VOL 15

# GLOBAL REEF EXPEDITION

GLOBAL REEF EXPEDITION FINAL REPORT

Khaled bin Sultan Living Oceans Foundation

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Khaled bin Sultan Living Oceans Foundation


*Science Without Borders®*

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The Khaled bin Sultan Living Oceans Foundation (KSLOF) is a nonprofit organization dedicated to providing science-based solutions to protect and restore ocean health. KSLOF was incorporated in California as a 501(c)(3), public benefit, private operating foundation in September 2000. Since then, the Living Oceans Foundation has worked to conserve the world's oceans through research, outreach, and education.
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# EXECUTIVE SUMMARY



*Coral reefs offer a variety of ecosystem services, including sustenance, economic opportunities, and protection from natural disturbances, as well as playing an essential cultural role for thousands of communities. However, globally, the extent of the world's reefs is being degraded at an astounding rate. The coral reef crisis has led to substantial coral declines ranging from 40% in the Indo-Pacific to more than 80% coral loss in the Caribbean. To better understand the coral reef crisis, the Khaled bin Sultan Living Oceans Foundation (KSLOF) embarked on the Global Reef Expedition (GRE), the world's largest coral reef survey and high-resolution habitat mapping initiative, to assess the status of Earth's reefs during a period of time. Data collected on the expedition will help scientists and marine managers better understand the extent of the coral reef crisis and provide valuable baseline data that can be used in both local and large-scale conservation efforts.*

The expedition was conducted by KSLOF, a US-based nonprofit environmental organization dedicated to providing science-based solutions to protect and restore ocean health. Starting as early as 2001, the foundation conducted field research to survey and map coral reefs to aid in coral conservation efforts. These research missions culminated in the Global Reef Expedition, which brought together an international team of over 200 scientists, educators, photographers, and filmmakers who circumnavigated the globe surveying some of the most remote coral reefs in the world. This report presents findings from the intensive GRE field research, education, and outreach that took place from 2006-2015, and from this point forward, references to the GRE in this document reflect the findings from the work completed during this period.

From 2006-2015, the GRE visited 16 countries and territories around the globe, starting along the Saudi Arabian Red Sea coastline, traveling throughout the Caribbean and tropical Pacific Ocean, and ending in the Chagos Archipelago in the Indian Ocean. Local representatives from the communities provided invaluable knowledge and helped us share our findings with the residents. Our team of scientists used standardized methods to map and assess the benthic and fish communities, allowing us to evaluate the reefs across large geographic areas. To better understand large-scale trends, we grouped data into three datasets: the Saudi Arabian Red Sea, the Caribbean, and combined data from the Pacific and Indian Oceans.

The primary scientific goals of the expedition were to:

1. **Map and characterize coral reef ecosystems.**
2. **Identify the current status of and major threats to the world's reefs.**
3. **Examine factors that enhance a reef's ability to resist, survive, and recover from disturbance events such as bleaching, cyclone damage, and crown-of-thorns starfish outbreaks.**

As the science team was conducting research, our team of educators worked in real time with communities to share discoveries. In turn, knowledge of how the local communities managed their marine resources was shared with the scientists at sea. Our photographers and filmmakers produced award-winning films to showcase the work and transport audiences to places they may have never otherwise seen.

## MAPPING THE WORLD'S REEFS

Using high-resolution satellite imagery, KSLOF was able to map over 65,000 km$^2$ of coastal marine habitats in 11 countries and territories across the globe. This mapping endeavor produced the most comprehensive atlas of ground-truthed high-resolution coral reef habitat maps. Two publications, the *Atlas of the Saudi Arabian Red Sea Habitat* and the *Atlas of Shallow Marine Habitats of Cay Sal Bank, Great Inagua, Little Inagua, and Hogsty Reef, Bahamas*, were released by the foundation and are freely available on our website. One of the most useful tools developed because of the mapping component of the GRE is the web-based World Reef Map. This is a global, online, interactive map that allows users to explore all the surveyed coral reefs. These maps continue to be used by scientists and managers to aid in management and conservation efforts globally.

## BENTHIC ASSESSMENT OF THE WORLD'S REEFS

KSLOF conducted nearly 8,600 benthic surveys at over 1,200 survey stations around the world. Globally, coral reef benthic communities varied by location. In the Red Sea, the highest mean (±S.E.) coral cover was in the Farasan Banks (29.4±13.4%) and the lowest was found in Ras Al-Qasabah (20.4±10.4%). Macroalgal cover was high in shallow locations in the Farasan Islands and nearshore reef flat communities in the Farasan Banks and parts of Ras Al-Qasabah, but in Al Wajh and Yanbu, crustose coralline algae and turf algae were the dominant algae groups observed.

In all locations surveyed in the Caribbean, algae dominated the substrate, with a mean (±S.D.) of 65±14% across all locations. Macroalgae was the most abundant algae observed in all locations. Mean live coral cover for each country in the Caribbean ranged from <8% to 14%, with The Bahamas having the lowest live coral cover and St. Kitts and Nevis having the highest.

In the Pacific and Indian Oceans, the benthic communities had high coral cover, and the algal communities were dominated by crustose coralline and turf algae. The reefs of the Gambier Archipelago in French Polynesia had the highest mean live coral cover (52±13%), followed by the Republic of Palau (49±16%) in the Pacific Ocean. The Chagos Archipelago in the Indian Ocean had a mean live coral cover of 40±16%. New Caledonia and the Cook Islands had the highest percentage of algae recorded but were both dominated by crustose coralline algae.

## FISH ASSESSMENT OF THE WORLD'S REEFS

Our fish experts conducted over 8,300 fish surveys across all locations to better understand the status of the world's reef fish populations. Overfishing was evident in nearly every location we surveyed on the GRE. Some studies estimate that a baseline biomass threshold for reef fish should fall between 11 and 19 kg per 100 m$^2$,

## GRE BY THE NUMBERS

| | |
|---|---|
| 65,000 | Square Kilometers of Coral Reefs Mapped |
| 53,657 | Kilometers Traveled (1.25 times around the world) |
| 20,675 | Hours SCUBA Diving (541 days underwater) |
| 11,189 | Dropcam Videos |
| 8,596 | Benthic Surveys |
| 8,314 | Fish Surveys |
| 7,152 | Education Seminar Attendees |
| 5,911 | Coral Samples Taken |
| 1,460 | Fish Species Recorded |
| 1,242 | Dive Sites |
| 1,108 | Coral Reefs Studied |
| 488 | Coral Species Recorded |
| 467 | Days of Research |
| 216 | Scientists |
| 107 | Islands |
| 26 | Research Missions |
| 16 | Countries |
| 10 | Years |
| 1 | The Most Important Coral Reef Expedition in History |

and most locations fell at or below that threshold. Almost every location had few large commercially important fish, with most of the fish biomass instead composed of small fish in the lowest trophic levels.

The fish of the Red Sea were diverse, but some species appeared to be depleted, including many top predators like sharks and groupers. The fish communities of the Red Sea had varying reef fish communities that were highly dependent on the benthic communities. Generally, the sharks and large groupers were rarely seen, and instead some of the largest fish seen on the reefs were parrotfish.

The fish communities on Caribbean reefs had very low fish biomass, and most fish were herbivores. The Bahamas had the highest mean fish biomass (11±9.5 kg per 100 $m^2$) and second-highest mean fish density (61±25 fish per 100 $m^2$) in the Caribbean. Colombia had a higher mean fish density than The Bahamas but the second-lowest mean fish biomass (5.6±2.8 kg per 100 $m^2$), showing the fish there were abundant but small.

The fish communities of the Pacific and Indian Oceans varied greatly by location. The Tuamotu Archipelago in French Polynesia had the highest fish density (279±165 fish per 100 $m^2$) and second-highest fish biomass (39±48 kg per 100 $m^2$) of all locations surveyed in the Pacific and Indian Oceans. The Kingdom of Tonga had alarmingly low fish density (92±46 fish per 100 $m^2$) and biomass (4.5±4.1 kg per 100 $m^2$), the lowest of all locations surveyed in the Pacific and Indian Oceans. The highest fish biomass (42±20 kg per 100 $m^2$) was found in the Galapagos Islands, which was due to the high number of sharks and other large top predators found at this location.

### EDUCATION ON THE GRE

The education and outreach teams launched several in-country programs to share the foundation's knowledge about coral reefs with community members, traditional leaders, local teachers, and schoolchildren. In total, over 7,000 people attended coral reef seminars, community events, and ship tours in Jamaica, French Polynesia, Tonga, Fiji, and the Solomon Islands. The government and community seminars proved to be especially important. Not only was the foundation providing education about coral reefs, but also, we received valuable local environmental information from the participants.

### USING PHOTOGRAPHY AND FILM TO BRING THE GRE TO THE REST OF THE WORLD

The *M/Y Golden Shadow* served as an incredible platform from which to photograph and record high-resolution footage in parts of the world that had never been recorded before. Using this footage, we were able to develop and broadcast our award-winning films, such as our 2015 Suncoast Emmy® winning film, *Sharks of the Coral Canyon*, to communities around the world. These films and photographs brought to life the research that we were conducting. We were able to bring the coral reefs that we were studying into living rooms and classrooms worldwide.

> This report provides an assessment of the state of **corals** and **reef fish** for over **1,000 coral reefs** surveyed on the **Global Reef Expedition.**

### FIVE MAIN TAKEAWAYS FROM THE GRE

There were many things learned from our research on the Global Reef Expedition. Whether we were visiting some of the most remote untouched reefs or reefs being used by local communities, each one had a story to tell and added to our knowledge about the extent of the coral reef crisis.

The five main takeaways from the GRE are:

**1) Swift action is needed to address climate change.** Climate change is currently the biggest threat that the world's reefs are facing. Coral bleaching and ocean acidification are a direct result of climate change, and regardless of the status of a reef, these two disturbances will have substantial impacts globally if climate change is not addressed.

**2) Reef fish populations are being overexploited globally.** One of the most significant findings from the GRE was that nearly every country we visited showed signs of overfishing. Almost all countries had predominantly small fish remaining, particularly in families fished for subsistence and commercial fishing. Most reef fish populations are unable to withstand the fishing pressure they are currently experiencing, and expansion and enforcement of fishing regulations is critical.

**3) We need better management of acute reef disturbances.** Both natural and human-induced disturbances are having a negative impact on coral reefs. Widespread coral mortality from crown-of-thorns starfish outbreaks was seen in Saudi Arabia, French Polynesia, Tonga, and the Solomon Islands, and we witnessed an active outbreak occurring in the Cook Islands. Most of the natural acute disturbances, such as tsunamis, storms, and crown-of-thorns starfish outbreaks, are hard to manage. Managing and relieving other reef stressors such as nutrient runoff and overfishing can help reefs recover from these acute disturbances.

**4) Marine Protected Areas (MPAs) work in conserving coral reefs.** We were able to work in some of the world's oldest and largest MPAs. Some countries we visited, such as Australia (Northern Great Barrier Reef), Palau, and New Caledonia, have large human populations utilizing the reefs and have prioritized establishing large protected and managed areas to conserve their nearshore reef systems. In nearly every instance, these reefs had the best coral and reef fish communities. Protecting remote reefs and using marine spatial planning to strategically place no-take, no-entry MPAs can help engender coral reef resilience.

**5) Collaboration with local communities has the biggest impact on reef conservation.** In order to protect and conserve the world's reefs, aggressive measures will need to be taken. One of the biggest takeaways from the GRE was that nearly every community we worked with around the world expressed, and continues to express, the want and need for conservation of its reef systems. Working directly with the communities, continuing education programs, sharing our findings, and expanding on their current management efforts has proven to be the most successful in conserving the reefs visited on the GRE.

The GRE took place at a critical time, providing a baseline dataset that is being used by scientists and managers around the world to help battle the ongoing coral reef crisis. Over 100 peer-reviewed scientific papers, reports, and management plans have been published using data collected on the GRE. Our work has helped establish internationally recognized Marine Protected Areas and locally managed areas around the globe. Currently, our maps are being used in partnership with NASA to help map the remainder of the world's reefs. These maps can be used to aid in conservation efforts at an even larger scope than the already expansive GRE.

