	145.2312	12.15	17.212	4.063	1.544	0.409	23.227	13.414	9.813	0.000	17.5
2014	N.MARIAN	Maug	5/4/2014	MAU-0204	20.03087	145.234	16.85	13.805	4.867	26.502	4.755	49.929	16.931	8.661	24.338	25
2014	N.MARIAN	Maug	5/4/2014	MAU-0298	20.03014	145.2362	24.95	6.708	9.448	7.653	0.988	24.797	13.437	11.360	0.000	45
2014	N.MARIAN	Maug	5/4/2014	MAU-0190	20.02516	145.2368	12.15	40.777	7.587	14.334	35.901	98.599	45.000	49.746	0.000	15
2014	N.MARIAN	Maug	5/4/2014	MAU-0212	20.03344	145.2273	8.85	9.218	3.770	1.867	0.407	15.261	11.991	3.270	0.000	19.5
2014	N.MARIAN	Maug	5/5/2014	MAU-0289	20.01752	145.2398	23.75	11.990	6.130	14.508	6.412	39.039	20.705	18.335	0.000	35

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	N.MARIAN	Maug	5/5/2014	MAU-0339	20.01509	145.2286	4.45	22.459	9.673	24.024	12.936	69.093	35.049	17.856	16.188	2
2014	N.MARIAN	Maug	5/5/2014	MAU-0208	20.01348	145.2267	13.2	7.880	2.967	52.718	38.095	101.661	9.954	40.927	50.779	10
2014	N.MARIAN	Maug	5/5/2014	MAU-0195	20.01115	145.2313	19.65	11.252	3.550	23.356	4.053	42.211	14.466	19.979	7.766	37.5
2014	N.MARIAN	Maug	5/5/2014	MAU-0187	20.01322	145.2338	16.6	19.498	23.677	12.679	50.000	128.218	45.000	71.839	0.000	20
2014	N.MARIAN	Maug	5/5/2014	MAU-0203	20.01922	145.2398	16.2	7.294	8.786	140.087	6.712	162.879	16.451	9.222	137.206	33
2014	N.MARIAN	Maug	5/5/2014	MAU-0335	20.0236	145.2378	5.65	39.685	9.301	16.218	1.658	66.862	18.568	37.575	10.719	3
2014	N.MARIAN	Maug	5/5/2014	MAU-0185	20.01003	145.2291	17.45	5.144	4.729	12.890	2.122	24.885	12.019	2.147	10.719	30
2014	N.MARIAN	Pagan	4/20/2014	PAG-0278	18.10593	145.7831	23.7	3.430	0.771	11.637	0.416	16.254	4.685	11.569	0.000	1
2014	N.MARIAN	Pagan	4/20/2014	PAG-0338	18.09062	145.7591	10.05	58.495	6.079	7.977	17.733	90.283	10.994	64.832	14.458	7.5
2014	N.MARIAN	Pagan	4/20/2014	PAG-0305	18.0611	145.7437	26.65	13.844	16.784	29.069	17.221	76.918	15.000	53.703	8.215	6.5
2014	N.MARIAN	Pagan	4/20/2014	PAG-0349	18.04265	145.7117	15.05	17.310	23.446	31.358	25.343	97.457	33.699	38.367	25.391	7.5
2014	N.MARIAN	Pagan	4/20/2014	PAG-0281	18.09914	145.7976	23.75	16.094	8.020	13.236	4.139	41.488	10.972	30.516	0.000	5.5
2014	N.MARIAN	Pagan	4/20/2014	PAG-0322	18.10292	145.7721	9.25	12.324	8.897	20.381	3.769	45.371	7.983	25.538	11.850	10
2014	N.MARIAN	Pagan	4/20/2014	PAG-0310	18.0759	145.7508	21.35	11.222	27.147	27.225	14.278	79.871	36.481	35.175	8.215	20
2014	N.MARIAN	Pagan	4/20/2014	PAG-0397	18.07185	145.7464	4.85	18.955	7.594	38.392	4.409	69.351	11.620	18.169	39.562	12.5
2014	N.MARIAN	Pagan	4/20/2014	PAG-0359	18.04911	145.7303	7.75	7.946	2.525	32.466	13.977	56.914	21.644	17.331	17.938	17.5
2014	N.MARIAN	Pagan	4/20/2014	PAG-0396	18.04589	145.7193	3.9	29.097	5.712	149.919	6.179	190.907	17.749	34.708	138.450	15
2014	N.MARIAN	Pagan	4/20/2014	PAG-0280	18.04388	145.7181	23.45	10.354	9.688	77.436	1.850	99.328	13.027	15.956	70.346	12.5
2014	N.MARIAN	Pagan	4/21/2014	PAG-0313	18.05575	145.7078	21.85	20.747	14.787	8.690	27.610	71.835	18.046	53.788	0.000	9
2014	N.MARIAN	Pagan	4/21/2014	PAG-0326	18.07766	145.7175	9.6	42.475	15.949	8.799	0.776	67.999	17.786	41.889	8.323	9

