Site Summaries

RATIONALE

The purpose of this section is to provide a more comprehensive survey of TCRMP site characteristics than can be achieved in the overall data compilations. Each TCRMP monitoring site is each unique and has experienced unique responses to local and global stressors. Given the increase in sites included under this program and the inclusion of more information at each site, such as physical data, this section is designed to provide a summary that highlights the each site's characteristics and serves as a quick reference guide for managers, policy makers, and academics. The duration of surveys at most sites also now provides sufficient data from which to draw conclusions about longer term site dynamics and the processes that might be contributing to recent trajectories of health, development, and degradation.

SITE SUMMMARY ELEMENTS

TCRMP site information is presented in six pages that provide a brief description of the setting and the potential susceptibility to local and global stressors and disturbances. Sub-sections include a description of (1) the physical environment, (2) the benthic community and (3) the fish community. The benthic data and coral health are updated in each annual report, whereas the fish summaries and physical data are updated periodically.

Benthic community structure is presented as the mean (±SE) cover of coral, macroalgae, cyanobacteria, and epilithic algae. Epilithic algal communities are diminutive turf and filamentous algae that cover hardbottom surfaces, whilst macroalgae have identifiable thallus differentiation and structure. Any open hardbottom space is assumed to host an epilithic algal community even if algae cannot be resolved in video images. The loss of coral cover due to the 2005 bleaching event was calculated as the relative change in coral cover from 2005 to 2007, unless otherwise noted for sites not sampled in these years. In addition, the percent recovery from the 2005 bleaching event was calculated as the amount of coral cover regained by 2011 ($Cover_{2011}$ - $Cover_{2007}$)/($Cover_{2005}$- $Cover_{2007}$). Change calculations must be treated with caution for sites where transects where not made

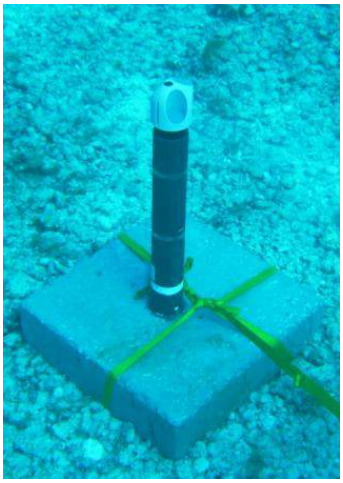
permanent until after the 2005 bleaching event or where percent cover is low, since the conditions introduce an unknown amount of error.

Benthic community pie charts were constructed from all years of data. The sessile epibenthic animal community includes *Agaricia* spp., *Colpophyllia natans*, *Diploria strigosa*, *Orbicella*[1] spp. (*O. faveolata*, *O. fransksi*, + unidentified *Orbicella* spp.), *Orbicella annularis*, *Montastraea cavernosa*, *Porites astreoides*, branching *Porites* species, *Siderastrea siderea*, other corals, sponges, gorgonians. The algae/non-living substrata category includes cyanobacteria, epilithic algae ("DCA"), *Lobophora variegata*, *Dictyota* spp., *Halimeda* spp. crustose coralline algae, and sand/sediment.

Coral Health is presented as the mean (±SE) of coral bleaching prevalence (proportion of population affected) and extent (proportion of colony affected), disease prevalence, and partial mortality prevalence.

PHYSICAL CHARACTERISTICS.

Temperature. Benthic temperatures were recorded at each site with a HoboTemp™ thermistor data logger (Onset Computer Corporation, Bourne, Massachusetts). Thermistors were affixed within transects and set to record at intervals of 15 minutes. Records are presented as daily averages across months, February 29th excluded. Each temperature figure includes the climatological monthly maximum mean temperature (28.5°C), and the bleaching threshold temperature (29.5°C) established for the region (NOAA 2006). Data for 2005 was taken from current profilers or federal data sources.



Currents. Water currents were recorded at a subset of sites and

[1] The genus *Orbicella* was formerly named *Montastraea*, but changed in 2012 reflecting an earlier precedence and dissimilarity with *Montastraea cavernosa* (Budd et al. 2012). Some figures in this report may still abbreviate the genus name as "*M.*"

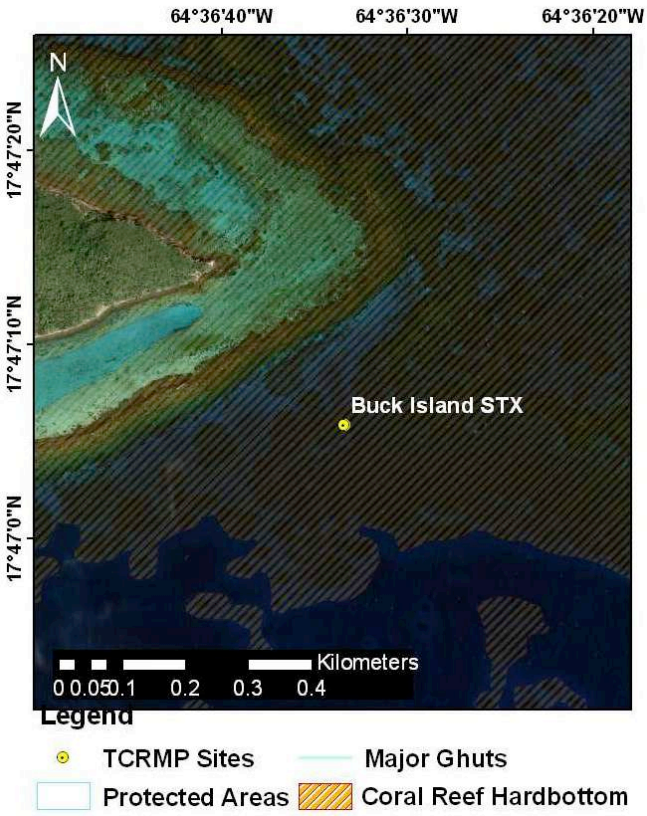
times with Nortek Aquadopp™ Acoustic Doppler Current Profilers (ADCPs). Profilers were set in bases on the seafloor and set to record current speed and direction within predefined depth bins above the substrate. The bin closest to the substrate and closest to the coral reef was selected for display. Compass rose figures were developed that show the frequency of current in magnetic directions 0, 22.5, 45, 67.5, 90, 112.5, 135, 157.5, 180, 202.5, 225, 247.5, 270, 292.5, 315, 337.5, 360°. Within each direction the frequency of current speed within bins of 0.1 m s^{-1} were plotted. For Flat Cay, current data was retrieved with an Aandaraa 2-D current meter that measured current speed and direction directly over the sensor head.

Chlorophyll and Turbidity. Continuous fluorometric measurements of chlorophyll and turbidity were conducted at some sites for short periods (Black Point, Grammanik, Magens Bay). Wetlabs ECOFLNT fluorometers with antifouling bio-wipers were deployed and set to record for one minute at hourly intervals. Water column chlorophyll measurements detect phytoplankton abundance. Fluorometric measurements of chlorophyll are proxies for true chlorophyll concentrations. Direct chlorophyll measurements to calibrate fluorometric measurements have not been conducted at the monitoring sites.

St. Croix

BUCK ISLAND, ST. CROIX

Description. The Buck Island, St. Croix site is seaward extension of the southeast Buck Island barrier reef complex in water depth of 15 m. The reef is a low framework surrounded by a sand plain to the west and a rolling reef/hardbottom to the east. The Buck Island, St. Croix site is largely composed of large living and dead *O. annularis* heads surrounded by sand. The site has been monitored since 2001, with three permanent benthic transects installed in 2001, and three additional transects installed in 2003.



Outstanding Feature. The Buck Island, St. Croix site is within the expanded (2001) Buck Island Reef National Monument. The reef fish populations may show recovery due to the restriction of fishing.

Threats. Due to its protected area status and remoteness from land-based pollution Buck Island, St. Croix is primarily threatened by changing climate as its populations of *O. annularis* were shown to be susceptible during the 2005 bleaching event.

Figure 15. The Buck Island, St. Croix. (top) Position in the Buck Island Reef National Monument. (right)A representative photo.

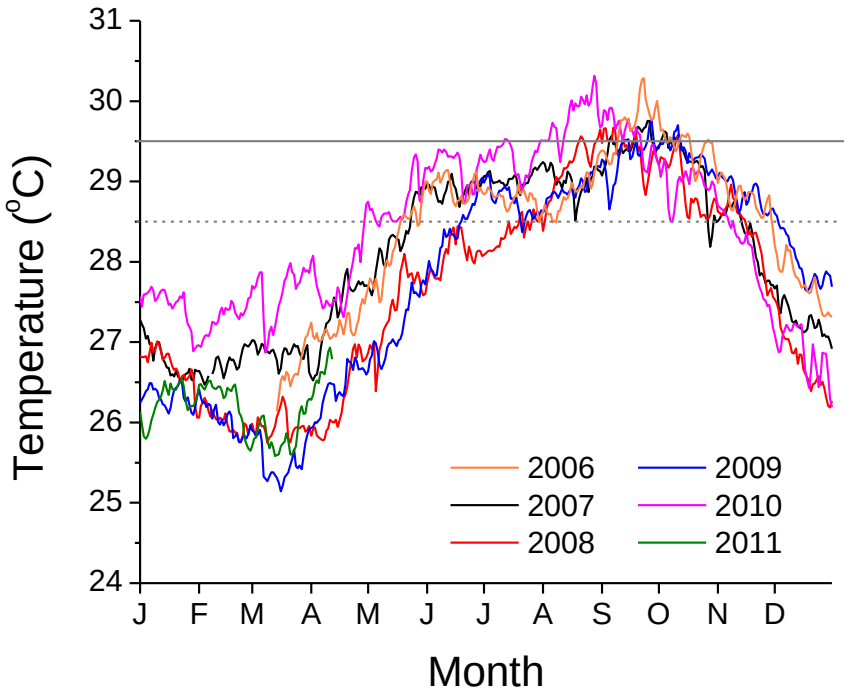


Figure 16. Buck Island, St. Croix benthic temperatures (14 m depth). Data provided by the National Park Service (site BUIS_SFR).

Physical Characteristics

Current. Currents have not been recorded at the Buck Island, St. Croix monitoring site. Unidirectional currents have always been light during monitoring. Oscillatory currents occasionally impact the site when swell is from the east.

Temperature. Temperatures at the Buck Island, St. Croix monitoring sites can get very warm and surpassed the bleaching threshold significantly in 2006 and 2010. There were no site records for the 2005 bleaching event.

Benthic Community. The Buck Island, St. Croix hard coral community is dominated by the boulder star coral *Orbicella annularis*; however, the most abundant sessile epibenthic animals are gorgonians. Epilithic algae dominate the algal community, with a low cover of macroalgae relative to other sites. There is a high proportion of sand.

This coral community lost 65.5% of its coral cover in the 2005 bleaching event and had only regained 6% of coral cover by 2012. Filamentous cyanobacteria showed very large increases in cover after the 2005 bleaching event.

Coral Health. Buck Island, St. Croix corals were likely severely affected during the 2005 bleaching event; however, bleaching health surveys were not completed until Jan. 13, 2006 when recovery had already commenced. Bleaching surveys were not conducted during the 2010 bleaching event. The prevalence of coral diseases was high on *O. annularis*, with frequent incidence of yellow band disease and white disease following the 2005 bleaching event. Old partial mortality was very prevalent after the 2005 coral bleaching event and then decreased to 2011.

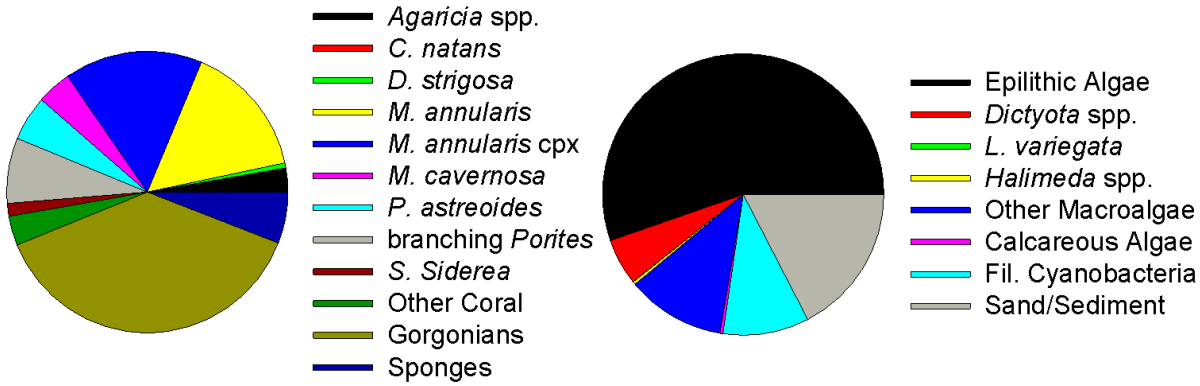


Figure 17. Buck Island, St. Croix. (left) Relative composition of the sessile epibenthic animal community. (right) Relative composition of the algal community and unconsolidated sediment.