Drastic measures are needed to address the coral reef crisis. KSLOF hopes the findings in this report, as well as our many resources that resulted from the GRE, will be used by scientists, managers, and communities around the world to support their conservation efforts. This expedition would not have been feasible without the tireless work of our partners and everyone who participated on the GRE. The gracious financing and support from His Royal Highness Prince Khaled bin Sultan Abdulaziz Al-Saud made this work possible, and for that, we will be forever indebted.

# 1.0 INTRODUCTION

# INTRODUCTION



## 1.0

The Khaled bin Sultan Living Oceans Foundation (KSLOF) is a US-based nonprofit environmental science organization that was established in 2000 by His Royal Highness Prince Khaled bin Sultan Abdulaziz Al-Saud. As an avid scuba diver, Prince Khaled witnessed the rapid decline of the world's coral reefs during his travels throughout his lifetime. After investigating the reasons the reefs were declining, he chose to act. He was inspired to establish an organization dedicated to understanding, conserving, and preserving our precious oceans for generations to come.

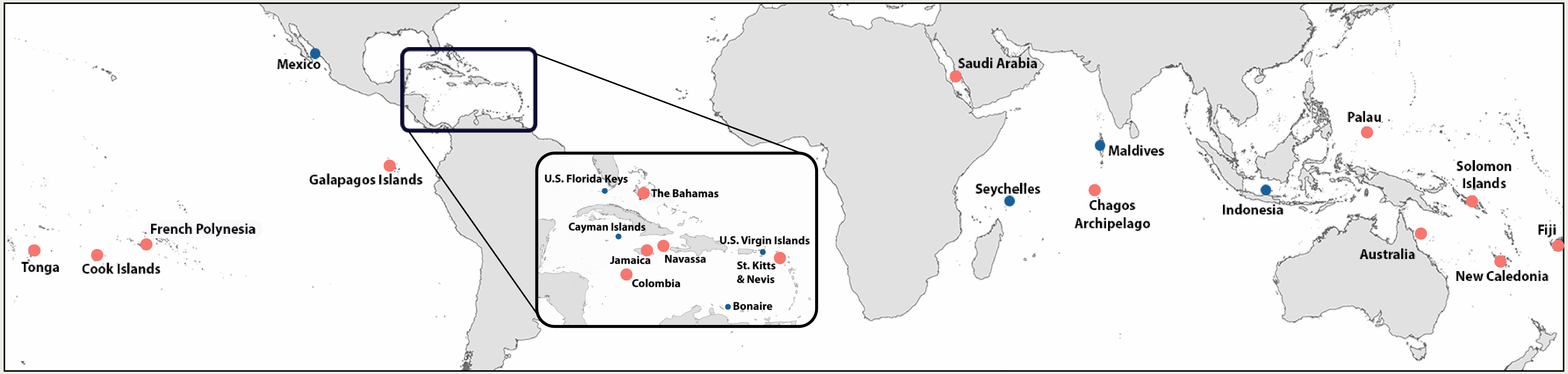
Prince Khaled, with support from his closest advisors, chose to use a three-pronged approach to undertake this mission to protect the world's oceans by establishing three departments of the foundation: Science, Education, and Outreach. Together, these departments work synergistically to educate and share science-based solutions to protect and restore the oceans' ecosystems, particularly coral reefs. Because coral reefs are found in countries and territories across the globe, Prince Khaled established the **Science Without Borders®** philosophy, which became core to the foundation's operation. Subsequently, KSLOF formed partnerships with scientists, conservation organizations, and local leaders to leverage the resources, commitment, and ideas necessary to make substantial progress in ocean conservation. Through these partnerships, the foundation recognized a gap in the understanding of coral reefs on a global scale. Therefore, KSLOF launched numerous expeditions starting in 2001 to assess the state of the reefs in 24 countries and territories across the tropical oceans **(Figure 1)**. These research missions intensified in 2006, leading to the Global Reef Expedition (GRE), the world's largest coral reef survey and high-resolution habitat mapping initiative.

Embracing the three-pronged approach, the foundation enabled a broad team of educators, filmmakers, photographers, and scientists to work in some of the most remote locations in the world. One of the main goals of the GRE was to use a collaborative approach to study and map coral reefs by partnering with scientific and local experts in each of the countries visited. To do this, Prince Khaled retrofitted and graciously donated the use of his ship, the *M/Y Golden Shadow*, to support the field team and facilitate its work on a portfolio of the most remote and understudied reefs. To achieve this goal, the foundation assembled over 200 coral reef experts from 25 different countries to map and study the benthic and fish communities around the world. The culmination of the work completed on the GRE can be found in the more than 100 peer-reviewed scientific papers, reports, and atlases that were published as a result of this expedition. This publication will focus on the intensive field research conducted in 16 countries between 2006 and 2015 **(Figure 1)**, and from here forward, references to the GRE reflect the findings from fieldwork completed during this time period.

From 2006-2009, the foundation surveyed the reefs along the Saudi Arabian coastline in the Red Sea. Between 2011 and 2015, the foundation continued its circumnavigation of the globe, traveling through the Caribbean, then into the Eastern Pacific, South Pacific, Western Pacific, and finally the Indian Ocean. Along the way, KSLOF scientists and partners applied standardized sampling protocols to map and survey the reefs in each of these regions.

While the science team was conducting underwater surveys, the foundation implemented various education and outreach programs in parallel to improve ocean literacy and inspire the next generation of ocean advocates. New education curricula and programs were established as a direct result of the GRE, including the foundation's Coral Reef Educator on the Water (CREW) program, the Mangrove Education and Restoration Program, the Coral Reef Ecology Curriculum, and the Science Without Borders® Challenge. Initially, the education team hosted seminars for hundreds of elementary and high school students in the Washington, D.C., area, sharing discoveries from the GRE in near real time. After this initial round of seminars, the team joined the GRE scientists in the field to connect with local students and communities. The education team worked directly with cultural liaisons in Jamaica, French Polynesia, Tonga, Fiji, and the Solomon Islands to share information about the GRE, learn how local communities were using and managing their marine resources, and educate students about coral reefs, while showcasing the foundation's award-winning films.

**Figure 1** LOCATION OF ALL SITES VISITED ON THE GLOBAL REEF EXPEDITION FROM 2001-2021. THIS EXPEDITION CIRCUMNAVIGATED THE GLOBE TO MAP AND COLLECT BASELINE DATA OF THE WORLD'S CORAL REEF BENTHIC AND FISH COMMUNITIES AT A POINT IN TIME. THE DATA PRESENTED IN THIS REPORT IS FROM THE INTENSIVE FIELD WORK THAT TOOK PLACE BETWEEN 2006 AND 2015 [MARKED BY CORAL-COLORED DOTS] IN: THE SAUDI ARABIAN RED SEA (2006-2009), THE BAHAMAS (2011), ST. KITTS AND NEVIS (2011), JAMAICA (2012), NAVASSA (2012), COLOMBIA (2012), GALAPAGOS ISLANDS (2012), FRENCH POLYNESIA (2012-2013), COOK ISLANDS (2013), FIJI (2013), TONGA (2013), NEW CALEDONIA (2013), AUSTRALIA (2014), SOLOMON ISLANDS (2014), PALAU (2015), AND THE CHAGOS ARCHIPELAGO (2015).




COUNTRIES SURVEYED ON THE GLOBAL REEF EXPEDITION FROM 2006-2015 AND DISCUSSED IN THIS REPORT

# 2.0 SCIENTIFIC BACKGROUND

2.0

## THE VALUE OF CORAL REEFS

*Coral reefs and adjacent nearshore tropical marine ecosystems play a vital role in the lives and livelihoods of people living in coastal communities across the globe. They offer a variety of ecosystem services, including providing sustenance, economic opportunities, and protection from storms, while also playing an important cultural role for thousands of communities[1]. Using the* M/Y Golden Shadow, *the GRE granted scientists the opportunity to visit some of the most remote reefs in the world, many of which had never been mapped or surveyed before. This allowed our team of scientists to capture the status of these reefs and gain valuable scientific information on remote reefs that are far away from many human threats such as fishing, coastal development, and pollution.*

2.1

## REEFS IN CRISIS

Globally, there is a coral reef crisis, where reefs are being lost or degraded at an astounding rate[2]. Scientists have estimated that over the past three decades, live coral cover has fallen by up to 80% in the Caribbean, 40% in the Indo-Pacific, and 50% on the Great Barrier Reef[3–6]. Several anthropogenic and natural disturbances have been contributing to the decline of the world's reefs and, considering these large-scale ecological changes, the GRE took place at a critical time.

Starting as far back as the late 1990s, the coral reef crisis was highlighted by numerous scientists who saw the need to address this rapid and global decline of coral reefs[2,7,8].

An increase in human impacts has led to ecological phase shifts from coral-dominated to macroalgal-dominated reefs, a decrease in the resilience of the reef ecosystem, and reduced fitness of many reef organisms[2]. Since the problem was first recognized, several mitigation efforts have been employed to address the reef crisis. Some of the most common management practices include regulating nearshore runoff and pollution, fisheries management, and adaptive management to shifting baselines[2]. Despite these mitigation efforts and due to compounding pressure from both anthropogenic and environmental disturbances, the reefs are still declining.

### The primary scientific goals of the GRE were to:

1. **Map and characterize coral reef ecosystems.**
2. **Identify the current status of and major threats to the world's reefs.**
3. **Examine factors that enhance a reef's ability to resist, survive, and recover from disturbance events such as bleaching, cyclone damage, and crown-of-thorns starfish outbreaks.**



2.2

## SMALL CHANGES CAN HAVE CATASTROPHIC IMPACTS

Coral reef ecosystems are one of the most complex systems on Earth. A change in just one species can have catastrophic effects on the entire ecosystem, and globally, we have seen widespread impacts on the reef system from acute and localized disturbances. One common disturbance observed throughout the Pacific and Indian Oceans was the outbreak of *Acanthaster planci*, commonly known as crown-of-thorns starfish, or COTS. COTS are corallivores who prey directly on corals, and a rapid increase in their population or an outbreak can substantially reduce live coral cover on a reef[9–11]. On the GRE, we witnessed multiple areas where COTS outbreaks caused extensive damage to reefs. This was particularly true in French Polynesia and the Cook Islands. We also found evidence of previous COTS outbreaks in the Red Sea, Tonga, the Solomon Islands, and the Chagos Archipelago. The cause of these destructive outbreaks has been difficult to identify, but numerous theories attribute them to pollution and high local nutrient inputs, enhanced levels of phytoplankton and subsequent increase in larvae survival, overfishing, and decreases in their natural predators[12–14]. Encouragingly, some areas we visited that had recently experienced outbreaks showed signs of recovery. When we observed an active outbreak, we took action to help communities physically remove these voracious predators and establish management practices to help conserve the remaining corals[15].

> Globally, **coral reefs** are being **lost** or **degraded** at an **astounding rate.**

In 1983-1984, the Caribbean reefs also experienced an acute disturbance that contributed to the phase shift from coral- to macroalgal-dominated reefs in many locations throughout the Caribbean. The black sea urchin, *Diadema antillarum*, found throughout the tropical waters of the Western Atlantic, experienced mass mortality due to a disease outbreak. Its population rapidly decreased by about 95% throughout its range[16,17]. The urchin is a functional grazer that helps regulate the coral and macroalgal dynamics on the reefs by controlling the macroalgal growth. Combined with this mass mortality event, disease outbreaks starting as early as the late 1970s, widespread bleaching events occurring nearly annually, and increased severity of storm damage have led to a decline of coral cover throughout the Caribbean basin by up to 80% from 1975-2000[18]. While the mass mortality of *Diadema* in the Caribbean occurred decades before the GRE, we found nearly all the locations surveyed were macroalgae-dominated reefs. The data collected on the GRE provides valuable insight into the threats coral reefs are currently experiencing. Both acute, like the ones described above, and large-scale disturbances, such as disease outbreak and coral bleaching events, have contributed to the decline in the world's reefs. The GRE provides valuable data on the status of the world's reefs that can be used to monitor and better understand the resilience of reefs to these disturbances.