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	N.MARIAN	Pagan	4/21/2014	PAG-0315	18.09651	145.7491	22	3.596	1.172	2.265	4.470	11.503	8.844	2.659	0.000	70
2014	N.MARIAN	Pagan	4/21/2014	PAG-0339	18.09868	145.7532	10.75	16.639	18.638	4.058	2.888	42.222	19.836	22.386	0.000	4
2014	N.MARIAN	Pagan	4/21/2014	PAG-0252	18.06032	145.7084	21.15	14.463	3.230	34.568	4.128	56.389	17.645	18.097	20.647	24.5
2014	N.MARIAN	Pagan	4/21/2014	PAG-0270	18.06525	145.7116	22.35	10.680	19.758	12.077	9.593	52.109	24.708	27.401	0.000	30
2014	N.MARIAN	Pagan	4/21/2014	PAG-0409	18.08528	145.732	5.3	16.290	4.583	5.851	4.957	31.681	11.907	19.774	0.000	30
2014	N.MARIAN	Pagan	4/21/2014	PAG-0357	18.10584	145.7557	10.65	9.911	12.710	3.899	14.117	40.636	20.929	19.708	0.000	9
2014	N.MARIAN	Pagan	4/21/2014	PAG-0329	18.12081	145.7557	13.5	5.642	4.290	1.019	0.637	11.588	7.251	4.337	0.000	14
2014	N.MARIAN	Pagan	4/21/2014	PAG-0301	18.04469	145.7052	24.35	5.795	5.488	7.972	0.771	20.026	9.655	10.371	0.000	20
2014	N.MARIAN	Pagan	4/21/2014	PAG-0319	18.051	145.7089	8.5	11.168	5.852	2.438	0.648	20.106	10.446	9.661	0.000	17
2014	N.MARIAN	Pagan	4/21/2014	PAG-0342	18.08602	145.7277	14.7	34.399	11.532	1.890	28.717	76.538	35.057	41.481	0.000	15
2014	N.MARIAN	Pagan	4/21/2014	PAG-0385	18.10418	145.7573	3.75	7.970	1.664	17.339	0.198	27.171	7.369	5.946	13.856	4
2014	N.MARIAN	Pagan	4/21/2014	PAG-0277	18.11535	145.753	21.2	12.242	18.261	35.889	4.362	70.753	12.298	33.634	24.822	8
2014	N.MARIAN	Pagan	4/21/2014	PAG-0379	18.1235	145.7571	4.65	3.225	2.611	0.206	0.220	6.261	5.397	0.865	0.000	2
2014	N.MARIAN	Pagan	4/21/2014	PAG-0250	18.14358	145.7547	19.4	15.601	16.738	32.329	50.000	230.472	45.000	62.988	10.145	17.5
2014	N.MARIAN	Pagan	4/22/2014	PAG-0389	18.15456	145.8074	4.9	65.395	4.540	17.240	13.450	100.625	30.899	69.726	0.000	2
2014	N.MARIAN	Pagan	4/22/2014	PAG-0249	18.12957	145.8105	23.75	34.424	9.602	29.815	8.757	82.598	16.049	44.399	22.150	20
2014	N.MARIAN	Pagan	4/22/2014	PAG-0332	18.15875	145.8078	15.8	5.552	14.633	20.299	2.362	42.846	8.526	34.320	0.000	20
2014	N.MARIAN	Pagan	4/22/2014	PAG-0295	18.14965	145.8115	21.45	19.555	11.322	16.595	4.150	51.621	16.899	24.003	10.719	9
2014	N.MARIAN	Pagan	4/22/2014	PAG-0246	18.14379	145.8117	23.1	13.126	11.453	12.547	11.967	49.094	22.326	26.768	0.000	30
2014	N.MARIAN	Pagan	4/22/2014	PAG-0352	18.1315	145.8107	15.9	40.023	9.432	55.917	16.418	121.790	30.436	46.866	44.488	9