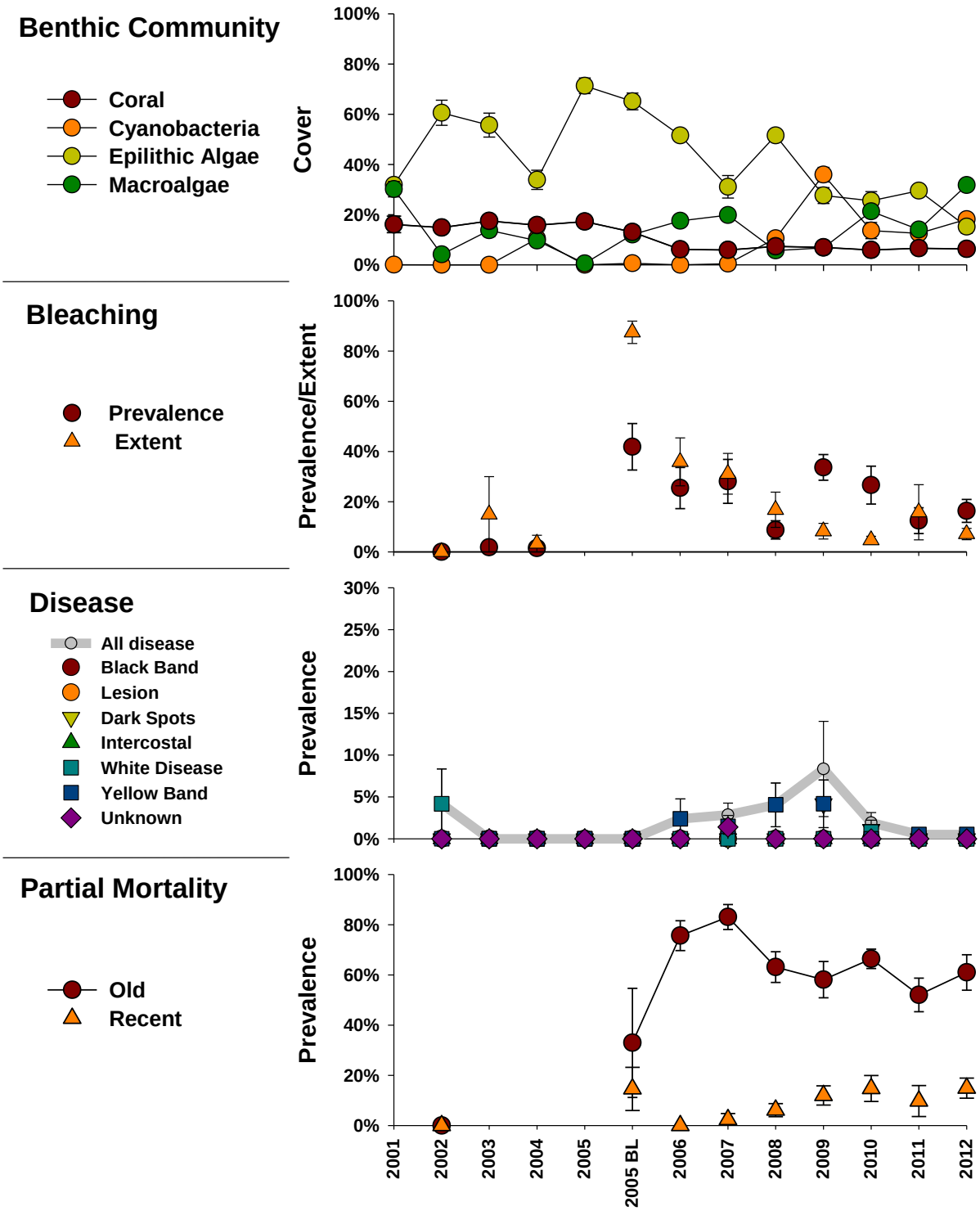


Figure 18. Buck Island, St. Croix benthic cover and coral health through time (mean ±SE).

Fish Community. Buck Island is a low patchy reef community surrounded by and interspersed with sand. The fish community is largely dominated in biomass by herbivores with a very high biomass of stoplight parrotfish. Close to the monitoring site are "the Haystacks", large *Acropora palmata* skeletal remains that provide amble grazing areas for the large parrotfish. In addition, the Buck Island site is within the National Monument and the fish inhabitants are theoretically protected from spearfishing and nets. There is also a high biomass of invertivore fishes, which are dominated by the yellowhead wrasse. Invertivores are diverse on the site and include several species of grunts (tomtate, French, Spanish, white and bluestripe) as well as many wrasses (yellowhead, bluehead, clown, yellowcheek, slippery dick and creole wrasse). Piscivores are uncommon, and the only groupers observed there are small red hind and graysby. Snapper are also limited and in 2012 only schoolmaster and one mahogany snapper were seen.

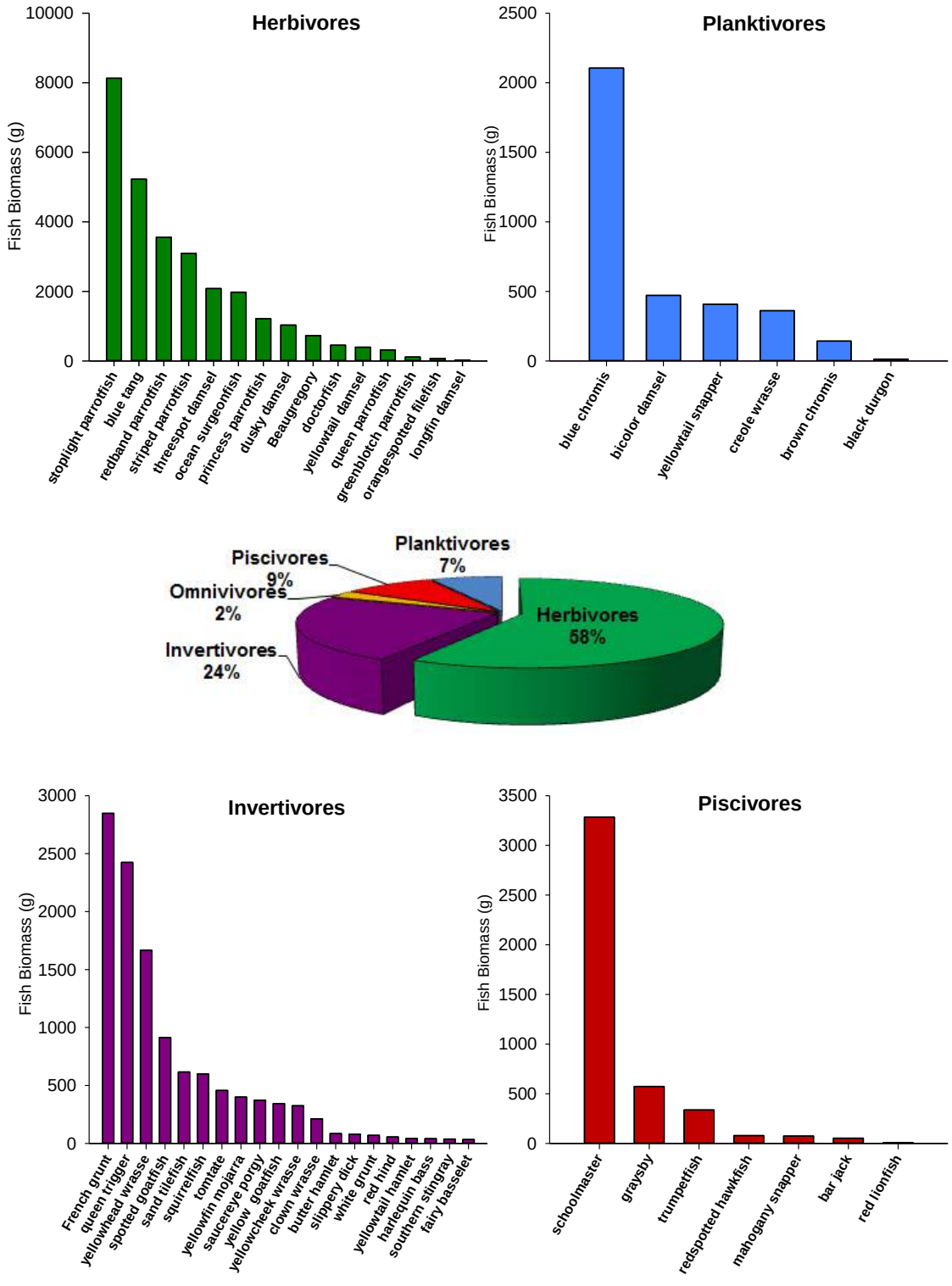
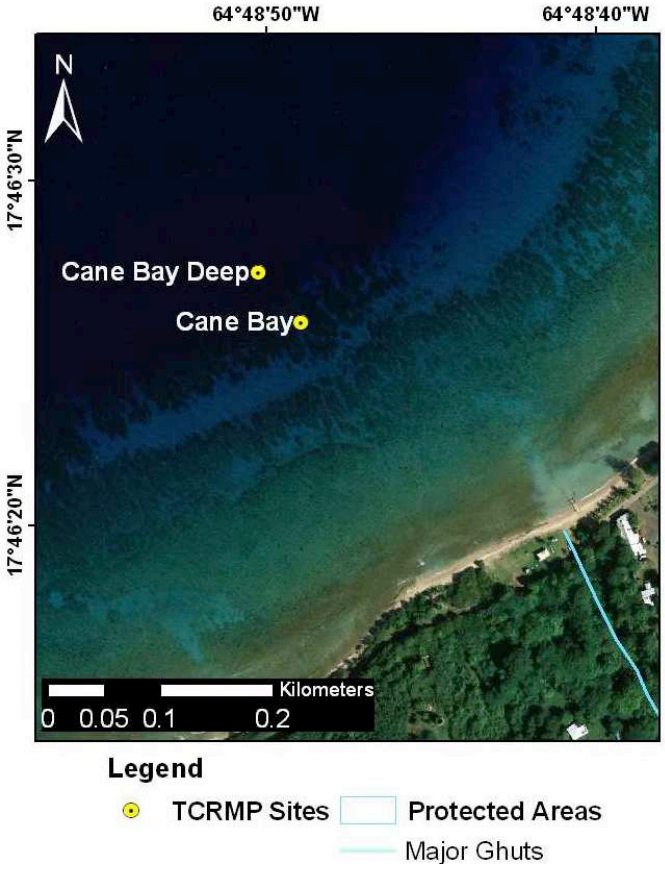


Figure 19. The Buck Island, St. Croix fish community by absolute and relative biomass.

CANE BAY

Description. The Cane Bay monitoring site is a nearshore/shelf edge fringing reef on the northwest coast of St. Croix. Transects follow the trend of the leeward spur and groove formations. Cane Bay has been monitored since 2001.



Outstanding Feature. Cane Bay is one of the most well developed nearshore reefs on St. Croix. It is also one of the most heavily visited dive sites by both tourists and residents in the Virgin Islands due to its proximity to the wall, considered by some to be the most precipitous submarine drop off in the world. The reef has been under scientific investigation since the 1970's.

Threats. Although the Cane Bay reef is a singular treasure for the Virgin Islands, it is threatened by pollution, fishing, climate change, and recreational overuse. The watershed above Cane Bay has been planned for residential development with potential for the influx of terrestrial sediment. The reef is also fished commercially, and teams of spearfishers on SCUBA have been observed. This reef also lost half its coral cover in the 2005 bleaching event, suggesting it is vulnerable to warming ocean temperatures.

Figure 20. Cane Bay. (top) Location. (right) A representative photo of the reef.

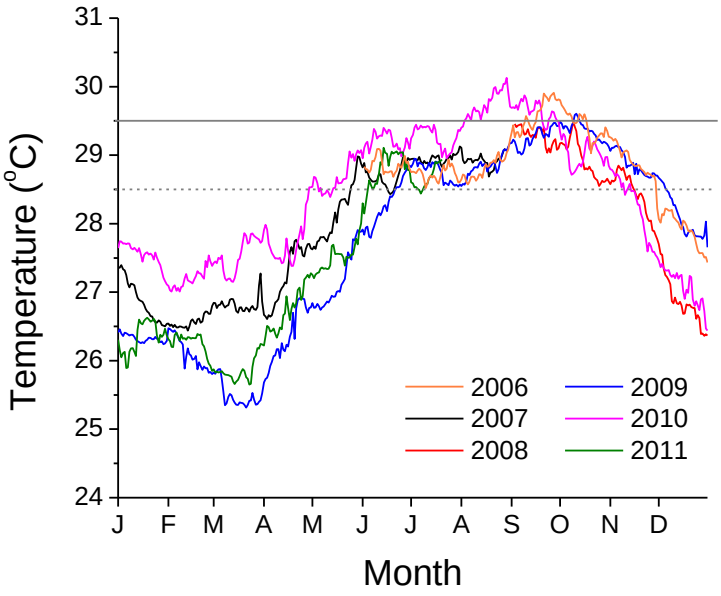


Figure 21. Cane Bay benthic temperatures (8 m depth)

Physical Characteristics

Current. Cane Bay currents have not been directly measured by the TCRMP. However, this site typically has moderate unidirectional currents with the occasional exposure to strong north swell. The current at the site may be part of an eddy formed by the dominant westward flowing current wrapping around the eastern point. Its downstream location from the entire north coast of St Croix may also make this site a recruitment sink for larvae, potentially adding to the diversity.

Temperature. Cane Bay is a relatively open and clear environment, and the temperatures tend to stay cooler, but the propensity for bleaching may be increased by the high light transmission.

Benthic Community. Cane Bay supports a very diverse coral community, with dominance by the *Orbicella* spp.. Open substrates were mostly epilithic algal community; however, epilithic algae cover has declined since the 2005 bleaching event with increases in the cover of macroalgae and filamentous cyanobacteria. This indicates that the resident herbivore community was not able to effectively graze substrates opened by coral mortality. This coral community lost 46.8% of its coral cover in the 2005 bleaching event and lost 6% more as of 2011, a troubling sign.

Coral Health. Cane Bay corals were severely affected during the 2005 bleaching event with nearly all colonies bleached over 80% of the colony surface. The prevalence of bleaching was also high in 2010, yet at a low extent. The prevalence of coral diseases was low before 2005, but outbreaks of white, yellow band, and dark spots disease have occurred more recently, another indication of declining health at this reef. Old and recent partial mortality became very prevalent after the 2005 coral bleaching event and have remained nearly steady or increased since.

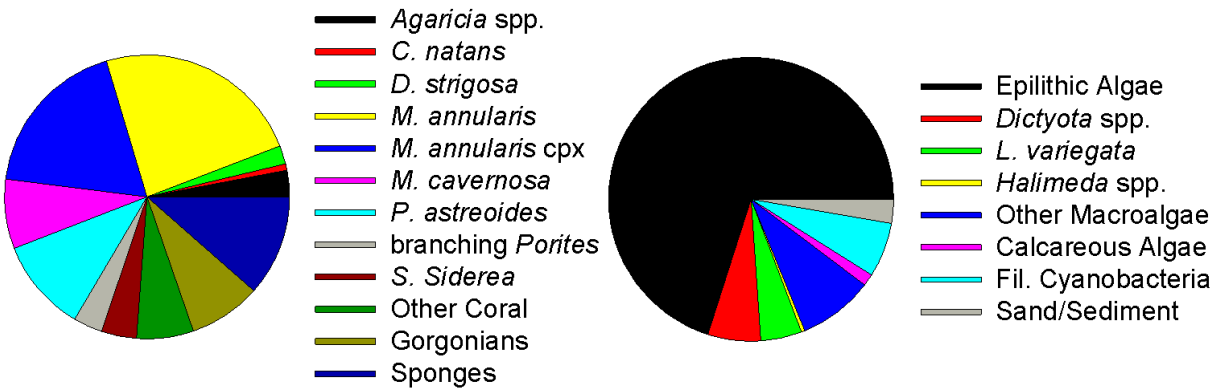


Figure 22. Cane Bay. (left) Relative composition of the sessile epibenthic animal community. (right) Relative composition of the algal community and unconsolidated sediment.