## 2.3 MANAGING REEF FISH POPULATIONS

An estimated 800 million people live within 100 kilometers of coral reefs, and just one square kilometer of reef is valued at USD $600,000 annually[19]. A study by Teh et al. (2013) estimated that there are six million reef fishers in 99 countries and territories globally[20]. The reefs of the world produce 10-12% of the fish caught in tropical nations and 20-25% of the fish caught in the developing nations of the Pacific, Indian, Middle East, and Caribbean[21]. Across the tropical Pacific nations, it is estimated that 90% of the daily protein consumed by local communities comes directly from the adjacent reefs[21].

Most rural reef fishers target nearshore reef fish for both sustenance and subsistence. Unfortunately, these nearshore reef fish populations are either poorly regulated or unregulated in many fisheries management practices. Overfishing of nearshore coral reefs is a complex problem and is often unaddressed due to the lack of information on reef fish community structure[22]. It was important for KSLOF scientists to look not only at the benthic organisms but also at reef fish populations in both heavily fished and remote locations where the reefs experienced less fishing pressure. Coral and reef fish have an interdependent relationship[23] where corals provide habitat structure for fish, and in return, many fish help graze the reef, regulating the algal cover that can impede coral settlement and growth[24]. When a reef is overfished, it can have widespread effects on the benthic community and negatively impact the delicate reef system. Studies in the Caribbean Sea and Indian Ocean suggest that minimum reef fish biomass targets should fall between 1,195 and 1,900 kg per ha (or 11 and 19 kg per 100 $m^2$)[25,26] because it is not only sustainable for reef fish populations, but also, it will help maintain critical ecosystem services, food security, and resilience of reefs currently in crisis.

In nearly every location surveyed on the GRE, evidence of overfishing was present. Because of the heavy reliance on reef fish for sustenance in coastal communities, the GRE fish surveys provide critical information for local governments to better understand the status of their reef fish populations and use the data to establish best management practices as fishing pressure continues to increase.

## 2.4 THE NEED FOR THE GLOBAL REEF EXPEDITION

Historically, humans have overexploited nearshore reef ecosystems to a point where recovery feels like a futile effort. Recording the status of the world's reefs at a specific point in time on a large scale provides scientists and managers with valuable information that can be used for both local and large-scale conservation efforts. This is particularly true as the effects of climate change continue to worsen in both extent and severity. Since the start of the GRE, there have been numerous historic global coral bleaching events caused by prolonged ocean warming[27]. Many of the locations surveyed on the GRE were affected by these catastrophic events where substantial coral cover mortality has been recorded. The GRE data presented herein was collected between 2006 and 2015, before the most recent global bleaching events, and may be useful for future recovery efforts. As the coral reef crisis continues to worsen, KSLOF hopes the data used in this report will help scientists and managers around the world better protect coral reefs so they can be enjoyed by future generations.



The **data** collected on the **Global Reef Expedition** can help people address the **coral reef crisis** and **protect coral reefs** for future generations.

# 3.0 METHODS

# 3.0 SITE DESCRIPTIONS

The data presented in this report combines findings from multiple islands and sites throughout each location surveyed. A list of the sites visited can be found in **Appendix 2**. The team of KSLOF scientists and partners surveyed a total of 1,206 stations among the 16 locations visited. An impressive 8,596 benthic habitat surveys and 8,314 fish surveys were conducted on the GRE, providing the foundation with the largest global database of field-collected reef data so far acquired using a standardized survey protocol. **Table 1** shows the total number of benthic and fish surveys conducted in each country.

While researchers were surveying the reefs, another team from KSLOF was ground-truthing and mapping over 65,000 sq. km of coastal marine habitats at a high resolution, which has been made freely available for interpretation on our website **(Figure 2)**. This mapping endeavor has produced the most comprehensive atlas of ground-truthed high-resolution coral reef habitat maps. Additionally, the maps produced on the GRE are helping examine shifts in tropical marine coastlines around the world[28–32].

The research conducted on the GRE would not have been possible without the *M/Y Golden Shadow*, its crew, and its support vessels, which were graciously donated for use, allowing KSLOF researchers to easily gather data in these remote locations.

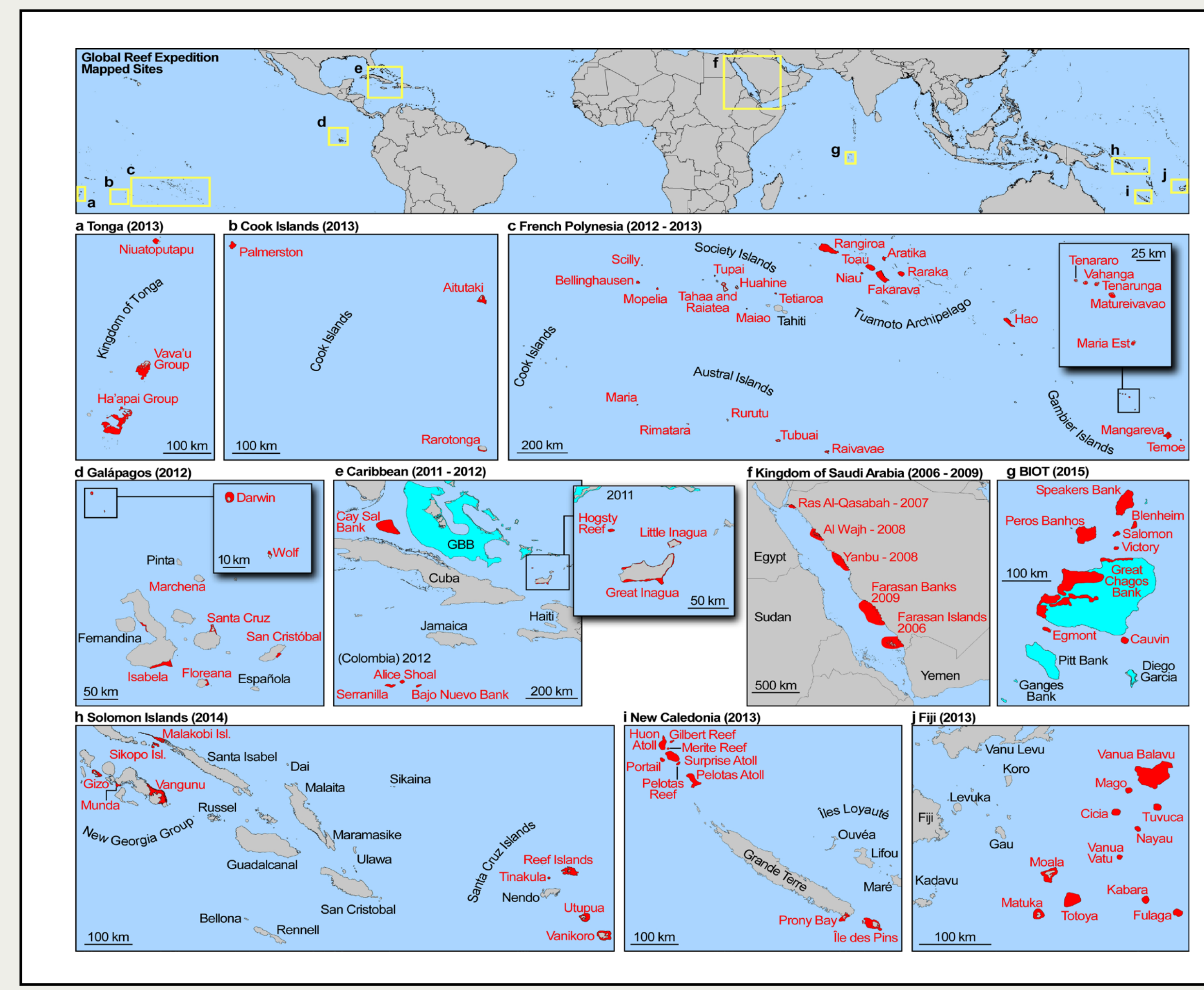
Analysis for this report grouped data into three datasets. One compared the locations surveyed along the Saudi Arabian Red Sea coastline: the Farasan Islands, Ras Al-Qasabah, Al Wajh, Yanbu, and the Farasan Banks; the second compared locations surveyed in the Caribbean: The Bahamas, Jamaica, Navassa, St. Kitts and Nevis, and Colombia; the third combined locations surveyed in the Pacific and Indian Oceans: the Galapagos Islands, French Polynesia, the Cook Islands, the Lau Province in Fiji, the Kingdom of Tonga, New Caledonia, the Northern Great Barrier Reef in Australia, the Solomon Islands, the Republic of Palau, and the Chagos Archipelago.

Because of the expanse of the four archipelagoes in French Polynesia, we chose to analyze them separately as the Austral, Society, Tuamotu, and Gambier Archipelagos.

**Table 1** SAMPLING INTENSITY OF THE COUNTRIES SURVEYED ON THE GLOBAL REEF EXPEDITION. THE TABLE SHOWS THE TOTAL NUMBER OF SITES, BENTHIC TRANSECTS, AND FISH TRANSECTS OF EACH LOCATION SURVEYED ON THE GRE.

| LOCATION | NUMBER OF SITES | NUMBER OF BENTHIC SURVEYS | NUMBER OF FISH SURVEYS |
|---|---|---|---|
| BAHAMAS | 80 | 653 | 780 |
| CHAGOS ARCHIPELAGO | 105 | 1,559 | 1,222 |
| COLOMBIA | 31 | 197 | 284 |
| COOK ISLANDS | 30 | 175 | 238 |
| FRENCH POLYNESIA, AUSTRAL ARCHIPELAGO | 30 | 264 | 177 |
| FRENCH POLYNESIA, GAMBIER ARCHIPELAGO | 54 | 315 | 303 |
| FRENCH POLYNESIA, SOCIETY ARCHIPELAGO | 70 | 367 | 507 |
| FRENCH POLYNESIA, TUAMOTU ARCHIPELAGO | 98 | 675 | 486 |
| GALAPAGOS ISLANDS | 15 | 67 | 97 |
| JAMAICA | 19 | 143 | 187 |
| LAU PROVINCE, FIJI | 64 | 313 | 363 |
| NAVASSA | 15 | 106 | 99 |
| NEW CALEDONIA | 74 | 562 | 505 |
| NORTHERN GREAT BARRIER REEF | 162 | 961 | 728 |
| PALAU | 86 | 1,004 | 878 |
| SAUDI ARABIAN RED SEA | 128 | 384 | 384 |
| SOLOMON ISLANDS | 68 | 453 | 640 |
| ST. KITTS AND NEVIS | 23 | 84 | 244 |
| TONGA | 54 | 314 | 192 |
| **GRAND TOTAL** | **1,206** | **8,596** | **8,314** |

**Figure 2: a-j** LOCATION OF THE SITES VISITED ON THE KHALED BIN SULTAN LIVING OCEANS FOUNDATION GLOBAL REEF EXPEDITION FROM 2006-2011 WHERE HABITAT AND BATHYMETRIC MAPS WERE PRODUCED. RED POLYGONS EMPHASIZE EXTENT OF MAPPING AND ENCOMPASS A TOTAL AREA OF 65,000 SQ. KM OF HABITAT SITUATED SHALLOWER THAN 25 M WATER DEPTH. ACCOMPANYING SITE NAMES ARE IN RED. GBB IN FIGURE 2E ABBREVIATES GREAT BAHAMA BANK. NORTH IS TOP IN ALL MAPS; SCALES AS NOTED. FIGURE AND CAPTION REPRODUCED WITH PERMISSION FROM PURKIS ET AL. (2019).




AREAS MAPPED

## 3.1 HABITAT MAPPING

Using multispectral Quickbird and WorldView-2/3 satellite imagery (DigitalGlobe Inc., Colorado, USA), in combination with data obtained from aerial surveys and ground-truthing by KSLOF fellows and researchers, high-resolution bathymetric maps and thematic habitat maps were created for shallow marine environments of 10 countries, spanning the Red Sea, Caribbean Sea, and Pacific and Indian Oceans (see examples of map outputs in **Figures 3a-c**)[15]. The remote sensing data and its derivatives will be useful not only for marine spatial planning but also as a reference for future research on the world's reefs. The generated maps extend from the shoreline to approximately 25 m water depth. Ground-truthing, which was used to define habitat classes and guide interpretation of the remote sensing data, included the continuous acquisition of depth soundings, drop-camera deployment, sediment and hard substrates, snorkel and dive assessments, and fine-scale photo-transect surveys. A publication by Purkis et al. (2019) provides a comprehensive description of our mapping methodology and findings from the GRE during the time period covered by this report[29].