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	N.MARIAN	Pagan	4/22/2014	PAG-0360	18.12003	145.8048	14.35	21.865	5.470	100.884	5.710	133.928	15.520	33.145	85.264	12.5
2014	N.MARIAN	Pagan	4/22/2014	PAG-0291	18.10391	145.8013	29.1	15.796	10.036	51.522	48.374	125.727	15.627	84.001	26.099	3
2014	N.MARIAN	Pagan	4/23/2014	PAG-0404	18.16956	145.7931	27.5	29.895	29.199	44.234	3.694	107.022	11.986	39.248	55.787	5
2014	N.MARIAN	Pagan	4/23/2014	PAG-0383	18.16849	145.785	5	0.999	1.479	11.142	0.123	13.743	2.608	0.000	11.135	8.5
2014	N.MARIAN	Pagan	4/23/2014	PAG-0361	18.17047	145.7791	8.5	21.541	4.136	22.310	14.511	62.498	12.779	24.887	24.832	20
2014	N.MARIAN	Pagan	4/23/2014	PAG-0369	18.16748	145.7681	14.1	38.152	21.576	22.655	18.089	100.471	43.410	43.206	13.856	15
2014	N.MARIAN	Pagan	4/23/2014	PAG-0366	18.1491	145.7548	11.8	14.841	12.212	1.779	0.664	29.496	16.521	12.974	0.000	1
2014	N.MARIAN	Pagan	4/23/2014	PAG-0405	18.16965	145.7706	21.65	33.497	10.640	21.854	50.000	129.382	31.184	98.198	0.000	25
2014	N.MARIAN	Pagan	4/23/2014	PAG-0406	18.16462	145.7635	22.75	36.695	7.767	6.944	50.000	103.606	27.933	75.673	0.000	5.5
2014	N.MARIAN	Pagan	4/23/2014	PAG-0363	18.13268	145.7594	14.75	13.185	10.710	4.009	14.084	41.989	11.212	30.777	0.000	3
2014	N.MARIAN	AGS	4/19/2014	SAR-0125	16.69738	145.7712	17.7	12.846	3.117	10.014	3.858	29.835	13.422	16.413	0.000	12.5
2014	N.MARIAN	AGS	4/19/2014	SAR-0137	16.7039	145.766	12.65	29.154	19.757	12.189	1.406	62.506	34.545	27.962	0.000	9.5
2014	N.MARIAN	AGS	4/19/2014	SAR-0140	16.7141	145.7741	5.75	33.740	8.273	17.519	0.330	59.863	19.313	40.550	0.000	3.5
2014	N.MARIAN	AGS	4/19/2014	SAR-0124	16.71876	145.7812	25	15.545	5.872	10.246	11.082	42.745	11.634	31.112	0.000	8
2014	N.MARIAN	AGS	4/19/2014	SAR-0122	16.70211	145.7907	22.35	25.492	18.591	13.666	6.153	63.902	16.497	47.405	0.000	3.5
2014	N.MARIAN	AGS	4/19/2014	SAR-0133	16.69215	145.7767	11.35	32.264	40.000	10.547	16.786	109.922	42.443	67.479	0.000	4
2014	N.MARIAN	AGS	4/19/2014	SAR-0129	16.7114	145.7677	21.4	11.526	3.209	11.570	1.168	27.473	8.373	19.099	0.000	12.5
2014	N.MARIAN	AGS	4/19/2014	SAR-0142	16.71556	145.783	6	49.645	8.219	5.737	2.155	65.756	14.202	40.000	11.554	2
2014	N.MARIAN	AGS	4/19/2014	SAR-0111	16.70897	145.7891	21.1	11.118	1.388	19.801	3.657	35.964	11.238	24.726	0.000	6.5
2014	N.MARIAN	AGS	4/19/2014	SAR-0149	16.69494	145.7877	11	22.435	5.908	30.539	4.735	63.617	6.461	43.463	13.693	6.5