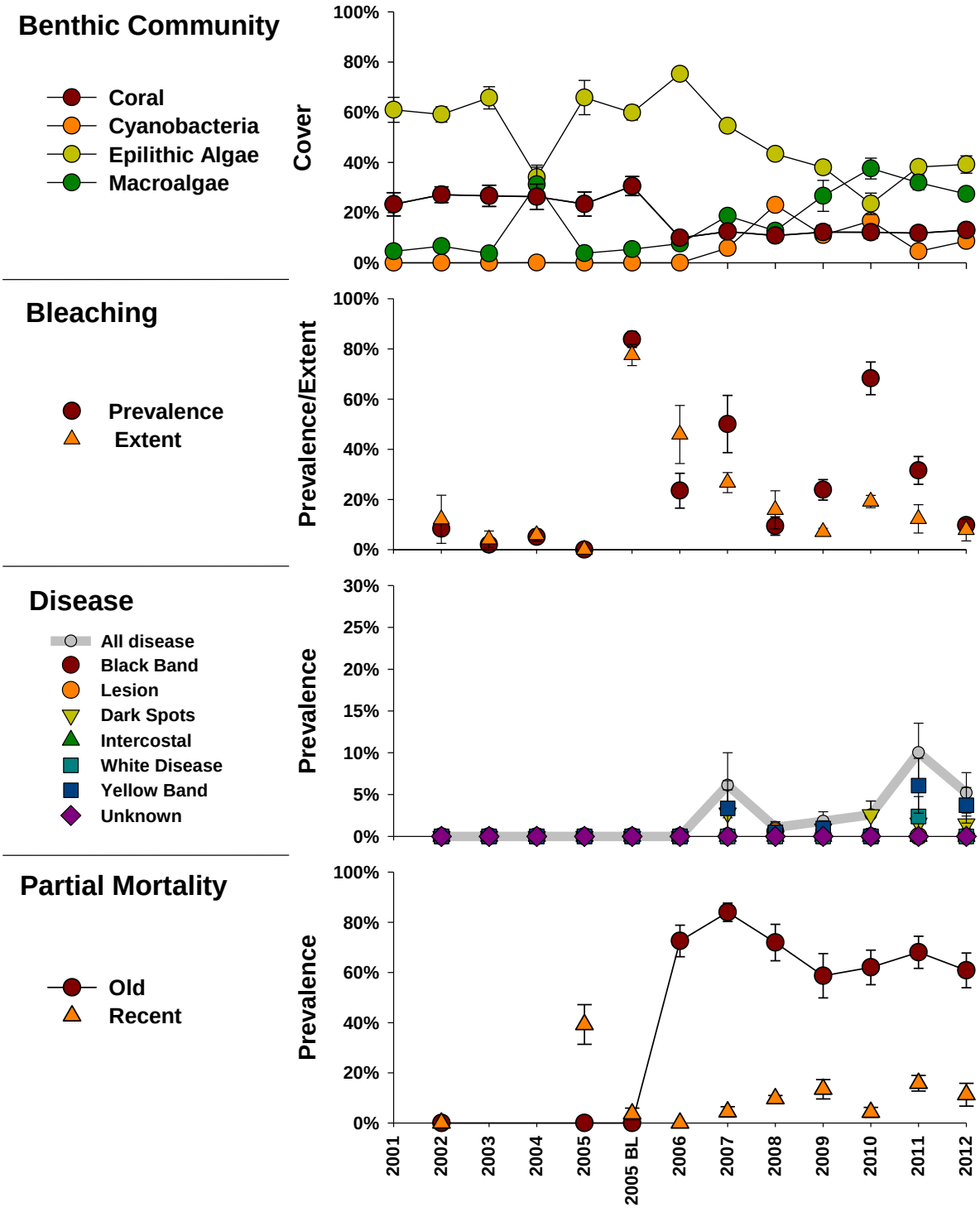


Figure 23. Cane Bay benthic cover and coral health through time (mean ±SE).

Fish Community. Cane Bay has a high diversity, abundance and biomass of fish, reflecting the benthic diversity and high coral cover of the site. The most dominant fish species in terms of both abundance and biomass is the creole wrasse, a zooplankton feeder. Also very common are other planktivorous fishes: the black durgeon, yellowtail snapper, and blue and brown chromis. Several large parrotfishes can regularly be observed on the Cane Bay site, including adult queen and stoplight parrotfish. A variety of other herbivores are common, especially princess parrotfish, redband parrotfish, and blue tang. Mahogany snapper and graysby dominated the piscivore group in 2012. Other than these, no snapper or grouper were observed on the Cane Bay reef. Nonetheless the site has a high diversity of fish, with several butterflyfish and squirrelfish species present, as well as some deeper water species (sunshinefish, longsnout butterflyfish and fairy basslet) due to the site's close proximity to the deep wall drop.

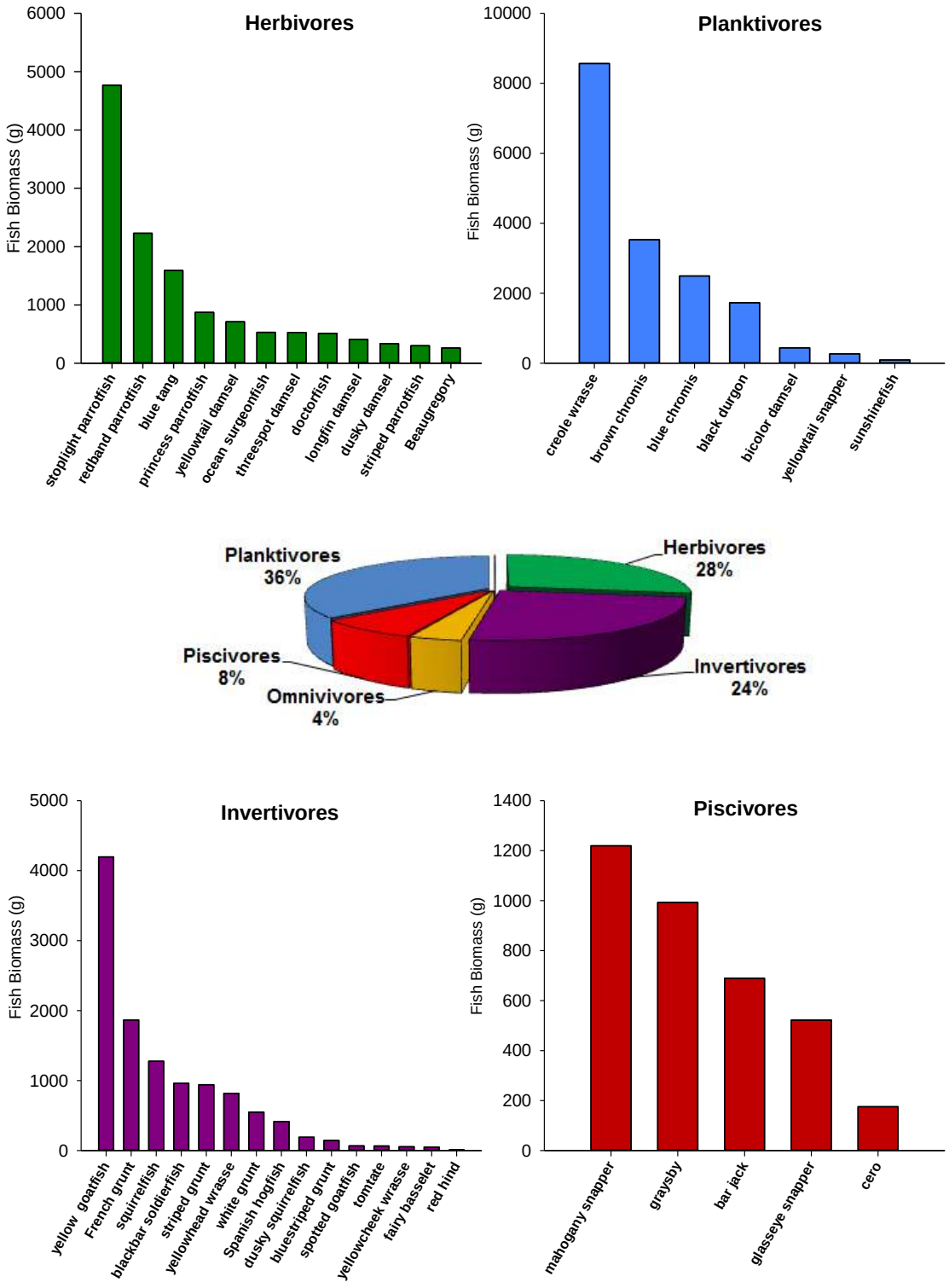
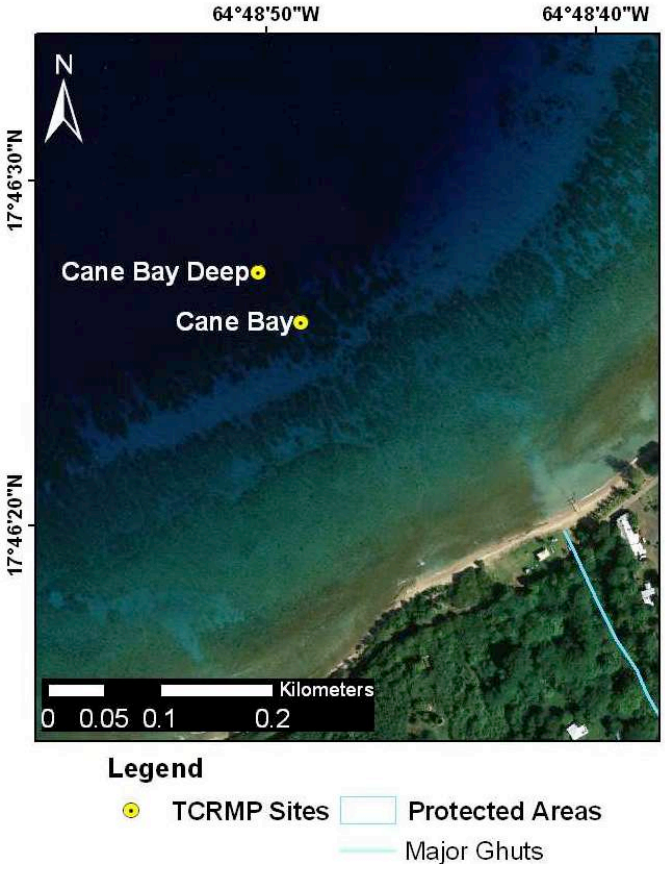


Figure 24. The Cane Bay fish community by absolute and relative biomass.

CANE BAY DEEP

Description. The Cane Bay Deep monitoring site is a mesophotic wall coral reef environment just downslope from the Cane Bay site. The reef is composed of deep spurs of coral interspersed with sediment. Cane Bay Deep was first surveyed during the 2005 coral bleaching event, but a permanent monitoring site was not established until 2009.



Outstanding Feature. Cane Bay Deep is one of the most impressive wall environments in the Caribbean and is the crown jewel for St. Croix dive tourism and biodiversity.

Threats. Although Cane Bay is economically important via dive tourism, it is under no special protection. Cane Bay Deep is threatened by sediment, fishing, climate change, and recreational overuse. Sediment cascades down for the shallow reef. Fishing occurs even at the deep reef and this is shown by the presence of lost gear (monofilament and trap lines).

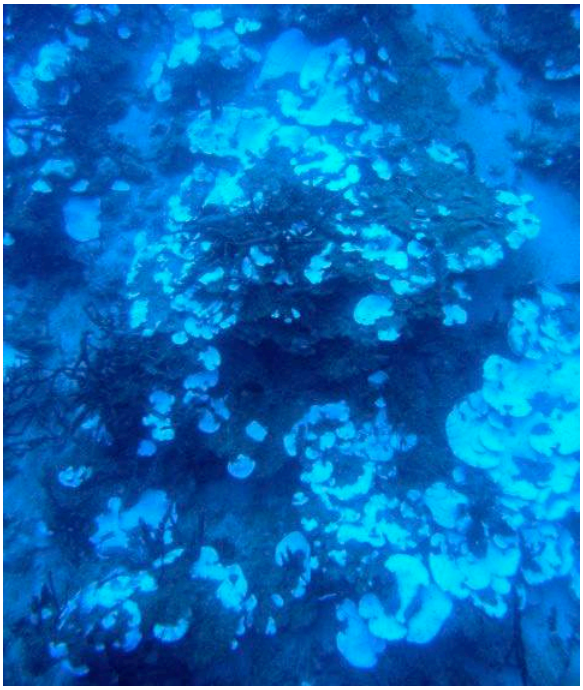


Figure 25. Cane Bay Deep. (top) Location. (right) A representative photo of the reef during the 2005 bleaching event. Bleached colonies are 0.5 – 3 m wide.

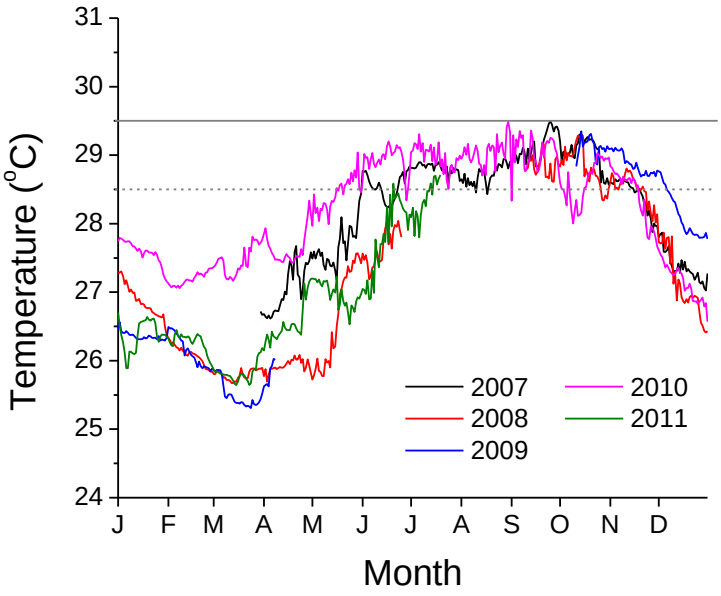


Figure 26. Cane Bay Deep temperature (39 m depth).

Physical Characteristics

Current. Cane Bay deep is a calm wall environment that is buffered from water motion. However, it does receive sediment cascades from particles resuspended from the upper reef terrace. These flows are directed in the depressions between spurs.