## 3.1 a SATELLITE IMAGERY

KSLOF acquired a total of 65,000 km$^2$ of DigitalGlobe Inc. Quickbird and WorldView-2/3 (8 band) satellite imagery for the regions mapped. The satellite images had a spatial resolution of 2 m x 2 m (each pixel covers a 4 m$^2$ area), enabling real-time navigation in the field to locate features of interest. KSLOF fellows from Nova Southeastern University used the scenes in conjunction with a differential GPS device to navigate throughout the coral reefs. Modelers used the imagery, combined with the ground-truthing data, to create bathymetric and benthic habitat maps **(Figure 4)**[29,33].

**Figure 3**

EXAMPLE OF (A) A TRUE-COLOR SATELLITE IMAGE CAPTURED FROM THE WORLDVIEW-2 SENSOR, (B) A HABITAT MAP, AND (C) A SPECTRALLY-DERIVED BATHYMETRY MODEL. THESE THREE EXAMPLE OUTPUTS ARE OF PALMERSTON ATOLL, COOK ISLANDS.

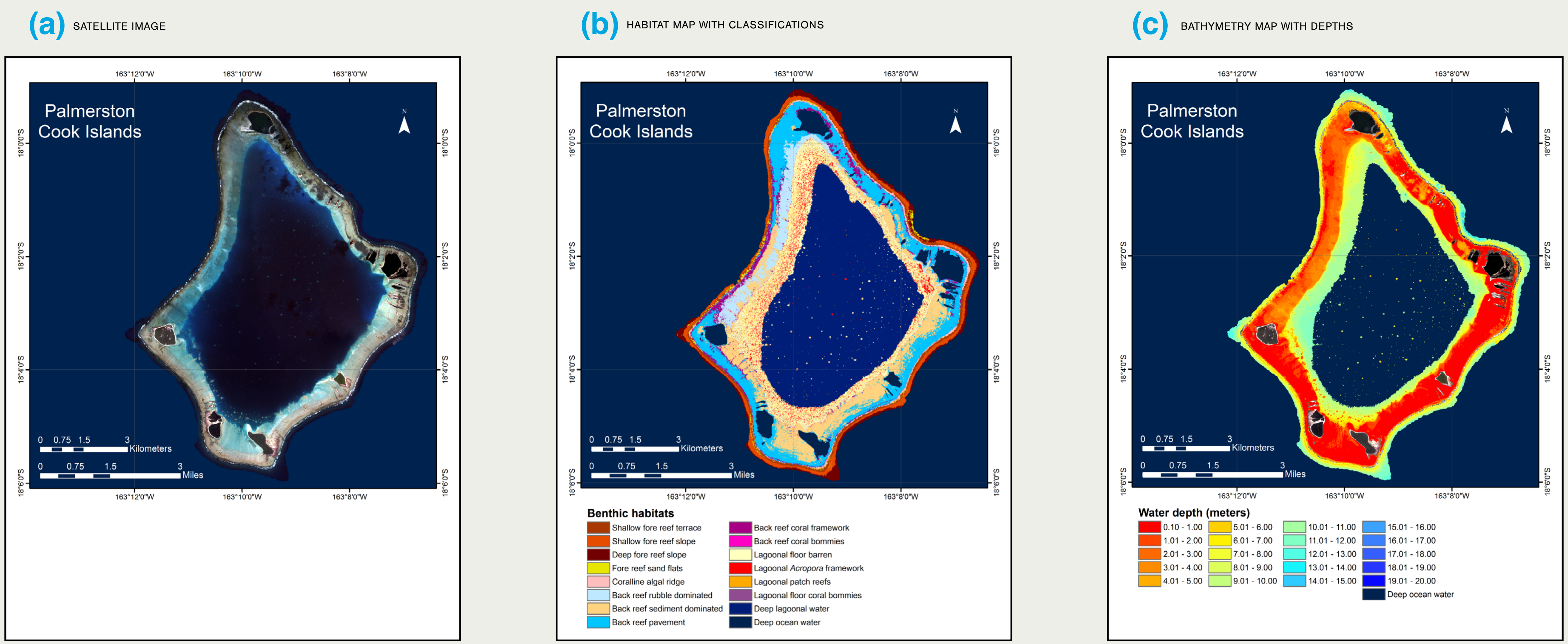



Figure 4

SEAVIEWER UNDERWATER VIDEO 'DROP-CAM' USED TO RECORD BENTHIC COMPOSITION AROUND EACH ISLAND.

## 3.1 b BENTHIC VIDEO

KSLOF scientists used an underwater tethered digital video camera, commonly termed a "drop-cam," to gather video of the benthic composition at each drop-cam location (Figure 4). At each point, the drop-cam was lowered from the survey boat to within 0.5 m of the seafloor and video recorded for up to 60 seconds. During this time, the laptop operator watched the video in real time and guided the drop-cam operator to raise or lower the camera to avoid any topography. In this manner, damage to marine life was prevented. The video was recorded on a ruggedized laptop, with position, time, date, boat heading, and boat speed digitally etched into the video stream. Drop-cam deployment was limited to depths shallower than 40 m due to the length of the tether cable (50 m).

## 3.1 c HABITAT CLASSIFICATIONS

Classifications of all the marine and terrestrial habitat types were determined using satellite imagery, ground-truthing, and benthic video surveys. The combination of all data collected was used for the development of a habitat classification scheme and training of eCognition software to develop object-based classification models[29]. A total of 82 habitat types were defined for all the studied sites (Appendix 1).

## 3.1 d ACOUSTIC WATER DEPTH SOUNDINGS

Sonar soundings were gathered by KSLOF fellows along transects using a Syqwest Inc. Hydrobox, a single-beam acoustic transducer operating at 50 Hz (Figure 5). Each sounding was positioned using differential GPS, and the data was recorded on a ruggedized laptop. The soundings were used to train a satellite water-depth derivation model, which is based on the spectral attenuation of light in the water column[33]. The final topo-bathymetric maps have the same spatial resolution as the satellite imagery from which they were extracted (i.e., 2 m x 2 m). The total number of depth soundings along with the number of drop camera videos and total area mapped by country can be found in Table 2.

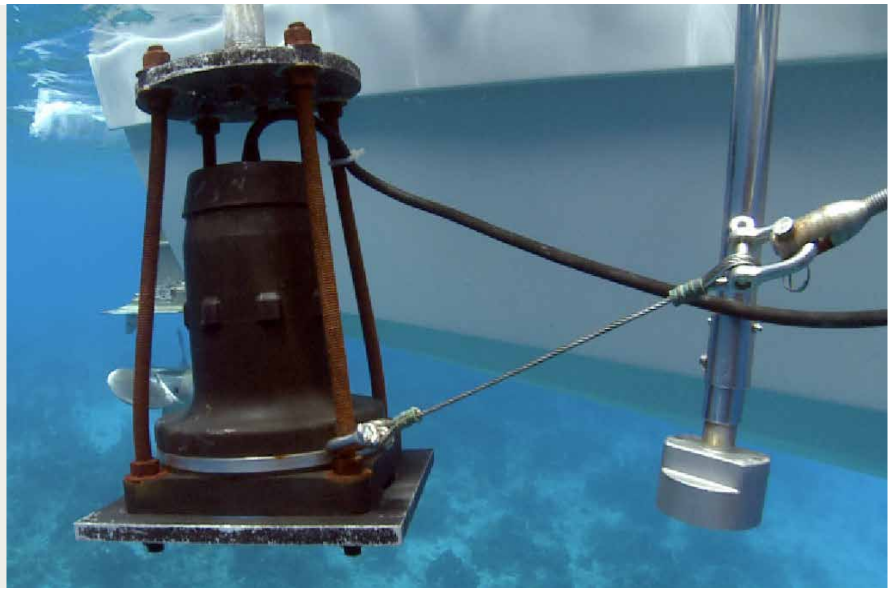


Figure 5

ACOUSTIC SONARS USED IN THE SURVEYS. SUB-SEABED PROFILER (LEFT) AND SINGLE-BEAM SONAR (RIGHT).

Table 2 A SUMMARY BY COUNTRY OF THE MAPPING COMPONENT OF THE THE GLOBAL REEF EXPEDITION. THIS TABLE WAS REPRODUCED WITH PERMISSION FROM PURKIS ET AL. (2019).

| Location | Year Fieldwork Conducted | Area of Reef Mapped (km$^2$) | Number of Drop Camera Videos | Number of Depth Soundings |
|---|---|---|---|---|
| Saudi Arabia | 2006-2009 | 31,419 | 1,759 | 2,711,903 |
| Bahamas | 2011 | 7,801 | 1,054 | 1,928,148 |
| Colombia | 2012 | 1,103 | 446 | 364,771 |
| Galapagos | 2012 | 1,030 | 593 | 1,258,413 |
| French Polynesia | 2012-2013 | 7,802 | 1,645 | 8,650,690 |
| Cook Islands | 2013 | 1,100 | 596 | 1,055,627 |
| Fiji | 2013 | 2,542 | 987 | 3,037,823 |
| Tonga | 2013 | 2,322 | 724 | 1,602,931 |
| New Caledonia | 2013 | 3,024 | 1,218 | 3,142,899 |
| Solomon Islands | 2014 | 2,965 | 962 | 3,458,261 |
| Chagos Archipelago | 2015 | 3,951 | 1,205 | 4,459,966 |
| Total | | 65,059 | 11,189 | 31,671,432 |

# 3.2 CORAL REEF COMMUNITY SURVEYS

*The KSLOF scientists and fellows on the GRE used a combination of quantitative methods, including belt transects, point intercept transects, and quadrats, to assess benthic and fish communities of reefs surveyed on the GRE. Surveys completed in the Caribbean followed the Atlantic and Gulf Rapid Reef Assessment (AGRRA) methodology, which is standard for assessing the reefs in this region[34]. The remainder of the GRE followed a similar methodology using the point-intercept method and belt transects to measure the status of the reefs. This standardized collection methodology provides robust data that can be compared regionally and globally.*

## 3.2 a BENTHIC COVER ASSESSMENTS

The AGRRA and KSLOF benthic surveys followed a similar methodology, with the only exception being the identification of coral in the Red Sea and Pacific and Indian Oceans to the genus level, rather than species level, as adopted in the Caribbean. Cover of major functional groups and substrate types (Box 1) were assessed along 10 m transects using recorded observations and/or photographic assessments. The major functional groups assessed included corals identified to genus or species; other sessile invertebrates, such as giant clams, anemones, and others, identified to phylum or class; and six functional groups of algae: crustose coralline algae (CCA), erect calcareous algae, cyanobacteria, fleshy macroalgae, turf algae, and turf mixed with sediment. At least two KSLOF surveyors used scuba-recorded observations to quantify benthic cover using a point-intercept method across all locations. This technique required the surveyor to place a 10 m transect line and record the organism and substrate type at every 10 cm mark (total 100 points per transect). A minimum of four transects were completed at each survey station (Figure 6), and when possible, surveys were completed at 25, 20, 15, 10, and 5 m water depths.

At some locations in the Red Sea, Pacific, and Indian Ocean, a photographic assessment was conducted to supplement the point-intercept surveys. On occasion, we were not able to complete the point-intercept surveys at every depth due to scuba time limitations, so we supplemented this dataset with photographic assessments. In this sampling technique, a scientific diver used a 1 m × 1 m quadrat, flipping it over a total of 10 times per transect to photograph a full 1 m x 10 m photo-transect (Figure 7) at each depth. When possible, the diver completed at least one survey at 20, 15, 10, and 5 m depths at each site.