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	N.MARIAN	AGS	4/19/2014	SAR-0126	16.69672	145.7885	21.65	11.656	5.832	33.105	0.541	51.134	11.809	11.939	27.386	7.5
2014	N.MARIAN	AGS	5/2/2014	ALA-0101	17.57946	145.823	21.85	34.223	18.918	21.150	10.305	84.597	28.310	47.691	8.596	12.5
2014	N.MARIAN	AGS	5/2/2014	ALA-0129	17.6021	145.8141	3.3	29.798	10.752	14.071	8.023	62.643	18.436	38.891	5.317	1
2014	N.MARIAN	AGS	5/2/2014	ALA-0104	17.62112	145.8364	16.2	41.427	14.220	11.480	48.564	115.691	45.000	69.222	0.000	10
2014	N.MARIAN	AGS	5/2/2014	ALA-0142	17.58471	145.8435	6.15	19.425	4.792	33.421	1.401	59.039	14.531	17.601	26.907	10
2014	N.MARIAN	AGS	5/2/2014	ALA-0116	17.58364	145.8217	9.65	18.140	3.661	5.360	1.376	28.538	7.766	20.772	0.000	5
2014	N.MARIAN	AGS	5/2/2014	ALA-0096	17.59192	145.8137	20	22.642	40.000	19.023	50.000	154.054	45.000	53.611	0.000	25
2014	N.MARIAN	AGS	5/2/2014	ALA-0112	17.61451	145.8198	8.95	31.324	12.751	23.631	4.110	71.816	37.641	19.694	14.482	7.5
2014	N.MARIAN	AGS	5/2/2014	ALA-0139	17.60799	145.8497	10.65	12.564	2.222	42.723	1.205	58.715	15.124	24.063	19.527	15
2014	N.MARIAN	AGS	5/2/2014	ALA-0111	17.57908	145.8352	9.85	40.942	13.800	58.622	50.000	204.863	45.000	79.829	44.311	3
2014	N.MARIAN	AGS	5/2/2014	ALA-0130	17.58607	145.8217	5.1	20.554	5.301	6.371	0.005	32.232	18.833	13.399	0.000	2
2014	N.MARIAN	AGS	5/2/2014	ALA-0140	17.60516	145.8516	23.8	6.666	2.678	10.147	3.930	23.421	11.030	12.391	0.000	15
2014	N.MARIAN	AGS	5/6/2014	GUG-0152	17.29727	145.8365	20.1	9.012	2.159	350.000	8.883	450.000	16.391	110.000	350.000	14
2014	N.MARIAN	AGS	5/6/2014	GUG-0132	17.31756	145.8327	8.55	24.915	8.041	11.649	9.320	53.925	23.907	30.018	0.000	2
2014	N.MARIAN	AGS	5/6/2014	GUG-0157	17.3226	145.8398	24.3	12.054	6.190	10.006	8.831	37.080	20.810	16.271	0.000	26
2014	N.MARIAN	AGS	5/6/2014	GUG-0147	17.31372	145.8505	22.05	12.449	11.460	26.943	4.954	55.805	16.383	27.714	11.708	7.5
2014	N.MARIAN	AGS	5/6/2014	GUG-0127	17.30238	145.8504	12.35	27.138	11.578	22.410	7.646	68.772	28.041	40.730	0.000	4
2014	N.MARIAN	AGS	5/6/2014	GUG-0112	17.29809	145.8396	3.45	29.389	4.029	3.466	0.006	36.889	12.419	24.470	0.000	1.5
2014	N.MARIAN	AGS	5/6/2014	GUG-0137	17.30458	145.8307	22.35	15.908	3.504	116.421	50.000	256.257	45.000	17.888	154.998	20
2014	N.MARIAN	AGS	5/6/2014	GUG-0154	17.31093	145.8315	5.45	33.201	10.667	18.522	0.656	63.046	30.284	32.761	0.000	1.5

Year	Region	Island	Date	Site	Latitude	Longitude	Depth (m)	Fish biomass (g m ⁻²)								Benthos
								Pri. consumer	Sec. consumer	Piscivores	Planktivores	All fishes	0-20 cm TL	20-50 cm TL	>50 cm TL	Hard coral (%)
2014	N.MARIAN	AGS	5/6/2014	GUG-0122	17.32007	145.8467	15.05	26.988	8.729	19.383	13.759	68.860	30.187	30.458	8.215	10
2014	N.MARIAN	AGS	5/6/2014	GUG-0130	17.29507	145.8462	13.8	20.820	4.223	6.277	0.878	32.199	13.583	18.616	0.000	12.5
2014	N.MARIAN	AGS	5/6/2014	GUG-0140	17.29941	145.8506	22.7	17.936	3.577	6.670	3.891	32.075	18.312	13.763	0.000	27.5

Contact us

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