Temperature. Cane Bay Deep temperatures are buffered in the warmest months by the presence of the thermocline. However, internal tide activity at this site is not as strong in deep (~40 m) sites on the south shelf of St. Thomas, leading to less diurnal variability in temperatures. This may make the mesophotic wall environments more susceptible to bleaching than other mesophotic sites on the southern Puerto Rican shelf.

Benthic Community. Cane Bay deep is a mesophotic plating coral community dominated by lettuce corals (*Agaricia* spp.), sponges, gorgonians, and black coral. The algal community is mostly epilithic algae, but there are also quantities of *Dictyota* spp. and *Lobophora variegata*. A high proportion of the substrate is soft sediment that flows from the upper shelf to deposit in grooves. Benthic cover was not measured until 2009.

Coral Health. Surprisingly for a dim and cooler mesophotic reef, Cane Bay Deep corals bleached heavily in the 2005 coral bleaching event by both prevalence and extent. Low-extent coral bleaching is very prevalent even in years without thermal stress, a likely result of sediment deposition. Unknown diseases and dark spots diseases are prevalent in some years. Old partial mortality increased after 2005, and remained high and steady from 2009-2011.

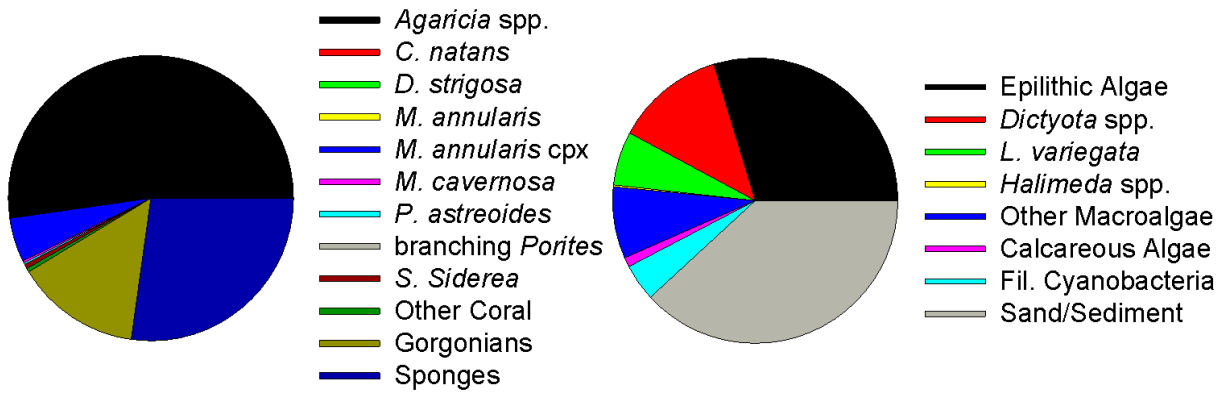


Figure 27. Cane Bay Deep. (left) Relative composition of the sessile epibenthic animal community. (right) Relative composition of the algal community and unconsolidated sediment.

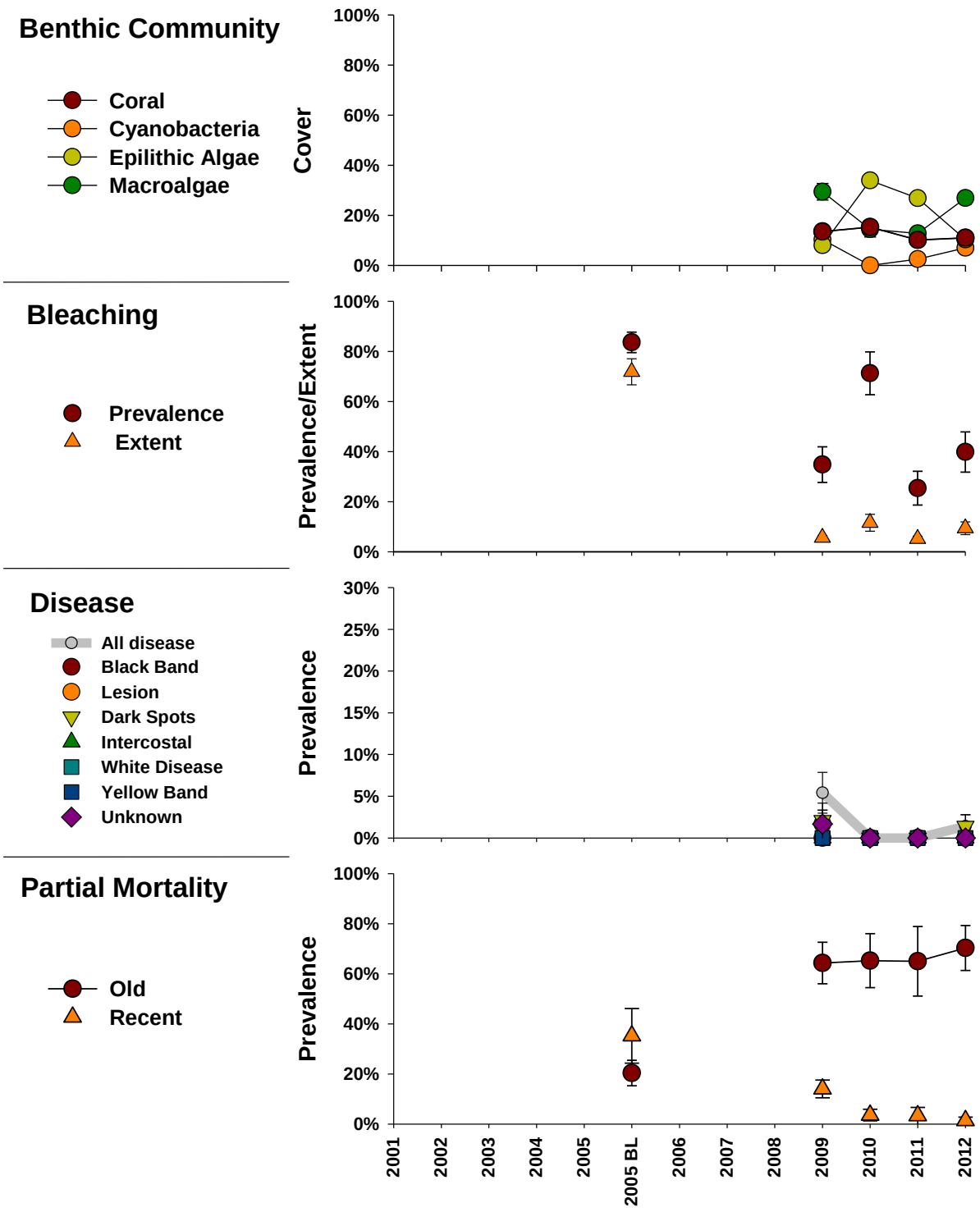


Figure 28. Cane Bay Deep benthic cover and coral health through time (mean ±SE).

Fish Community. Cane Bay Deep has maintained a very low fish biomass over the four year sampling period compared to both other mesophotic sites and shallow and midshelf sites of St. Croix. The site is dominated by invertivores; primarily planktivorous creole wrasse and blue chromis. This planktivorous community is depauperate compared to that of Salt River Deep, the reef wall site slightly east, probably due to less water movement and sediment deposition. Herbivores are primarily benthic feeders: sub-adult princess parrotfish, redband parrotfish, and doctorfish. There is very low piscivorous biomass on the reef, made up in 2012 of very few schoolmaster snapper, mahogany snapper, graysby and barracuda. Deepwater species such as the bantum bass, fairly basslet and sunshine fish are common.

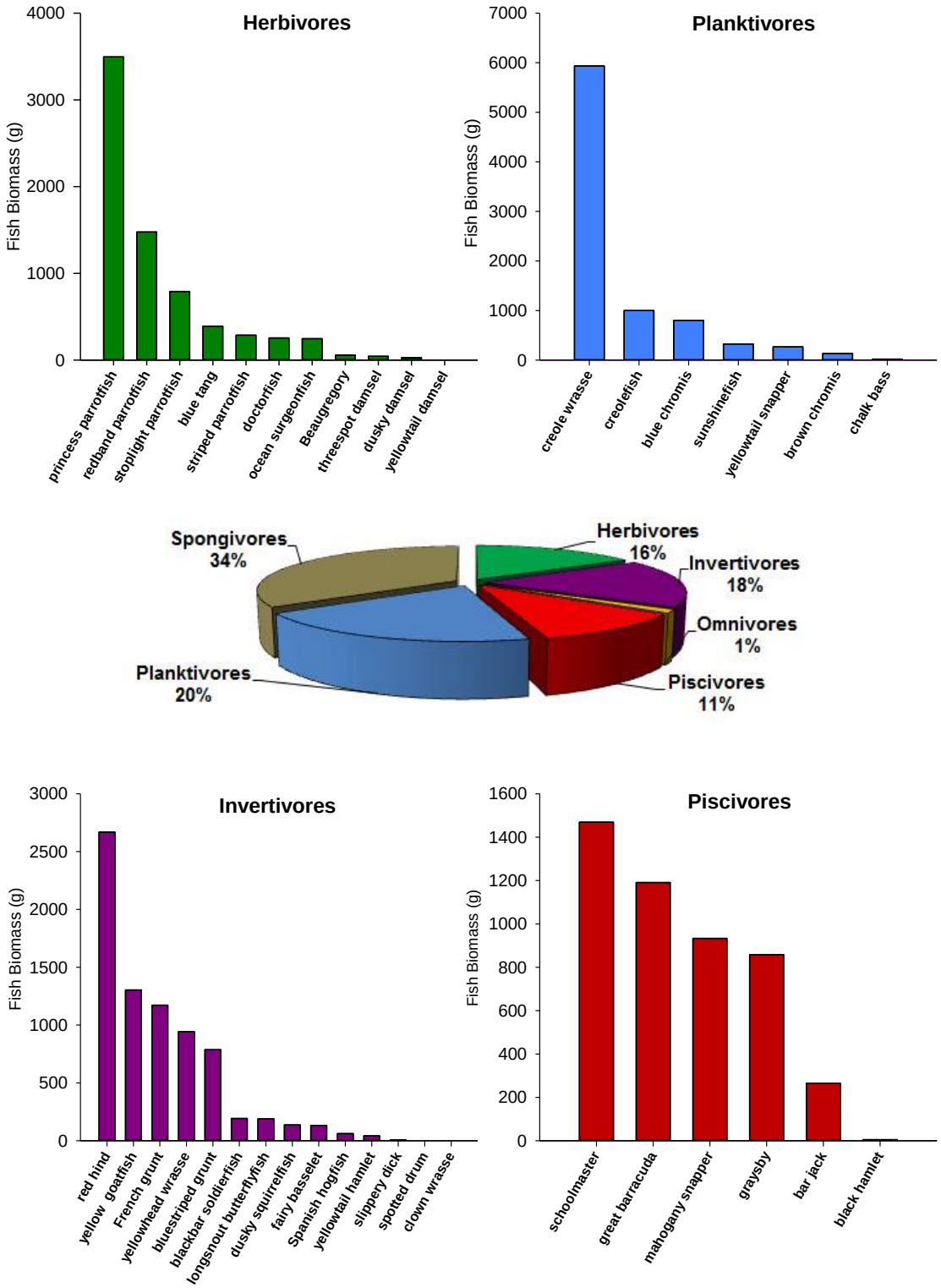
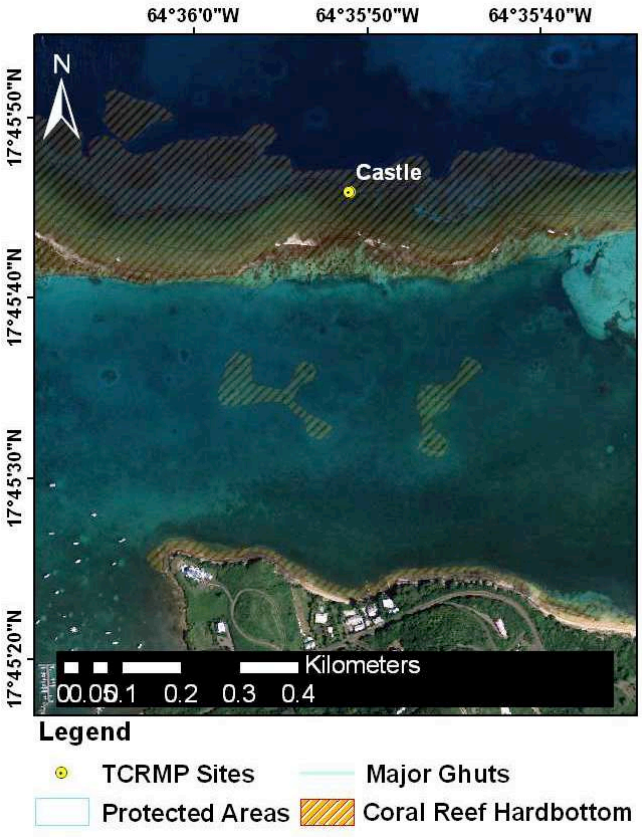


Figure 29. The Cane Bay Deep fish community by absolute and relative biomass.

CASTLE



Description. Castle (aka. West Indies Lab) is part of the seaward northeastern St. Croix barrier reef complex outside Teague Bay. The reef starts at sea level as a relict elkhorn coral reef and is dominated by boulder star corals along the seaward edge. The area around the Castle site was monitored initially in 2003, but permanent transect were not installed. Permanent benthic transects were installed in 2008.

Outstanding Feature. Castle is part of the once luxurious living elkhorn coral barrier reef that protects the northeastern St. Croix shoreline. It was a research area of the former West Indies Laboratory of Farleigh Dickenson University, which was a seminal area for global coral reef research from the 1970's and 1980's.

Threats. The barrier reef outside Teague Bay is inside the St. Croix East End Marine Park, but is in the open fishing zone. There is relatively low potential for land-based sources of pollution due to the sites midshelf location in front of a lightly populated area. Clear water and warm temperatures make this an area of potential concern during bleaching events.

Figure 30. Castle. (top) Location. (right) A representative photo of the reef.