**Box 1** CLASSIFICATION OF SUBSTRATE AND COVER TYPES RECORDED DURING BENTHIC TRANSECT SCUBA SURVEYS.

| BENTHIC HABITAT |
|---|
| **SUBSTRATE TYPE** |
| Live Coral |
| Dead Coral |
| Fused Rubble |
| Pavement |
| Rubble |
| Sand/Sediment |
| Recently Dead Coral |
| **LIVE COVER** |
| Algae |
| Macroalgae |
| Crustose Coralline Algae (CCA) |
| Erect Coralline Algae |
| Turf Sediment |
| Turf |
| Cyanobacteria |
| Other Invertebrates |
| Coral (to Genus) |

To measure the benthic community, the digital photographs were downloaded and analyzed using Coral Point Count with Excel Extensions (CPCe), a software developed by Nova Southeastern University's National Coral Reef Institute (NCRI)[35]. The 1 m x 1 m images were imported into the software, where 50 random points were overlaid on each photograph. A KSLOF scientist then defined the organism and substrate type directly underneath the point (Figure 8). This data was then exported into a Microsoft Excel (2013) spreadsheet and added to the benthic survey database for further analysis.

To measure overall coral diversity by genus, we used the Simpson Diversity Index, which is commonly used to characterize species diversity in a community[36]. This index uses the total number of individual coral colonies of a specific genus observed per transect and location, and the total number of genera, to provide a number to represent the total diversity of the island community. The calculated diversity index values will fall between 0 and 1, with the low diversity being close to zero and the high diversity close to one. For the Caribbean, and Pacific and Indian Ocean basins datasets, we used total coral genera counts across all locations in each region to standardize the coral diversity index. Doing this allows us to compare the data within each of the geographic regions. Because the coral species found in the Caribbean are not the same as those in the Pacific and Indian Ocean basins, we calculated the diversity separately for these two regions.

The benthic substrate cover percentages were calculated for each transect, then averaged by site. Further statistical analysis was completed using R-software to determine the relationships between the metrics measured[35]. Site averages were used to measure country-wide assessments addressed in this report.

**Figure 6** A DIVER CONDUCTING A BENTHIC SURVEY. DIVER USES A 10 M TRANSECT LINE AND RECORDS BENTHIC SUBSTRATE TYPE AND COVER EVERY 10 CM.

**Figure 7** A DIVER TAKES A PHOTO OF A 1M × 1M SQUARE QUADRAT. TEN PHOTOS FOR EACH TRANSECT ARE COMPLETED AT DIFFERENT DEPTHS TO SUPPLEMENT DATA COLLECTED USING TRANSECT LINES AS SHOWN IN FIGURE 6.

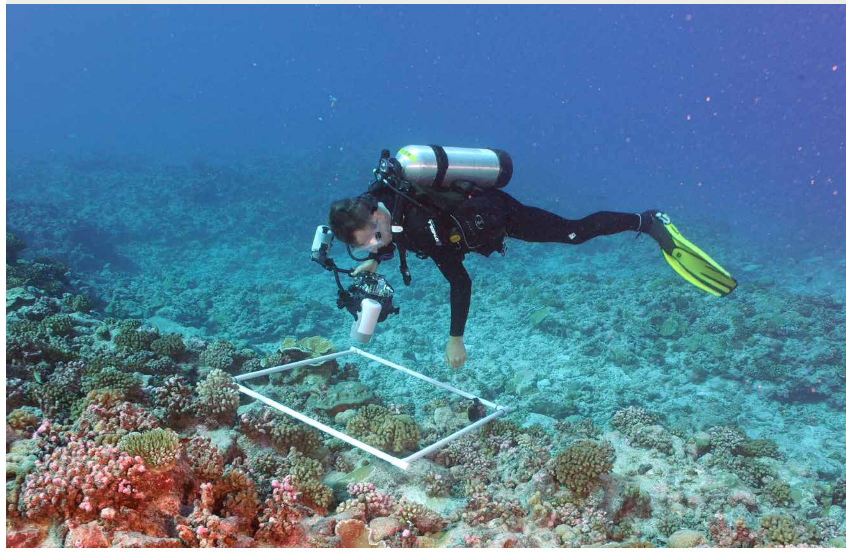
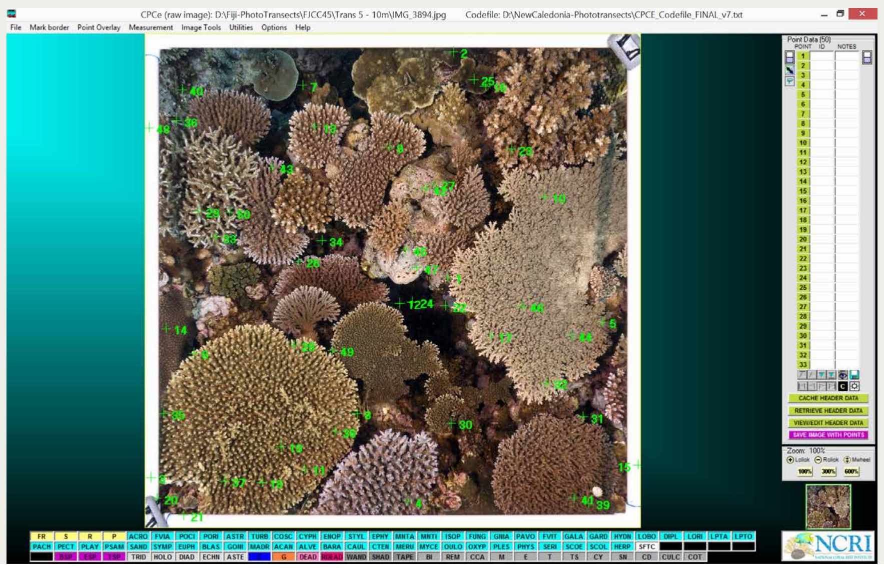


Figure 8 EXAMPLE OF A PHOTOGRAPHED QUADRAT IMPORTED INTO CORAL POINT COUNT WITH EXCEL EXTENSIONS (CPCE) SOFTWARE, WITH RANDOMLY PLACED POINTS FOR IDENTIFICATION. FIFTY RANDOM POINTS ARE OVERLAID ON EACH PHOTO QUADRAT AND SUBSTRATE TYPE AND LIVE COVER CLASSIFICATION ARE IDENTIFIED FOR EACH POINT.




## 3.2 b FISH ASSESSMENTS

Reef fish surveys in the Caribbean were conducted following the AGRRA survey methodology where key indicator species were counted. Fish size and count data were collected along 30 m x 2 m belt transects, where fish size was estimated to the nearest 5 cm using a T-bar. The assessment focused on 88 species of ecologically, commercially, and recreationally important fish, but surveys recorded a total of 170 species in the assessment. Mean total density and mean total biomass were calculated among transects for each site.

In the Pacific and Indian Oceans, survey methods were similar to AGRRA, and transects covered depths between 1 to 22 m, but most of the surveys were between 5 and 20 m depth (Figure 9). Transects were deployed at deep (>11 m) and shallow (<10 m) sections of the reefs, as allowed by the morphology of the survey stations. Where possible, at least two deep and two shallow transects were conducted by divers at each site. The fish assemblages at each survey station were surveyed following a fish visual census technique modified from the survey principles described by English et al. (1994)[37]. The diver identified and counted fish along a 30 m x 4 m transect for 10 to 15 minutes.

Fish assemblages were characterized in terms of species richness, abundance, and standing stock biomass. Fish were identified to species level, whenever possible, with the aid of photographic fish guides[38–41]. The abundance of each species of a particular size was estimated by actual counts or by cluster in the case of a school of fish. The biomass of each species was then computed using the formula ***W=aLb*** where ***W*** is the weight in grams, ***L*** is the length of the fish in centimeters, and ***a*** and ***b*** are the species-specific growth constants derived from the length-weight relationships[42–46]. Abundance and biomass data were then calculated and represented as density by number of individuals per 100 $m^2$ and biomass by kg per 100 $m^2$.

The counted fish were also attributed to either feeding guild (herbivore, piscivore, or invertivore), as was the case in the Caribbean using AGRRA surveys, or trophic-level categories, based on diet by species, as was the case in the Pacific and Indian Oceans[45]. The relationship between trophic levels and feeding habits is not strictly straightforward nor well defined, because of wide overlaps in the food items consumed by different species[47]. Therefore, the trophic levels under which a specific species is classified may be considered elastic and representative of the mean of its diet items.

Trophic levels were expressed numerically and broadly represented herbivores (2.0-2.4), corallivores (2.5-2.9), planktivores (3.0-3.4), benthic carnivores (3.5-3.9), and piscivores (4.0-4.5)[48]. By analyzing the fish communities using trophic levels, we strived to understand the community structures and determine how fishing pressures might be affecting the reef fish populations. Fish in trophic levels 2.0-2.5 and 2.5-3.0 are typically small and are not considered important to local fisheries[49]. Fish that are classified in trophic levels 2.0-3.0 are usually important indicator species that contribute to the health of the reef by providing such services as cropping algal growth that otherwise would impede the settlement of juvenile corals[50,51]. These fish include damselfish, tangs, surgeonfish, butterflyfish, and a few small-bodied parrotfish. Fish in trophic levels 3.0-3.5 and 3.5-4.0 include larger-bodied herbivores, planktivores, omnivores, or carnivores that feed on small benthic invertebrates. Fish classified in these ranges include wrasses, some species of butterflyfish, damselfish, hogfish, goatfish, snappers, and triggerfish. Fish in trophic levels 4.0-4.5 are typically considered top predators and prey on finfish of the lower trophic levels. These predatory fish include large wrasse, grouper, hawkfish, snapper, goatfish, and sharks. The majority of the fish important to local fisheries are found in trophic levels 3.5-4.0 and 4.0-4.5[49,52].

Figure 9 A SCIENTIFIC SCUBA DIVER RECORDS FISH ALONG A TRANSECT LINE. SCIENTIST RECORDS FISH OBSERVED ALONG A 30 M × 4 M TRANSECT OVER A 10-15 MINUTE PERIOD.

# 4.0 RESULTS

# 4.0 FINDINGS FROM THE GLOBAL REEF EXPEDITION

*The findings from the Global Reef Expedition highlight both expected and some unexpected ecological trends around the world. The Caribbean reefs, while showing similar trends among themselves, presented very different benthic assemblages when compared to the rest of the regions surveyed. Within the Eastern Pacific, the Galapagos Islands distinguished themselves as a unique region that didn't follow traditional ecological trends in both the benthic and fish assemblages.*

Fine-scale analysis of the benthic and fish communities for each country can be found in the Global Reef Expedition final country reports previously published by the KSLOF[53–67]. These reports provide detailed information, oftentimes to the site level, about the reefs from each country surveyed on the GRE. Additionally, detailed habitat and bathymetry maps can be found on the KSLOF Map Portal. These products can be interrogated and provide highly accurate maps of nearshore marine habitats. While a fine-scale analysis is important for local conservation efforts, understanding global trends will be key to facilitating a global initiative to help combat the coral reef crisis currently plaguing the world. The findings of this report are broad-scale and compare country-wide data to better understand global trends of the world's reefs.

## 4.1 SAUDI ARABIAN RED SEA COASTLINE

Five regions of the Saudi Arabian Red Sea (SARS) coastline were mapped and surveyed between 2006 and 2009. The Farasan Islands (2006), Ras Al-Qasabah (2007), Al Wajh (2008), Yanbu (2008), and the Farasan Banks (2009) were selected for their complexity of marine habitats and presence of extensive, unique offshore reef systems. These reefs also generally experienced low human use and impact, and presented an excellent opportunity to assess the unique habitats and biodiversity found in the region.

### 4.1 a MAPPING SAUDI ARABIAN RED SEA MARINE HABITATS

The mapping expedition to the SARS was the most extensive, and the first of its kind to ever occur in this region of the world. The results were published in the first-ever atlas of the coral reef habitats in the Saudi Arabian Red Sea[28]. Using satellite and aircraft data, approximately 32,000 km$^2$ of shallow-water bathymetry and habitats were mapped across the five regions visited[29]. These maps include 15 unique marine habitats from the shoreline to approximately 100 km offshore that were not seen in other parts of the world. The maps produced from this mission have been used in multiple studies to help develop novel methodology that uses remote sensing to identify areas of resilience and model live coral cover in the Red Sea[28,68–75].