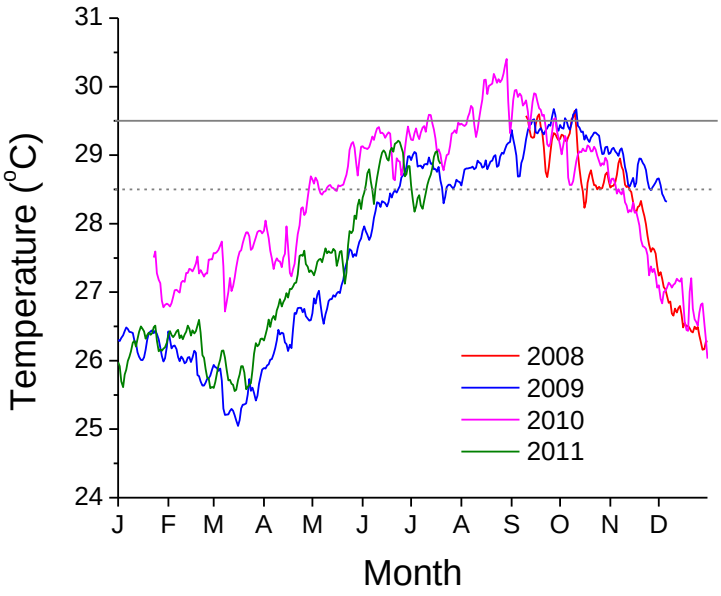


Figure 31. Castle benthic temperatures (9 m depth).

Physical Characteristics

Current. Little is know about the current at the Castle site. It is under the influence of wave-driven oscillatory flow in the shallows, but strong directional currents have not been experienced during monitoring activities.

Temperature. Castle has the potential to develop very warm temperatures and spent nearly a month above the bleaching threshold in 2010.

Benthic Community. The Castle site is unusual or its dominance of branching *Porites* corals along the slope and concentrations of *Orbicella* spp. corals at the outer fringe adjacent to sand. The algal community is dominated by epilithic algae, with lesser abundance of *Dictyota* spp.. Macroalgae and filamentous cyanobacteria are also common. The impacts of the 2005 bleaching event are not known since monitoring in 2003 was not necessarily in exactly the same spot and the site was not monitored in 2005.

Coral Health. Bleaching is mild at the site. Corals were assessed prior to but not during the 2010 coral bleaching event. Old partial mortality is high in prevalence and steady. Recent partial mortality is particularly high at the site, and this may be a consequence of numerous damselfish (*Stegastes* spp.) and predatory snails (*Coralliophila* spp.) on large *Orbicella annularis* spp. colonies.

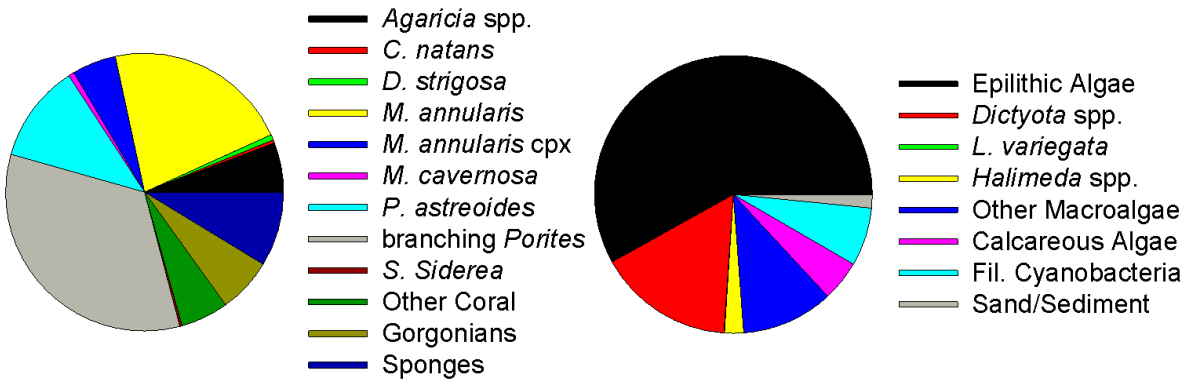


Figure 32. Castle. (left) Relative composition of the sessile epibenthic animal community. (right) Relative composition of the algal community and unconsolidated sediment.

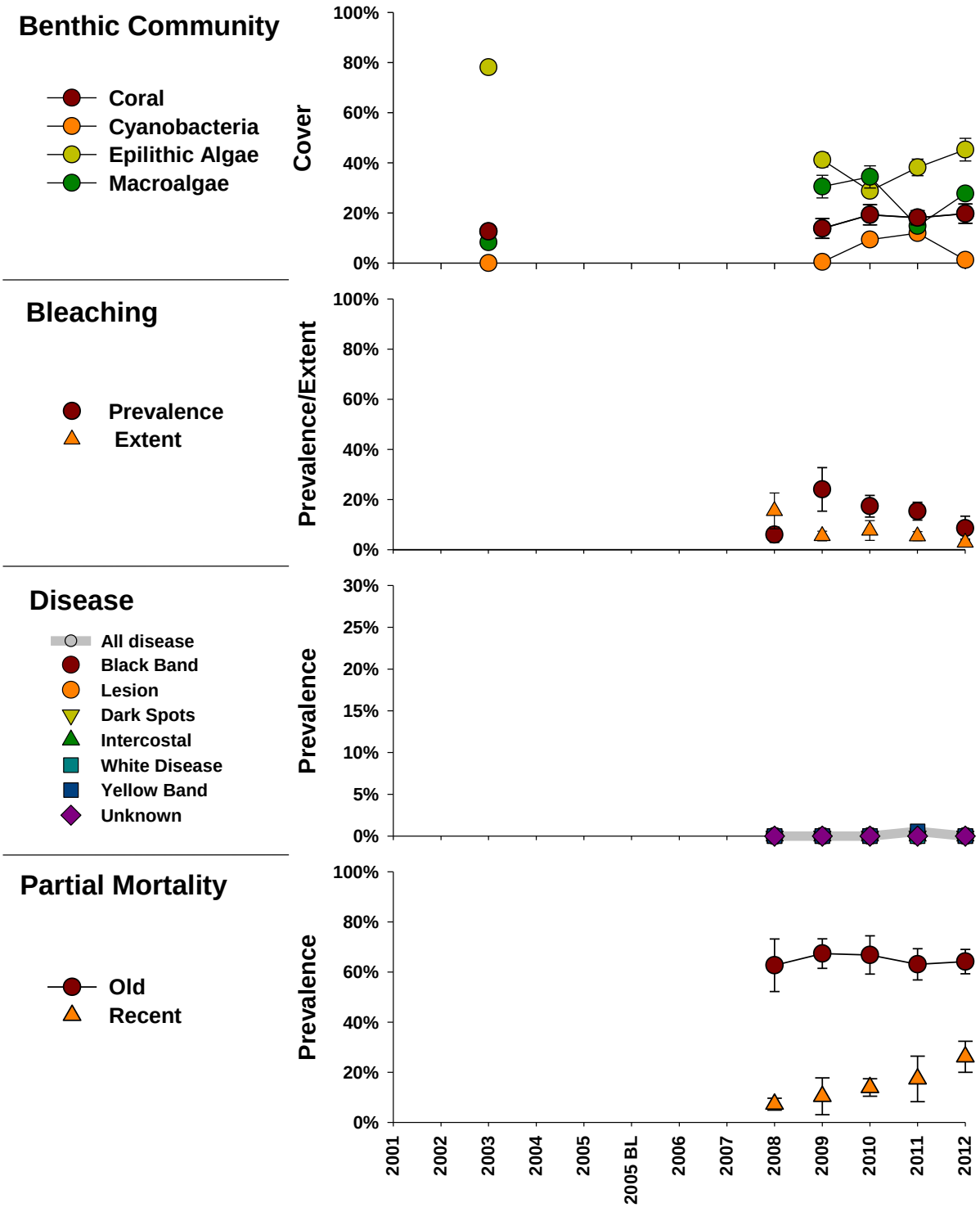


Figure 33. Castle benthic cover and coral health through time (mean ±SE).

Fish Community. The Castle fish community is typically lower in overall abundance and biomass than most of the St. Croix offshore sites. It is dominated by herbivores in biomass, driven by a few large stoplight parrotfish. Sub-adult and juvenile redband, striped and princess parrotfish are however numerically much most common than stoplight. All three Acanthurids (ocean surgeonfish, blue tang and doctorfish) are common, as are many species of damselfish. Invertivores are also fairly high in biomass and are a diverse group; dominated in 2012 by benthic feeders such as yellow and spotted goatfish as well as blackbar soldierfish and squirrelfish. Piscivore biomass in 2012 was heavily dominated by lionfish. A few piscivorous snapper and jacks were observed however no serranids were observed except the black hamlet.

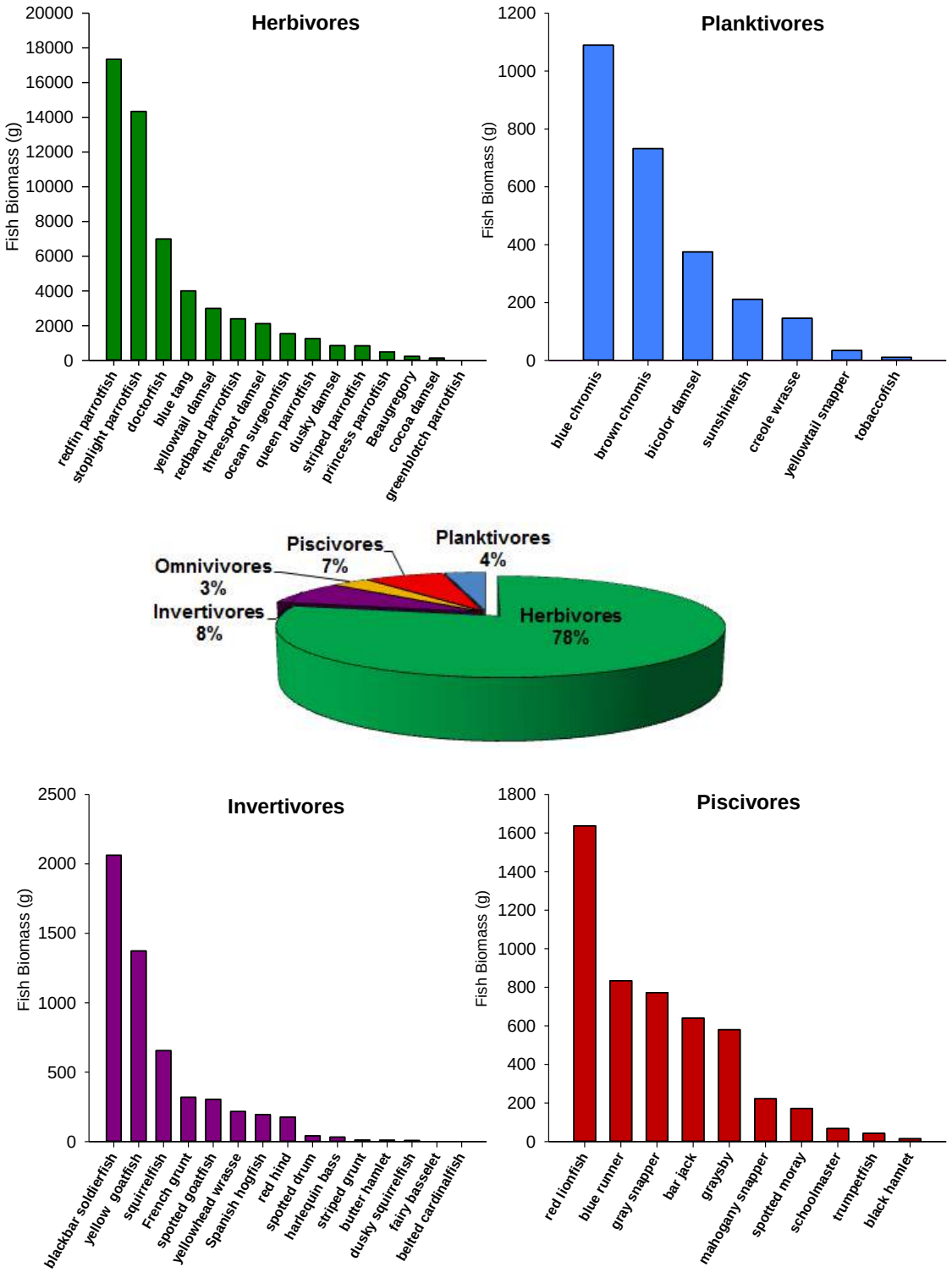
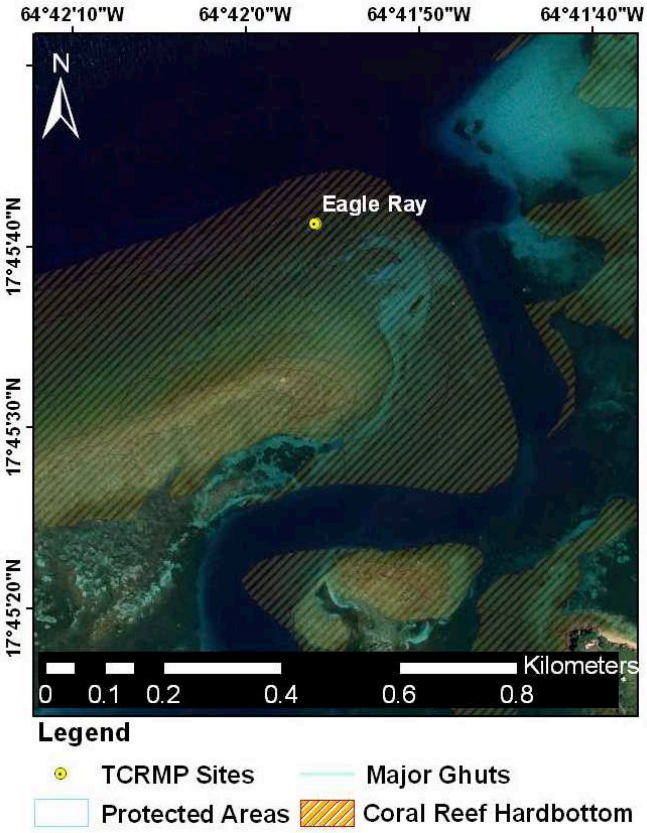


Figure 34. The Castle fish community by absolute and relative biomass.