### 4.1 b BENTHIC COMPOSITION OF SAUDI ARABIAN RED SEA CORAL REEFS

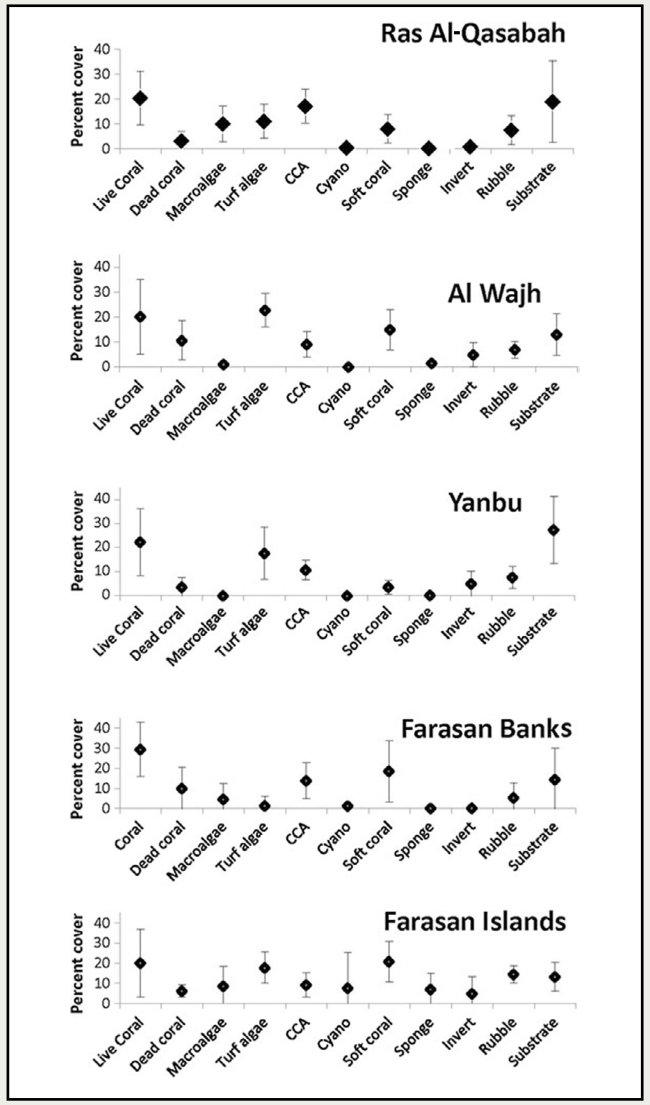
The northern-central SARS (Ras Al-Qasabah, Al Wajh, and Yanbu) had a high diversity of reef and coastal habitat types. These included large areas of coastal marshes, seagrasses, algal flats, sandy lagoons, and mangroves. The mainland and islands had fringing coral reefs and offshore patch reefs and barrier reefs. The southern area, including the Farasan Banks and Farasan Islands, had a wide, shallow shelf and turbid waters with high sedimentation in nearshore areas.

The Farasan Banks had the highest mean live coral cover (29.4±13.4% S.E.), and the lowest was found in Ras Al-Qasabah (20.4±10.4% S.E.) (Figure 10)[76]. Dead coral was commonly seen across sites and accounted for over 10% of the benthos. It appeared that most reefs throughout the region had experienced several acute past disturbances, such as possible bleaching events and disease and COTS outbreaks, that were responsible for extensive coral losses, and large portions of the entire reef track were devoid of adult colonies. The coral communities showed signs of recovery, with numerous coral recruits observed, and small colonies of live coral dominated the reefs.

Macroalgal cover was high in shallow locations in the Farasan Islands, nearshore reef flat communities in the Farasan Banks, and parts of Ras Al-Qasabah. Turf and CCA were the dominant algae found in Al Wajh and Yanbu. In all locations, benthic invertebrates (predominantly *Xenia*, 14-20% cover) colonized substrate and dead coral skeletons, particularly in degraded areas on deeper reefs.

## Figure 10

BENTHIC COVER OF FIVE REGIONS SURVEYED ALONG THE SAUDI ARABIAN RED SEA COASTLINE. BENTHIC COVER WAS RECORDED AS LIVE CORAL, DEAD CORAL, ALGAL FUNCTIONAL GROUPS (MACROALGAE, TURF ALGAE, CRUSTOSE CORALLINE ALGAE, AND CYANOBACTERIA), BENTHIC INVERTEBRATES (SOFT CORALS, SPONGES, AND OTHER SESSILE INVERTEBRATES POOLED), RUBBLE, AND UNCOLONIZED SUBSTRATE (SAND, PAVEMENT). ERROR BARS INDICATE STANDARD ERROR. FIGURE REPRODUCED WITH PERMISSION FROM BRUCKNER AND DEMPSEY (2015); COPYRIGHT SPRINGER-VERLAG BERLIN HEIDEBERG 2015; DOI 10.1007/978-3-662-45201-1_27.



4.1

## c REEF FISH ASSEMBLAGES OF SAUDI ARABIAN RED SEA CORAL REEFS

In general, most SARS reefs had a relatively high diversity of fishes, with representatives of most functional groups present. However, some species appeared to be depleted, including many of the top predators like sharks and large groupers. This was apparent in both a reduced number of fishes within transects and the presence of primarily juveniles and young adults of a small size. Of the fish present, few had achieved their maximum size. Coral feeders, including butterflyfish, angelfish, and filefish/pufferfish, were common on reefs with moderate to high coral cover, while they were absent from several of the more degraded sites. Certain planktivores, especially fusiliers, were often abundant in offshore locations adjacent to a steep slope, which may be indicative of upwelling. Herbivores, such as rabbitfish and surgeonfish, were usually most common on the reef flats, especially in the Farasan Banks and Farasan Islands where algal abundances were higher. In some cases, parrotfish were the largest-sized fish recorded in reef surveys[77].

4.1

## d MODELING RESILIENCE IN THE RED SEA

Measuring reef resilience was an important objective on the Red Sea research mission. Rowlands et al. (2012) used field data, satellite imagery, and remote sensing to model resilience of the Saudi Arabian Red Sea coastline[70]. To measure resilience, they used live coral abundance, framework abundance, water depth variability, fishing pressure, industrial development, and temperature stress as measures of stress to the environment. Using the high-resolution habitat maps, they overlaid a 1 km x 1 km geographic information system (GIS) grid across the map and used the field-collected data to develop multiple resilience indices across the multiple habitats. The indices they developed included a coral abundance index, framework abundance index, depth variability index, fishing intensity index, development index, thermal stress index, and remote-sensed resilience index within each of the 1 km GIS grid cells.

Ultimately, Rowlands et al. (2012) found that the reefs of the Farasan Banks had the highest overall resilience, which reflects a low level of combined stress and a reef landscape that promotes persistence of coral communities. The fishing pressure index was the greatest in the waters offshore of Jizan and the Farasan Islands, which can be attributed to the large industrial and traditional fishing fleets that are moored in the area. Yanbu had the lowest median combined resilience index, which may be attributed to the high fishing pressure on these reefs. Across all locations, Rowlands et al. (2012) notes that many factors, such as reef framework, coral abundance, thermal stress, fishing, and coastal development, have different levels of impact and contribute to the variability seen in the resilience of the reefs throughout Saudi Arabia. Studies like this provide critical insight into reef resilience that can be applied by Red Sea marine managers in the establishment of MPAs and management plans.

> Measuring **reef resilience** was an important objective on the **Red Sea research mission.**



4.2

## CARIBBEAN

*The Global Reef Expedition surveyed Caribbean reefs in The Bahamas (2011), St. Kitts and Nevis (2011), Jamaica (2012), Navassa (2012), and Colombia (2012). These reefs had some of the lowest coral cover, fish biomass, and fish density recorded on the GRE. Macroalgae dominated the substrate in all locations; however, there was no significant correlation between biomass of herbivorous fish and macroalgal cover.*

4.2

## a MAPPING THE CARIBBEAN

The Caribbean shallow marine habitats were mapped and surveyed on the Global Reef Expedition in 2011-2012. KSLOF developed high-resolution habitat maps of The Bahamas and Colombia. The Bahamian maps were published in the *Atlas of Shallow Marine Habitats of Cay Sal Bank, Great Inagua, Little Inagua, and Hogsty Reef, Bahamas*[30]. Combined, a total of nearly 9,000 km$^2$ were mapped in these two countries. Of the 26 total in these maps, 22 were unique to this region of the world. The Bahamas was home to the most seagrass habitats mapped on the GRE, covering over 500 km$^2$. Colombia had large *Acropora palmata* patch reef and framework habitats mapped. *Acropora palmata* is a reef-building, highly threatened species of coral, so knowing the location and extent of where it is dominant can help with monitoring and preserving the species. These high-resolution habitat maps have been referenced when developing conservation and management plans in The Bahamas.

4.2

## b CARIBBEAN REEFS BENTHIC ASSEMBLAGE

To measure the condition of the benthic communities in the Caribbean, KSLOF scientists and partners conducted benthic surveys following AGRRA sampling protocol. All survey data from the regions visited on the GRE can be found in the AGRRA database[34]. Caribbean reefs historically have lower coral diversity and live coral cover than reefs in the rest of the world. These reefs are isolated from the Pacific and Indian Ocean, and evolution has allowed endemic coral and fish species to develop and prosper here. The Caribbean reefs, overall, had low live coral cover. The Bahamas (8.3±5%) and Navassa (8.6±5%) each had an average of less than 9% live coral cover, the lowest in the Caribbean, and St. Kitts and Nevis and Colombia had the highest mean (±S.D.) coral cover, 14±5% and 13±7%, respectively.

Across the Caribbean, the number of coral genera observed averaged between 3-4.5 per transects out of 15 total genera recorded. *Siderastrea*, *Porites*, *Orbicella*, and *Agaricia* were the dominant coral genera in every country surveyed in the Caribbean. Coral genera diversity was measured for each country using the Simpson Diversity Index. Table 3 shows the coral diversity of each country surveyed in the Caribbean.

Algae groups recorded on the benthos include crustose coralline algae (CCA), erect calcareous algae (such as *Halimeda*), turf, fleshy macroalgae, and turf mixed with algae (Box 1). Overall, macroalgae was the dominant algal group of the benthos (Figure 11) in the Caribbean. Examples of macroalgae recorded on the survey transects include algae from the genera *Caulerpa*, *Sargassum*, *Lobophora*, *Padina*, *Peyssonnelia*, *Microdictyon*, and *Dictyota*. These algae are common throughout the Caribbean and have become more abundant due to the decline in herbivorous grazers and coral cover over the past 30 years. Macroalgae was most abundant in The Bahamas (49±22% cover) and Navassa (44±12% cover). Jamaica had the lowest macroalgal cover (22±8%) and the most crustose coralline algae (CCA) observed (18±7%) in the Caribbean (Figure 11). The mean percentage of algae observed in the Caribbean was 65% (±14% S.D.), with Colombia having the lowest (55±11% S.D.) and The Bahamas having the highest (70±15% S.D.) mean percentages recorded.

## Table 3

CORAL DIVERSITY FOR LOCATIONS SURVEYED IN THE CARIBBEAN WAS CALCULATED USING THE SIMPSON DIVERSITY INDEX. CORAL DIVERSITY WAS MEASURED USING CORAL GENERA CLASSIFICATIONS AS THE LOWEST TAXONOMIC IDENTIFICATION. CORAL GENERA DIVERSITY MEASURES WERE NORMALIZED ACROSS THE CARIBBEAN COUNTRIES SURVEYED. A VALUE CLOSE TO ZERO INDICATES LOW DIVERSITY AND A VALUE CLOSE TO ONE INDICATES HIGH DIVERSITY.

| COUNTRY | SIMPSON DIVERSITY INDEX |
|---|---|
| Bahamas | 0.83 |
| Colombia | 0.79 |
| Jamaica | 0.84 |
| Navassa | 0.86 |
| St. Kitts & Nevis | 0.83 |

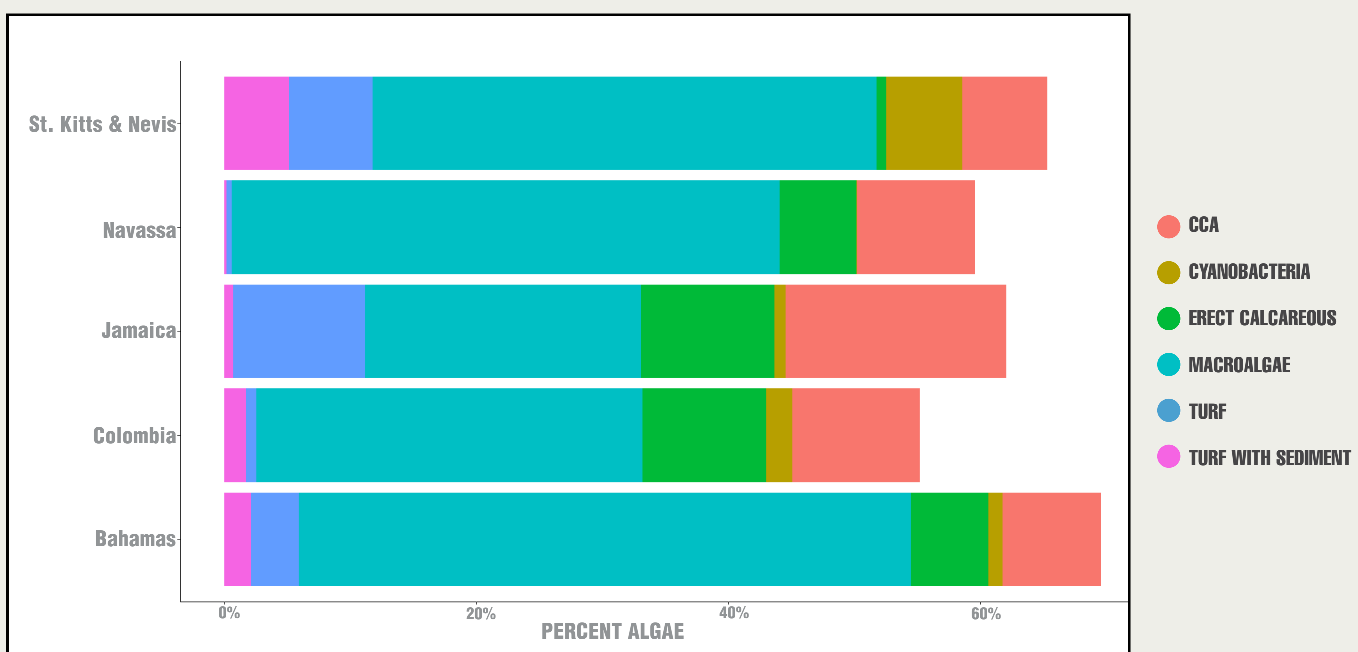
# 4.2 C

## CARIBBEAN REEF FISH ASSEMBLAGE

Reef fish biomass and density were measured to assess the status of the Caribbean reef fish populations in each of the locations surveyed. The reef fish were grouped into feeding guilds: piscivores, invertivores, and herbivores. This allowed us to understand the community dynamics of the reef fish and assess the impact these different feeding guilds may be having on the benthic communities. In all locations, total fish density and biomass were low. Herbivores were the overwhelmingly dominant fish group in both density and biomass (Figure 12a and b). Overall, the total mean fish biomass (±S.D.) for the Caribbean was 8.2±7.4 kg per 100 $m^2$, and the total mean fish density was 61±24 fish per 100 $m^2$. The Bahamas overall had the highest mean fish biomass (11±9.5 kg per 100 $m^2$) and the second-highest mean fish density (61±25 fish per 100 $m^2$). The Bahamas also had nearly double the mean fish biomass of invertivores and piscivores (Figure 12b) than other locations in the Caribbean. Colombia had the highest total mean fish density (77±19 kg per 100 $m^2$); however, the country also had the second-lowest mean fish biomass (5.6±2.8 kg per 100 $m^2$), indicating the fish observed were small but abundant. St. Kitts and Nevis had the lowest total fish biomass (4.2±3.3 kg per 100 $m^2$) and fish density (45±13 fish per 100 $m^2$), and despite poor fish populations, this country had the highest average live coral cover (14±5% S.D.) of all the Caribbean countries surveyed.

## Figure 11

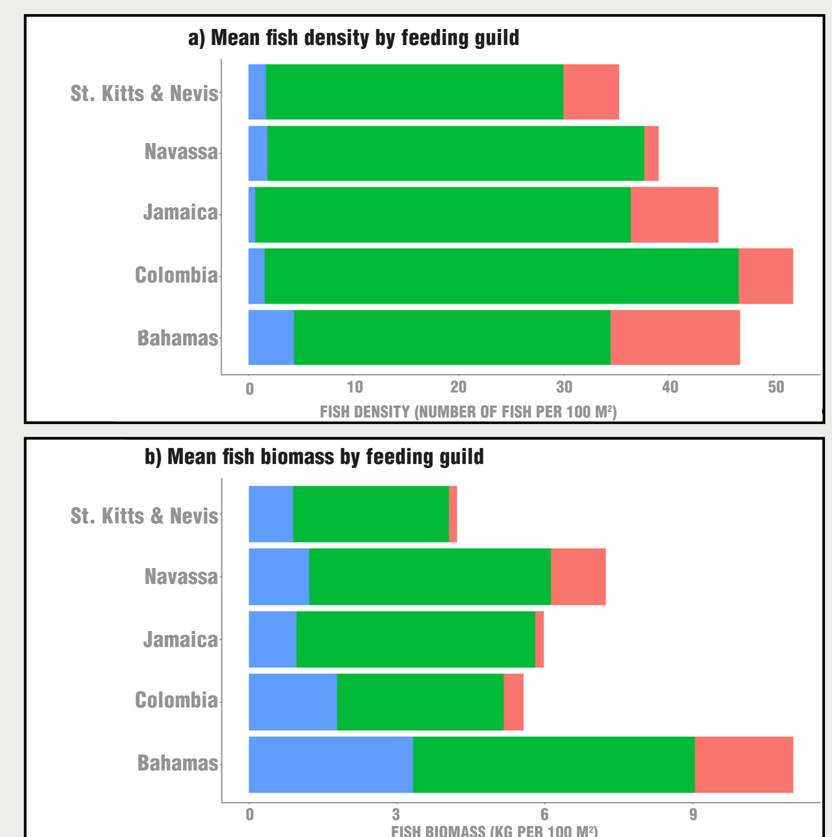
MEAN PERCENTAGE OF ALGAE GROUPS SURVEYED IN THE CARIBBEAN. ALGAE GROUPS RECORDED ON THE BENTHOS WERE CRUSTOSE CORALLINE ALGAE, CYANOBACTERIA, ERECT CALCAREOUS ALGAE, MACROALGAE, TURF, AND TURF MIXED WITH SEDIMENT. IN ALL LOCATIONS, MACROALGAE WAS THE DOMINANT ALGAE GROUP RECORDED.




## Figure 12

FISH COMMUNITY STRUCTURE IN CARIBBEAN LOCATIONS SURVEYED ON THE GRE. (A) MEAN FISH DENSITY (NUMBER OF FISH PER 100 $M^2$); AND (B) MEAN FISH BIOMASS (KG PER 100 $M^2$) OF FISH ARE GROUPED BY FEEDING GUILD (PISCIVORE, HERBIVORE, AND INVERTIVORE) FOR EACH LOCATION SURVEYED IN THE CARIBBEAN. HERBIVOROUS FISH ACCOUNTED FOR THE HIGHEST DENSITY AND BIOMASS IN ALL CARIBBEAN LOCATIONS.

PISCIVORE
HERBIVORE
INVERTIVORE

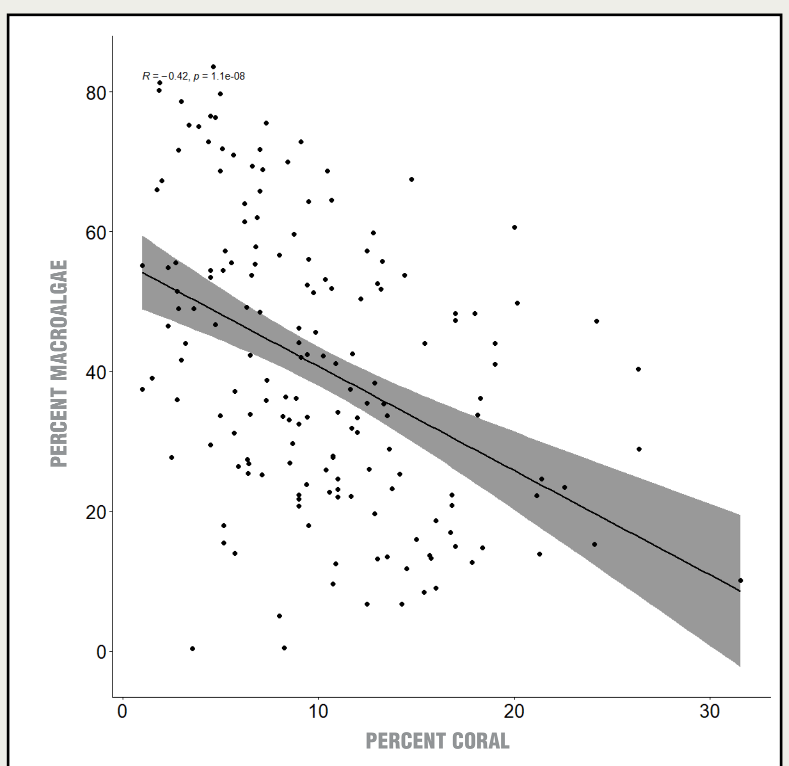


# 4.2 d ARE HERBIVOROUS FISH IMPACTING THE BENTHIC COMMUNITY?

To better understand the relationship between coral, algae, and fish, multiple regression analyses were performed, including more fine-scale correlations between fish feeding guilds (piscivore, herbivore, and invertivore) and common algae groups (macroalgae, CCA, turf). The goal was to identify the relationship between coral and macroalgae as a way to identify a potential for a phase shift from coral to algae, and to better understand the role of fish in controlling this phase shift. The percentage of recorded live coral cover across all Caribbean countries compared to algae groups showed a strong negative relationship between macroalgae and live coral cover (R=-0.42). As expected, as live coral cover increased, the total percentage of macroalgae decreased **(Figure 13)**. There was no significant relationship between coral cover and other algae groups (CCA, turf). Navassa (R=-0.68, p=0.005) and The Bahamas (R=-0.55, p=$1.5e^{-7}$) showed the strongest relationship between live coral and macroalgae. St. Kitts and Nevis and Jamaica both showed no significant relationship between these two variables **(Figure 14)**. The Caribbean-wide trend was likely driven by the strong correlation in The Bahamas and Navassa, as St. Kitts and Nevis and Jamaica both had a higher percentage of algae in other groups **(Figure 11)**. This might suggest Jamaica and St. Kitts and Nevis reefs may be recovering from a previous phase shift from coral to macroalgae.

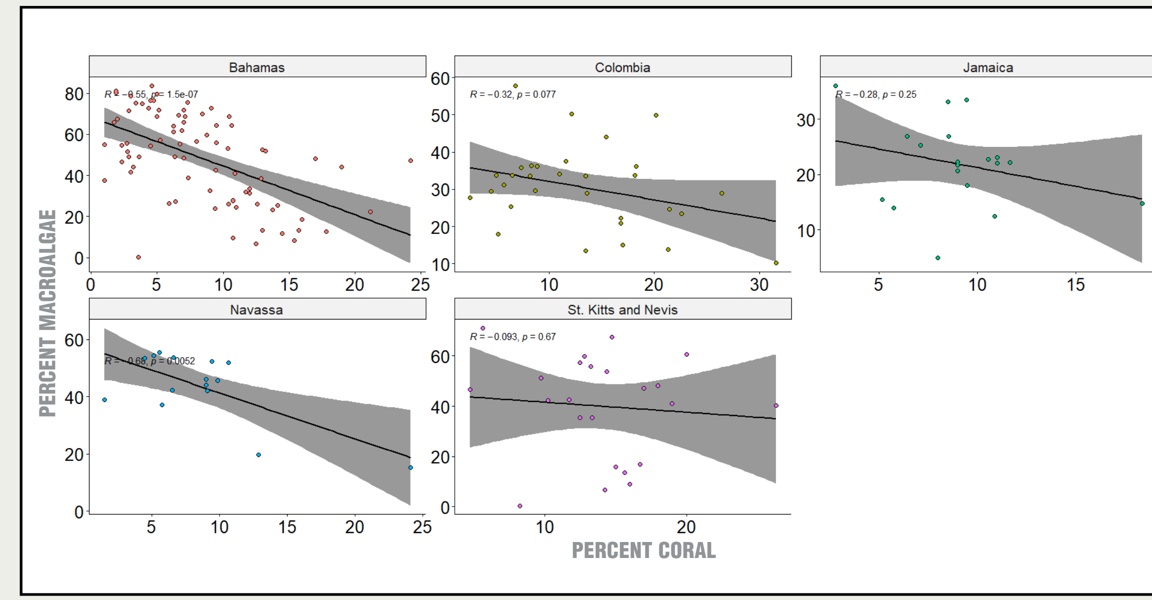
## Figure 13

SCATTER PLOT AND REGRESSION LINE COMPARING PERCENT LIVE CORAL COVER (X-AXIS) AND PERCENT MACROALGAE COVER (Y-AXIS) IN CARIBBEAN LOCATIONS SURVEYED ON THE GRE. MEAN PERCENT CORAL AND MEAN PERCENT MACROALGAE MEASURES FOR SITES SURVEYED ACROSS ALL CARIBBEAN LOCATIONS (N=168) WERE COMPARED TO BETTER IDENTIFY CARIBBEAN CORRELATION BETWEEN THESE TWO BENTHIC METRICS. THERE IS A STRONG NEGATIVE CORRELATION BETWEEN LIVE CORAL COVER AND PERCENT MACROALGAE (R=-0.42, P < 0.05). REGRESSION LINE AND VARIANCE ARE SHOWN.