EAGLE RAY

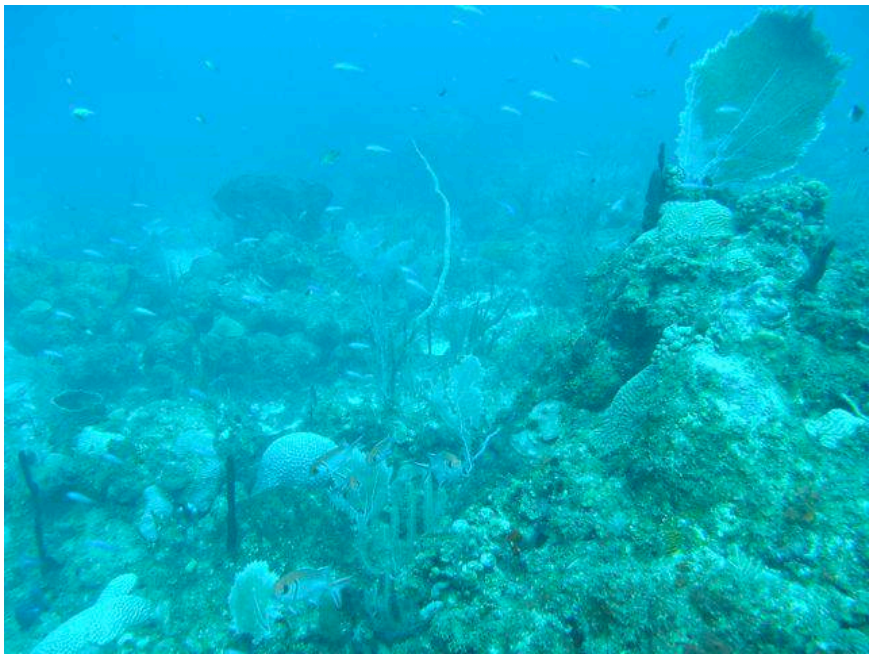
Description. The Eagle Ray site is a shallow seaward barrier reef located at west dive buoy 1 outside the main Christiansted access channel. The monitoring site is colonized hardbottom to coral reef, with more extensive development of reef at the seaward edge. Eagle Ray has been monitored since 2001.



Outstanding Feature. Eagle Ray is one of the most visited dive sites due to its proximity to Christiansted.

Threats. Proximity to Christiansted increases the potential for land-based sources of pollution, such as sewage, run-off, and marine debris. The site is frequented by small fishing craft that venture just out of port, likely increasing the fishing pressure.

Figure 35. Eagle Ray. (top) Location. (right) A representative photo of the reef.



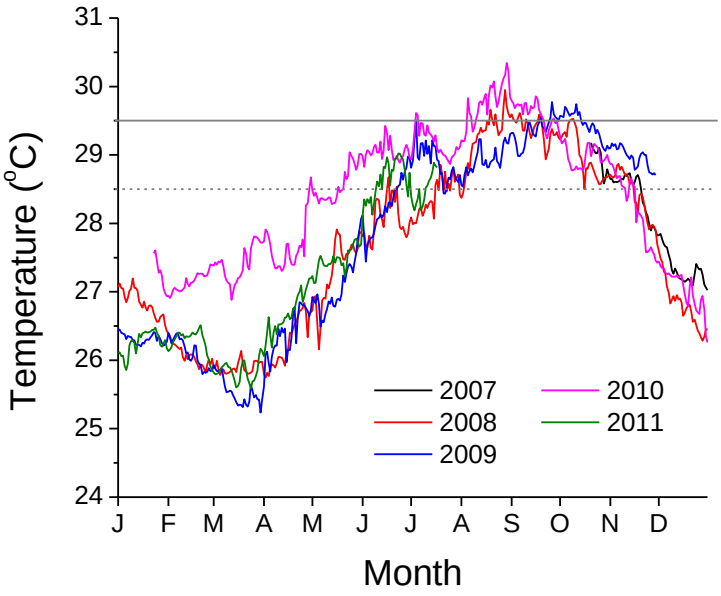


Figure 36. Eagle Ray benthic temperature at 9 m depth

Physical Characteristics

Current. Currents have not been measured at Eagle Ray, however strong unidirectional currents seem rare. There are increased oscillatory current near the shallow portion of the site.

Temperature. Eagle Ray is shallow but near deep water on two sides, which may potentially help to reduce thermal stress.

Benthic Community. Eagle Ray supports a diverse community of small coral colonies, but sponges and gorgonians compose half the sessile epibenthic animal community. Coral cover has been low and less than 10% throughout the monitoring period. Coral cover decreased only slightly with the 2005 coral bleaching event, 11.7%, but cover has come back and actually increased above pre-bleaching values. The limited response may be partly due to the high relative abundance of more thermally resistant coral species. The site was dominated with epilithic algae; however, this has declined after the 2005 bleaching event with a concomitant increase in macroalgae and filamentous cyanobacteria.

Coral Health. Eagle Ray corals were severely affected during the 2005 bleaching event with nearly all colonies bleached over about 80% of the colony surface. Low-level bleaching is also common in years without thermal stress. The site was only monitored prior to the 2010 bleaching event. Diseases area common feature of the site, with black band, yellow band, and dark spots disease having outbreaks in certain years. Lesions were also common during the 2005 coral bleaching event. Old partial mortality became very prevalent after the 2005 coral bleaching event and subsided in the following years.

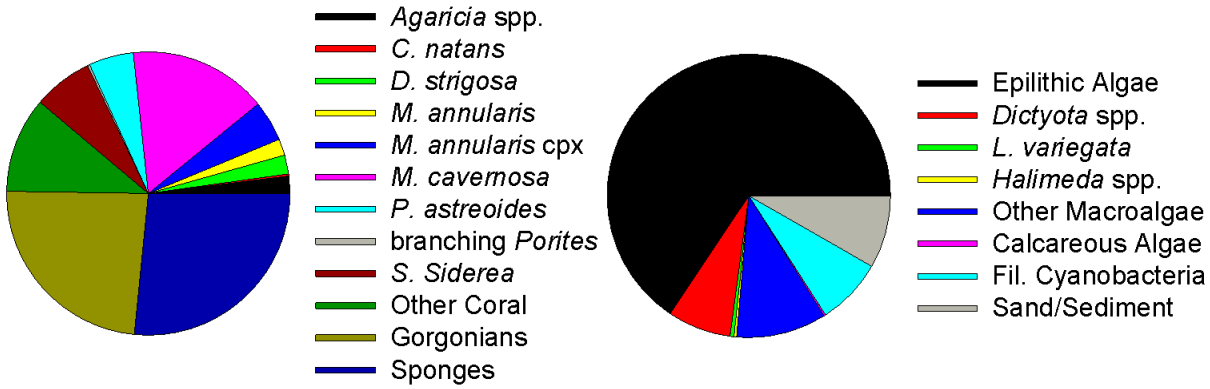


Figure 37. Eagle Ray. (left) Relative composition of the sessile epibenthic animal community. (right) Relative composition of the algal community and unconsolidated sediment.

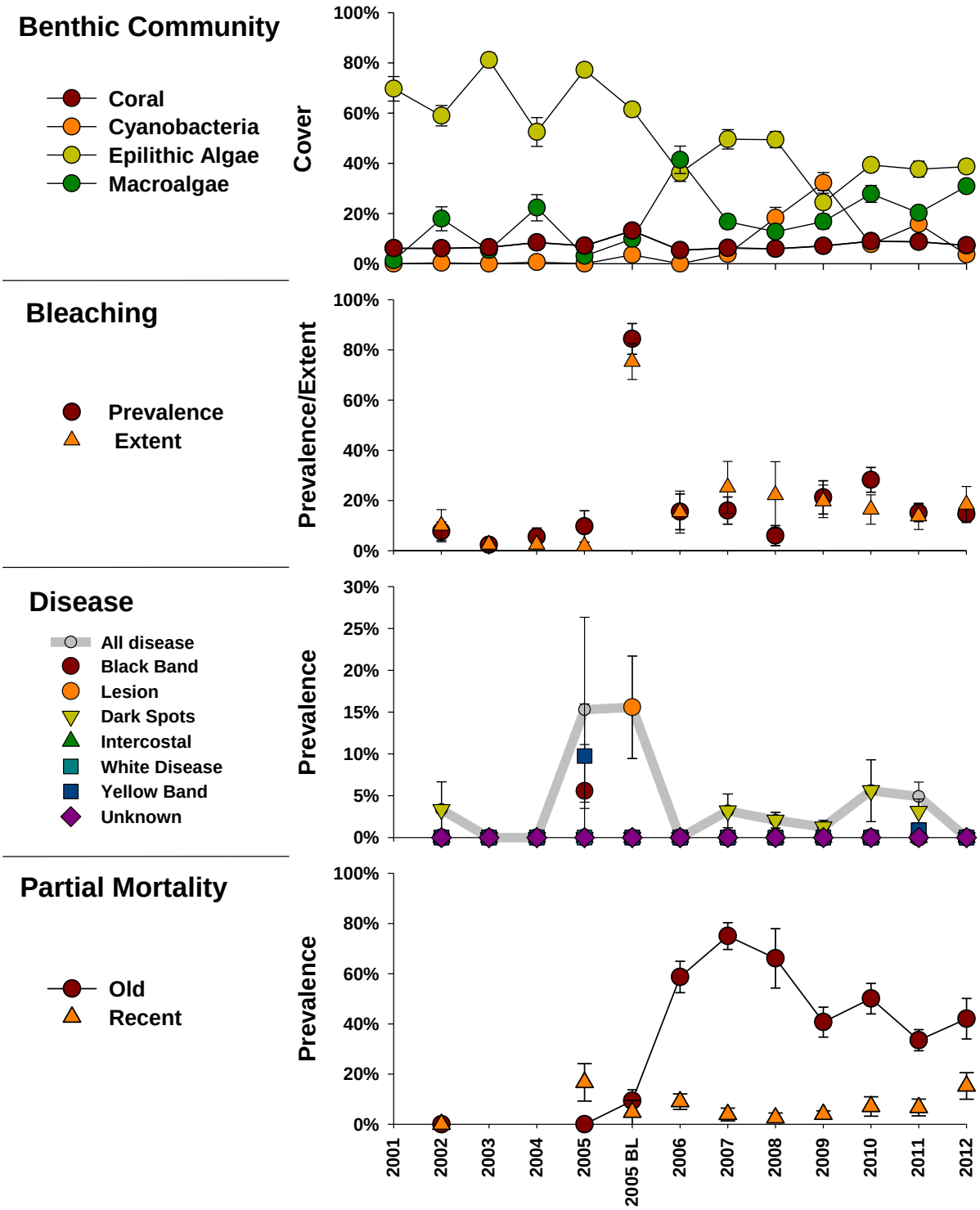


Figure 38. Eagle Ray benthic cover and coral health through time (mean ±SE).

Fish Community. Eagle Ray is a fairly diverse and rich site, especially considering the fishing and diving pressure it receives, as well as the proximity of Christiansted Harbor. It is dominated by herbivores and invertivores, with a large variety of parrotfishes and benthic feeders such as the blackbar soldierfish. Proximity to open deep water is evidenced by the occurrence of fairly high numbers of planktivorous creole wrasse and a few black durgeon. Yellowtail snapper are large and plentiful, probably due to the divers that frequent the site with fish food. The piscivores in 2012 were dominated by jacks. Graysby were common among the serranids however no larger serranids were observed on belt transects. Overall the fish community, while lacking top predators, remains high in overall biomass and species richness.

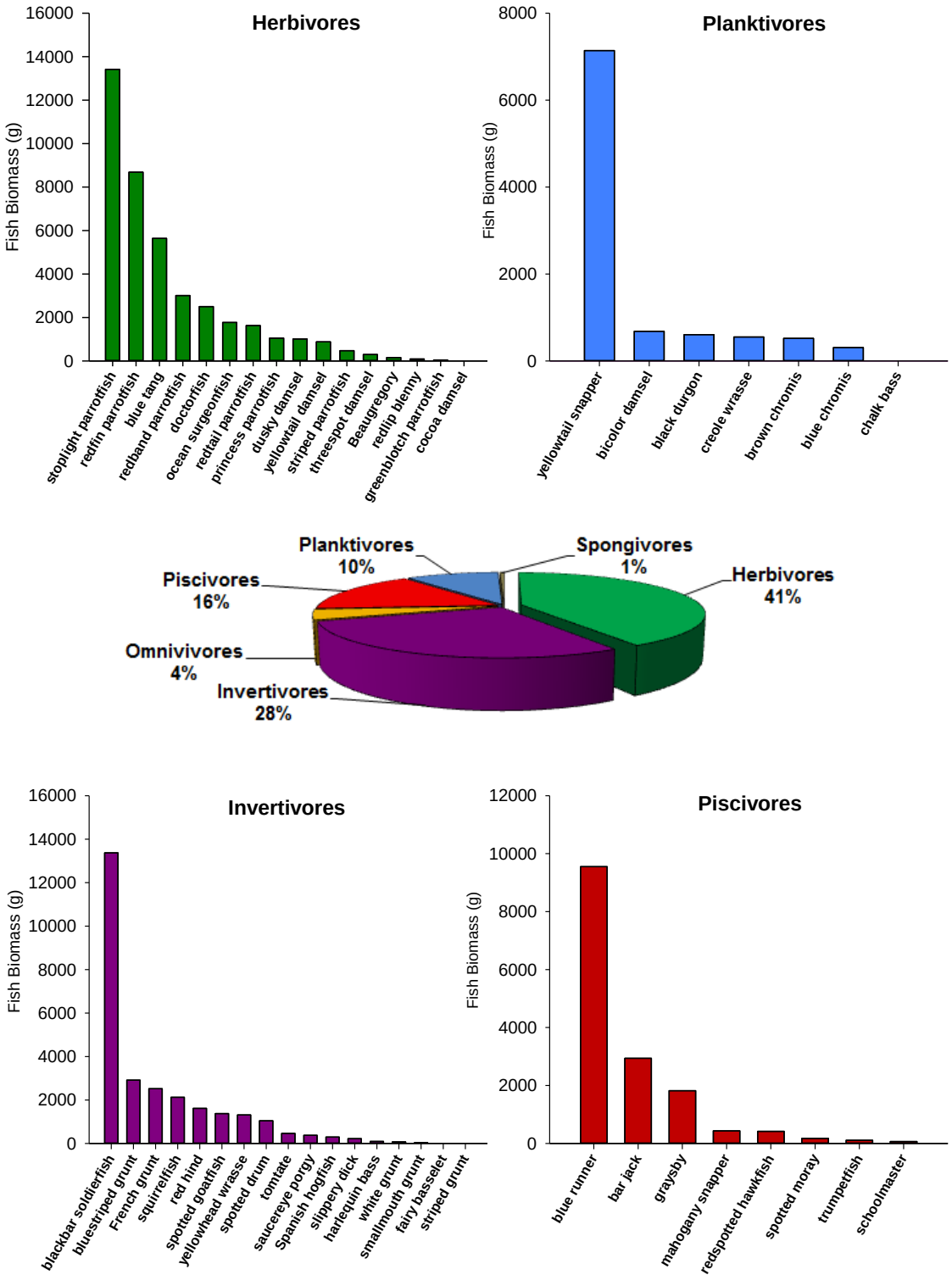
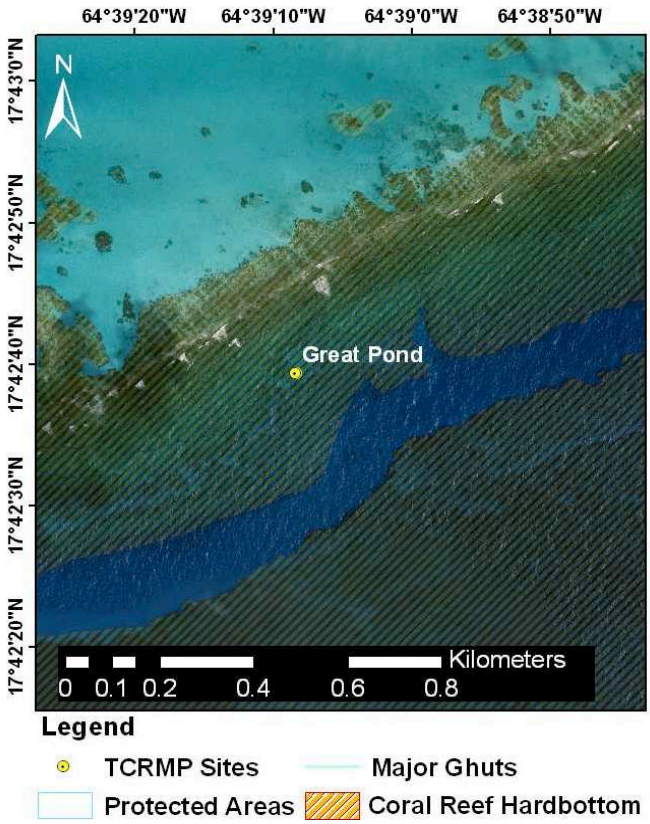


Figure 39. The Eagle Ray fish community by absolute and relative biomass.

GREAT POND

Description. The Great Pond Monitoring site is a wave-washed shallow barrier reef that was formerly an elkhorn coral reef in depths of 5-7 m. The reef is part of the barrier reef front surrounded by patch reefs and sand. Great Pond has been monitored since 2003.



Outstanding Feature. Great Pond hosts the largest population of the black spiny urchin *Diadema antillarum* of any TCRMP monitoring site, likely because of its shallow depth. It also hosts an abundance of large-bodied stoplight (*Sparisoma virde*) and yellowfin parrotfish (*Sparisoma rubripinne*) that likely spawn near the site.

Threats. The Great Pond monitoring site is located in the St. Croix East End Marine Park but outside the no-take fishery zone. If park rules are enforced this site could see a return of fisheries species by spillover from adjacent protected areas. Because of high turbulence and low watershed development sediment is not considered a problem; however, large industrial sites operate within 10 km, including the Hovensa Refinery, and could contribute to pollution.

Figure 40. Great Pond. (top) Location. (right) A representative photo of the reef.

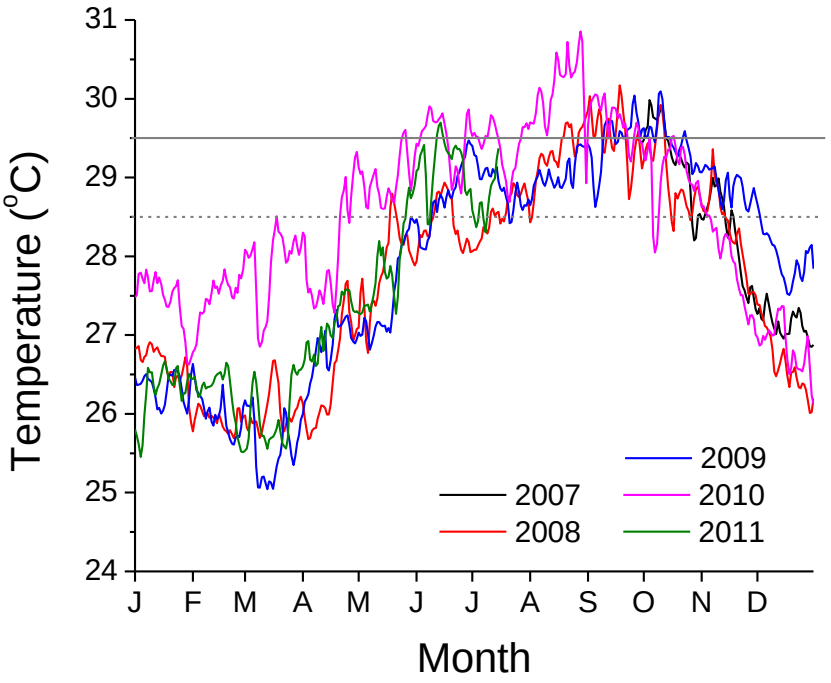


Figure 41. Great Pond benthic temperature (5 m depth).

Physical Characteristics

Current. Great Pond currents have not been measured directly. Wave-generated oscillatory currents dominate and this is the most regularly swell-influenced site in the TCRMP making work conditions difficult on all but the calmest day. Strong unidirectional currents have not been experienced.

Temperature. Great Pond typically experiences very high temperatures in August to October, with temperatures nearly peaking at 31°C in 2010.

Benthic Community. The Great Pond site is unusually dominated with the mustard hill coral (*Porites astreoides*) and *Diploria strigosa*. It is also the only site with high abundance of *Diploria clivosa.* The site lost 55.9% of its coral cover in the 2005 bleaching event, but has regained about half of the cover as of 2011. The site is dominated by epilithic algae, with occasional years where macroalgae blooms (2007 and 2011).

Coral Health. Great Pond corals were moderately affected during the 2005 coral bleaching event, which may be a reflection of the high composition of resistant coral species and the regular exposure to high temperatures. The site was not monitored during the height of the 2010 coral bleaching event. Patchy, low-level bleaching is common in some years. Diseases were almost non-existent at the monitoring site. Partial mortality is variable and has not shown consistent trends over years.

Figure 42. Great Pond (left) Relative composition of the sessile epibenthic animal community. (right) Relative composition of the algal community and unconsolidated sediment.

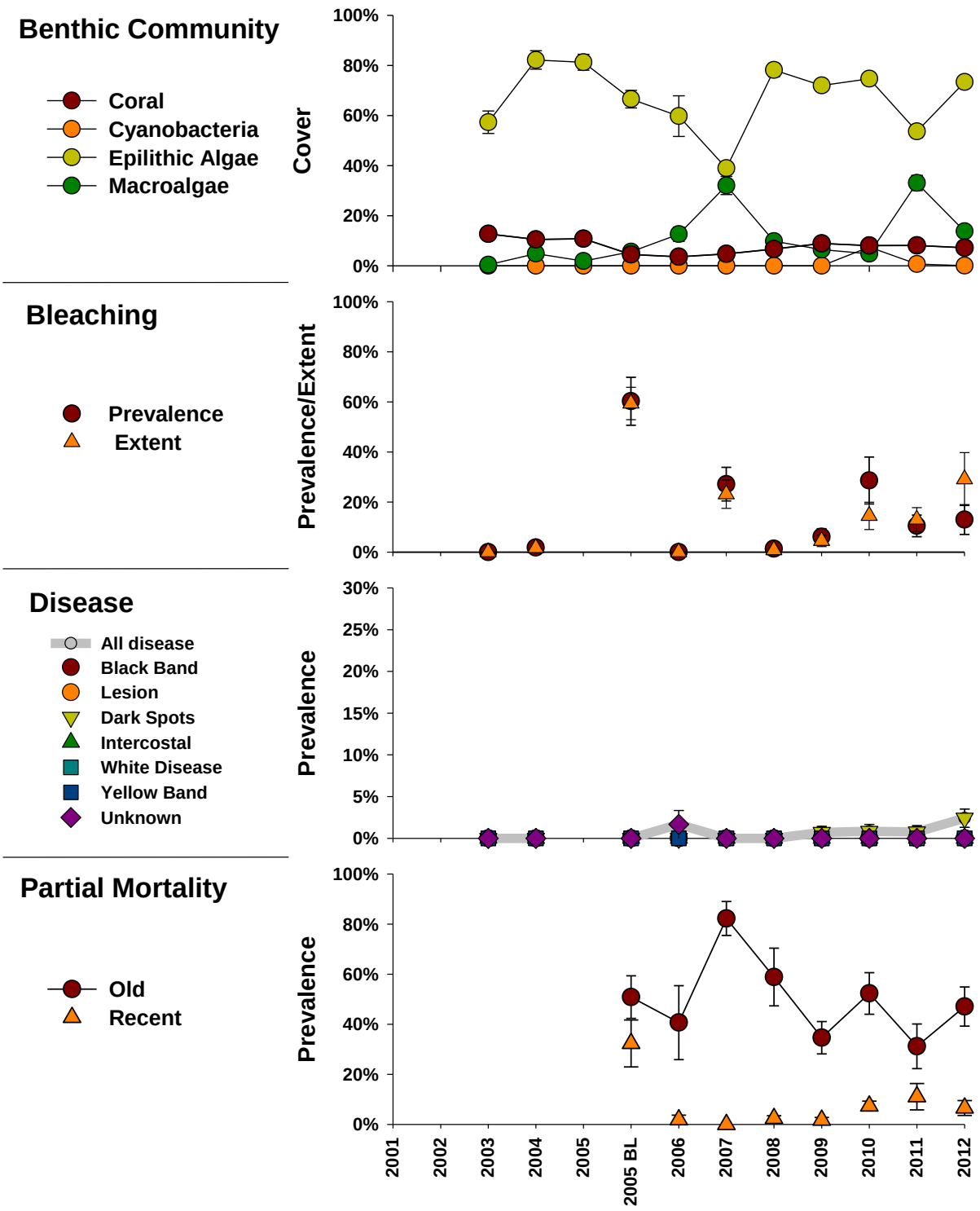


Figure 43. Great Pond benthic cover and coral health through time (mean ±SE).

Fish Community. The Great Pond fish community is dominated by herbivores. The primary herbivores at the site are the yellowtail damselfish and blue tang, which swims in foraging schools feeding on algae covering the relict elkhorn coral. Also present are large queen and stoplight parrotfish, which can also be seen in large groups, probably spawning in the late afternoon and evening hours. These fish concentrate around the "piles" of skeletal remains of *Acropora* across the site. Between these areas, fish biomass is low and is primarily made up of yellow goatfish, wrasses, and juvenile parrotfish. Piscivores at Great Pond are limited nearly entirely to mahogany snapper and bar jacks. Benthic invertivores are dominated in biomass by yellow goatfish and blackbar soldierfish, however the wrasse diversity is high on the site and includes slippery dicks, clown wrasse, yellowhead and bluehead wrasse, rainbow wrasse, puddingwife, and Spanish hogfish. In 2012 the piscivorous community included very few species and was dominated by bar jacks.

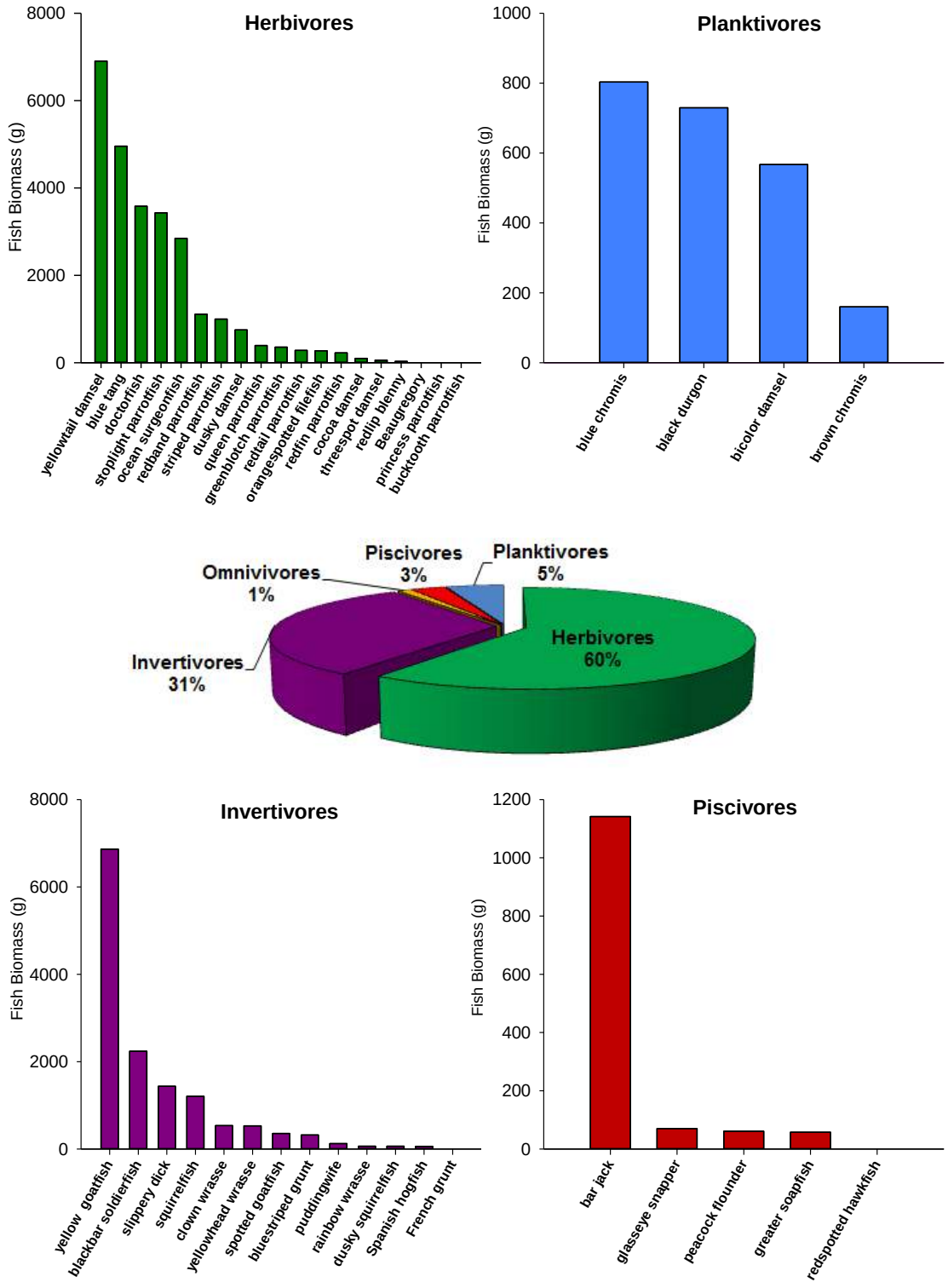
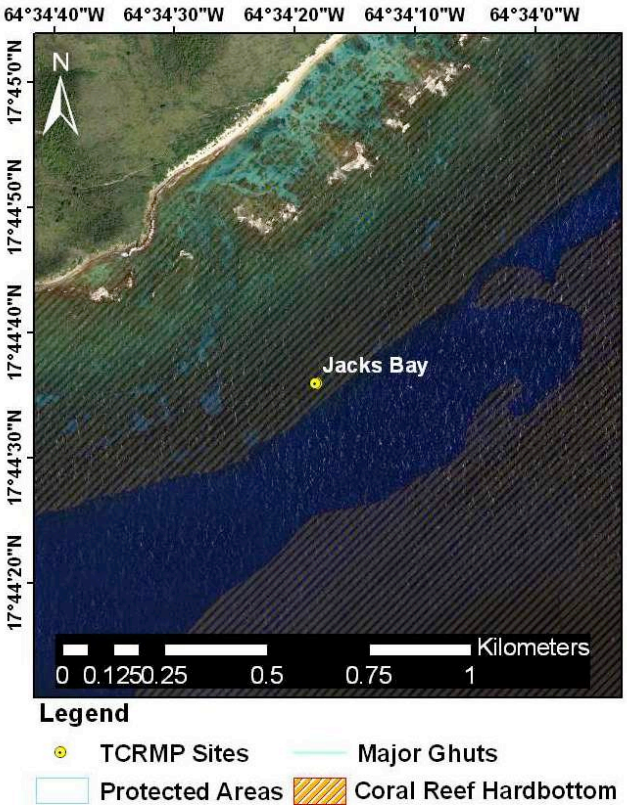


Figure 44. The Great Pond fish community by absolute and relative biomass.

JACKS BAY

Description. The Jacks Bay monitoring site (aka Jacks/Isaacs Bay) is part of fringing reef, colonized hardbottom on the southeast point of St. Croix in water depths of 13-16 m. The monitoring site is just inward from the shelf break and seaward reef slope, which terminates in a sand plain at about 20 m depth. Jacks Bay is largely a carbonate hardbottom with scattered hard coral, although there are some large coral heads seaward of the transects. Permanent transects were installed at Jacks Bay in 2001.



Outstanding Feature. Jacks Bay hosts a unique fish community with high abundance of small wrasses and the occasional occurrence of red hind (*Epinephelus guttatus*).

Threats. Jacks Bay is within the St. Croix East End Marine Park but lies just outside the restricted fisheries area and is open to fishing. High turbulence and no watershed development mean there is low threat of land-based sources of pollution at this nearshore site.

Figure 45. Jacks Bay. (top) Location. (right) A representative photo of the reef.

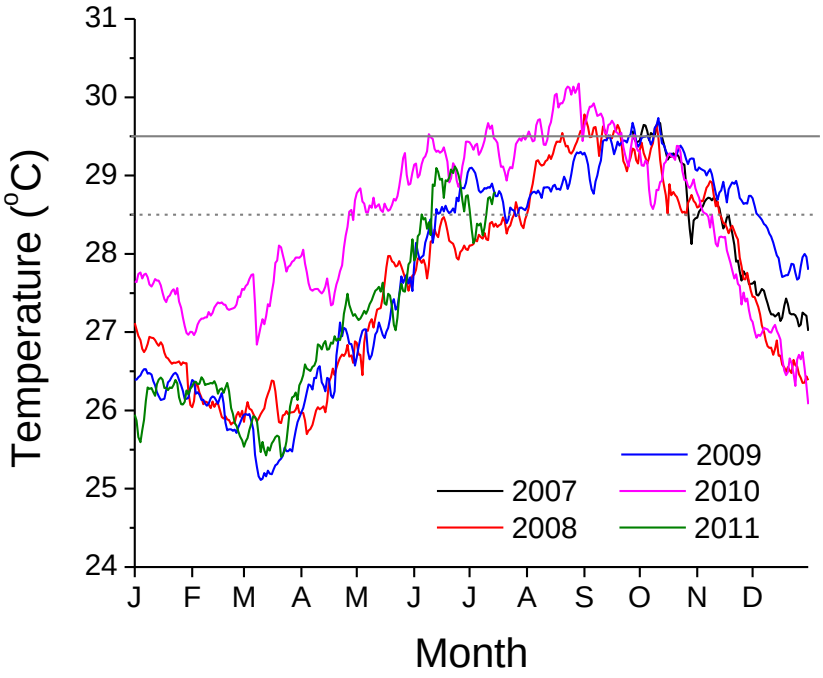


Figure 46. Jacks Bay benthic temperature at 12 m depth

Physical Characteristics

Current. Jacks Bay currents have not been measured directly. There are weak unidirectional currents, but a propensity for strong wave-generated oscillatory currents due the open coast southeast exposure.

Temperature. Jacks Bay can experience high temperatures during August to October.

Benthic Community. The Jacks Bay site has low coral cover (<10%) and is the only TCRMP site dominated by the great star coral *Montastraea cavernosa*. Jacks Bay lost 44.7% of its coral cover in the 2005 coral bleaching event, but had regained about 32% of the loss by 2011. Over half of the sessile epibenthic community is composed of gorgonians and sponges. The direct area of the site might be considered more a colonized hardbottom than true coral reef. The algal community is composed of high proportions each of epilithic algae, macroalgae, and filamentous cyanobacteria. These algal groups show high inter-annual variability.

Coral Health. The Jacks Bay site was strongly affected during the 2005 bleaching event and was moderately affected during the 2010 bleaching event. Disease prevalence was low and only dark spots disease was present. Recent partial mortality was high during the 2005 bleaching event, likely reflecting the fact that surveys were conducted in November 2005 when mortality had begun. Old partial mortality increased greatly after the 2005 bleaching and then declined to stable levels in 2009-2011.

Figure 47. Jacks Bay (left) Relative composition of the sessile epibenthic animal community. (right) Relative composition of the algal community and unconsolidated sediment.

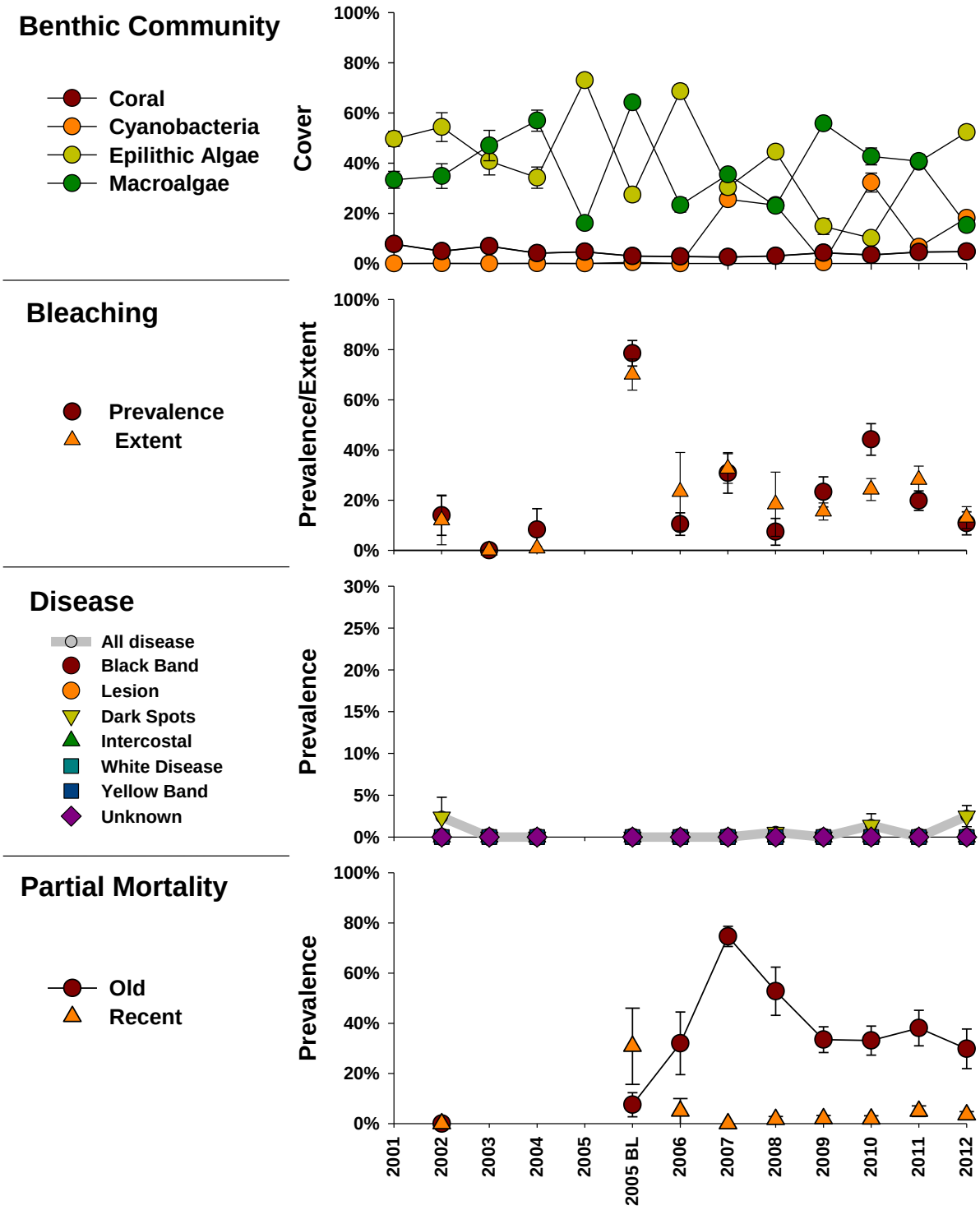


Figure 48. Jacks Bay benthic cover and coral health through time (mean ±SE).

Fish Community. The Jacks Bay fish community is characterized by very low fish biomass and abundance but relatively high diversity. The site is primarily hard bottom, adjacent to more developed coral reef on the seaward edge, over which larger fishes are observed. The hardbottom community is highly dominated numerically by blue chromis, yellowhead wrasse and bicolor damselfish. Juvenile wrasses and parrotfish swim and hover in mixed schools among the rubble and gorgonians. Slippery dicks, clown wrasse, rainbow wrasse and blackear wrasse are fairly common. Angelfishes are common across the hardbottom. In 2012 piscivores were rare and limited to schoolmaster, bar jack, glasseye snapper and redspotted hawkfish. Medium to larger sized species are very rare, and nearly all of these species are seen at Jacks Bay in the juvenile life history stage.

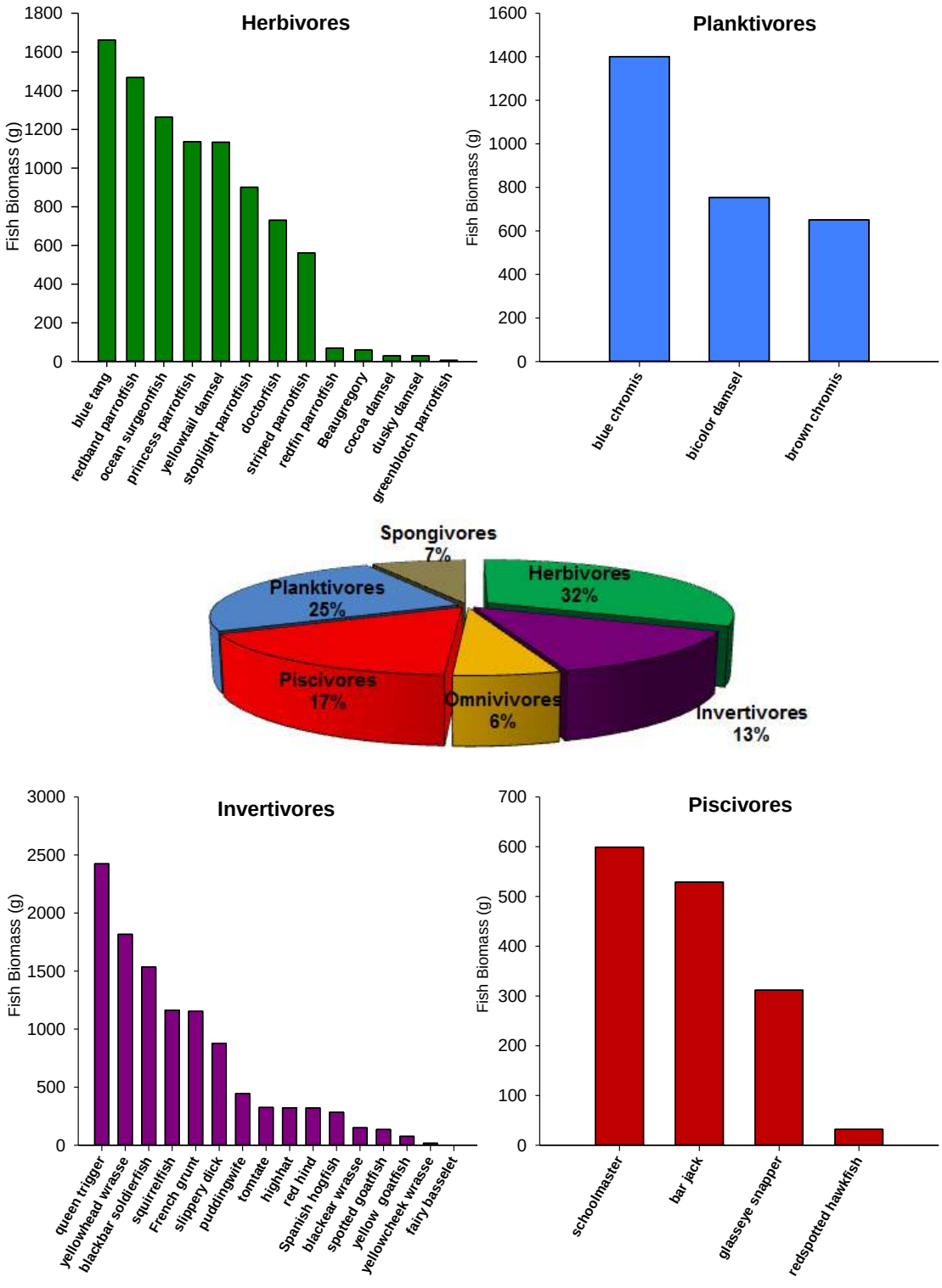


Figure 49. The Jacks Bay fish community by absolute and relative biomass.