## Figure 14

REGRESSION ANALYSIS OF PERCENT CORAL COVER (X-AXIS) AND PERCENT MACROALGAE COVER OF CARIBBEAN LOCATIONS SURVEYED. THREE OF THE FIVE LOCATIONS SURVEYED HAD A SIGNIFICANT CORRELATION BETWEEN THESE TWO BENTHIC METRICS AND THESE LOCATIONS (THE BAHAMAS, COLOMBIA, AND NAVASSA) AND ARE LIKELY DRIVING CARIBBEAN-WIDE TRENDS. SCALES FOR EACH GRAPH ARE DIFFERENT; REGRESSION LINE AND VARIANCE FOR EACH LOCATION SHOWN.



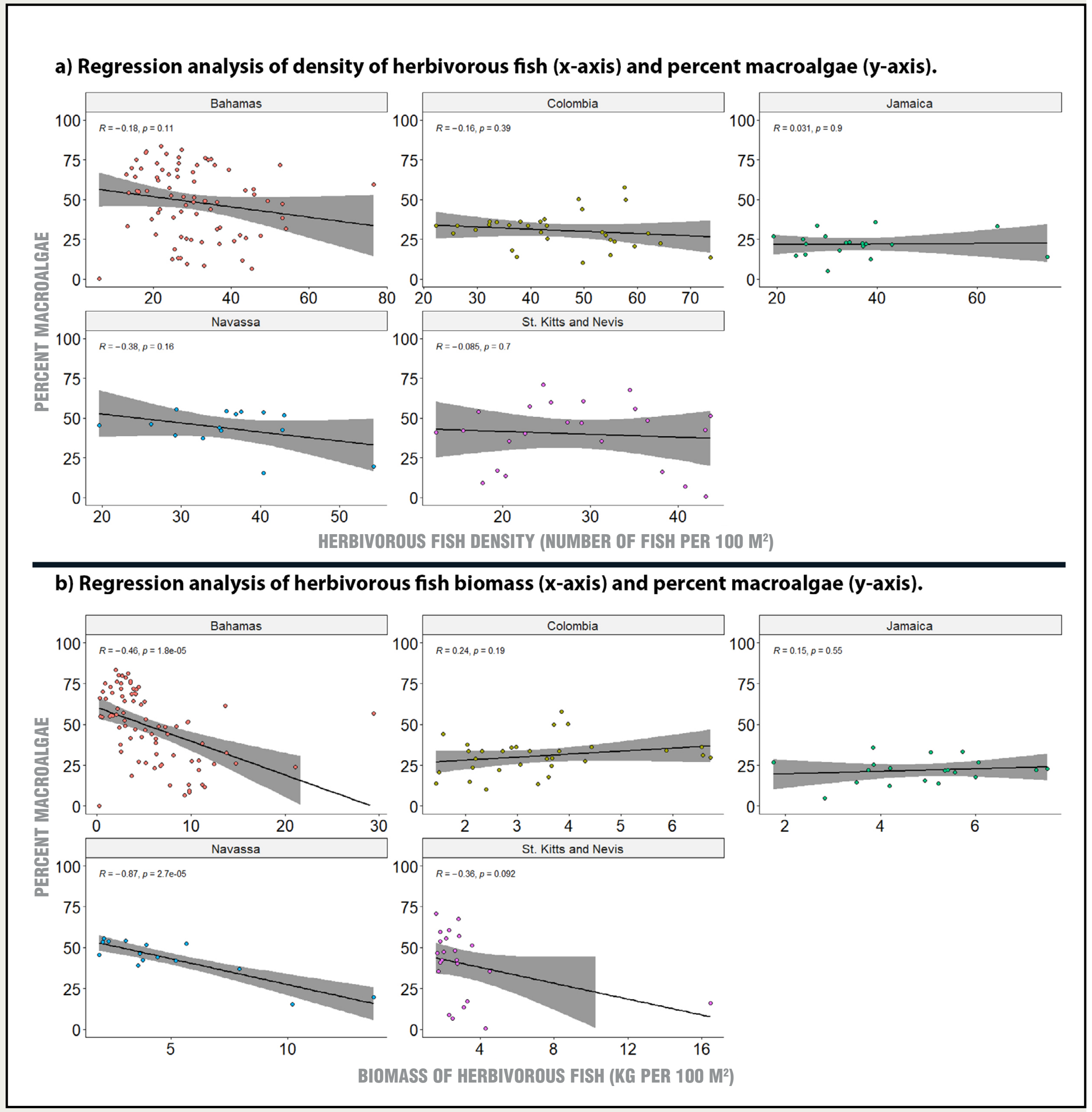

When looking at the correlation between fish biomass and the benthic organisms, there was a weak negative relationship with herbivorous fish density (R=-0.26) and biomass (R=-0.28) and macroalgal cover. This negative relationship indicates that the herbivorous fish may be helping to control the overall macroalgal cover; however, the relationship varied by country **(Figure 15a and b)**. The strongest correlations between herbivorous fish biomass and percent macroalgal cover were seen in The Bahamas (R=-0.46, p=$1.8e^{-5}$) and Navassa (R=-0.87, p=$2.7e^{-5}$) **(Figure 15b)**. These strong correlations can be attributed to the higher percentage of macroalgae and herbivorous fish observed in these countries.

There was no relationship between the total fish density, total fish biomass, and coral cover in the Caribbean. When further exploring the fish biomass and density by feeding guild, there was still no relationship with percent coral cover and fish.

Generally, other studies[51,78,79] have shown that fish biomass and coral cover have a strong correlation on a reef. It is likely that the fish biomass, density, and live coral cover across the Caribbean were all too low to show a meaningful relationship.

> There was **low fish biomass, density,** and **coral cover** across the **Caribbean.**

**Figure 15** REGRESSION ANALYSIS OF HERBIVOROUS FISH (A) DENSITY (NUMBER OF FISH PER 100 $M^2$) AND (B) BIOMASS (KG PER 100 $M^2$) AGAINST PERCENT MACROALGAE IN CARIBBEAN COUNTRIES SURVEYED ON THE GRE. THE CORRELATION BETWEEN HERBIVOROUS FISH DENSITY AND MACROALGAL COVER SHOWED NO SIGNIFICANT CORRELATION ACROSS ALL LOCATIONS. THERE WAS A NEGATIVE CORRELATION BETWEEN FISH BIOMASS AND MACROALGAL COVER IN THE BAHAMAS, NAVASSA, AND ST. KITTS AND NEVIS. GRAPHS SHOW FISH DENSITY AND BIOMASS ON THE X-AXIS, AND PERCENT MACROALGAE ON Y-AXIS. X-AXIS SCALES ARE VARIABLE.




## 4.3 PACIFIC AND INDIAN OCEANS

*Most of the reefs surveyed on the GRE were in the Pacific and Indian Oceans. The locations surveyed included the Galapagos Islands (2012), four island groups in French Polynesia including the Society Archipelago (2012), Tuamotu Archipelago (2012), Gambier Archipelago (2013), and the Austral Archipelago (2013), the Cook Islands (2013), Fiji (2013), Kingdom of Tonga (2013), New Caledonia (2013), Northern Great Barrier Reef (2014), Solomon Islands (2014), Republic of Palau (2015), and Chagos Archipelago (2015). The geographic expanse of these reefs allowed the GRE researchers to encounter some of the most pristine reefs with exceptionally high coral cover, fish biomass and density, as well as some reefs struggling to recover from local acute disturbances.*

## 4.3 a MAPPING REEFS IN THE PACIFIC AND INDIAN OCEANS

The KSLOF fellows mapped nearly all locations visited except for Palau and the Northern Great Barrier Reef, as these locations already had high-resolution habitat maps of their reefs. Over 24,000 $km^2$ were mapped in the Pacific and Indian Oceans, and a total of 61 unique shallow water habitats were identified, with most of the areas mapped surrounding atolls. Morphologically, nearly all the atoll reef systems consisted of traditional fore reef, backreef, and lagoonal habitats. The habitats identified included coral-dominated, macroalgal-dominated, and sediment-dominated habitats among the different areas of the reef system. The Galapagos Islands were unique, as they did not have the same geomorphology as seen in other regions of the Pacific Ocean. Instead, marine habitats such as basalt boulders and basalt rocks were common in this island group covering 61.6 $km^2$ and were unseen in other mapped regions of the GRE.

The Global Reef Expedition **mapped** over **24,000 km²** of **marine habitats** in the **Pacific** and **Indian Oceans.**

# 4.3 b PACIFIC AND INDIAN OCEANS BENTHIC ASSEMBLAGE

The benthic communities of the Pacific and Indian Oceans were assessed to provide insight into the expanse of the coral reef crisis and to determine the status of some of the most remote reefs. The mean (±S.D.) live coral cover in the Pacific Ocean basin was 36±17%. The reefs of the Gambier Archipelago in French Polynesia had the highest average live coral cover (52±13%), followed by Palau with 49±16% (Figure 16). The reefs with the lowest mean live coral cover were found in the Society Archipelago, French Polynesia, and the Galapagos Islands, both with 21% live coral recorded. As previously described in the French Polynesia Final Report[57], the reefs of the Society Archipelago had recently experienced a COTS outbreak that severely reduced the coral cover in this area[80]. The Chagos Archipelago, the only region surveyed in the Indian Ocean, had a mean coral cover of 40±16%.

A total of 74 coral genera were documented across the countries surveyed in the Pacific and Indian Oceans on the GRE. The mean number of coral genera recorded in the combined Pacific and Indian Ocean data was 6.6 genera per 10 m transect. The coral richness seen on these reefs generally decreased as distance away from the Coral Triangle increased. The Galapagos Islands, the location farthest away from the Coral Triangle, had only four coral genera recorded and a mean of 2.2±0.7 coral genera per 10 m transect (Figure 17). Northern Great Barrier Reef (8.7±3.4 coral genera per 10 m), Tonga (8.6±3.3 coral genera per 10 m), and Palau (8.5±3.7 coral genera per 10 m) had the highest mean coral genera recorded and are found near the Coral Triangle. The coral genera diversity of all countries surveyed in the Pacific and Indian Oceans can be found in Table 4.

**Figure 16** BOXPLOTS IN ASCENDING ORDER OF MEAN PERCENT CORAL COVER OF LOCATIONS SURVEYED IN THE CARIBBEAN, PACIFIC AND INDIAN OCEAN. THE BOXPLOTS WERE MADE USING SITE MEAN CORAL COVER MEASURED AT EACH LOCATION. THE HIGHEST CORAL COVER WAS FOUND IN THE GAMBIER ARCHIPELAGO, FRENCH POLYNESIA, WITH THE CARIBBEAN REEFS ALL HAVING THE LOWEST LIVE CORAL COVER RECORDED. THE DOTS INDICATE OUTLIERS AND MEDIAN IS SHOWN BY THE CROSSBAR.

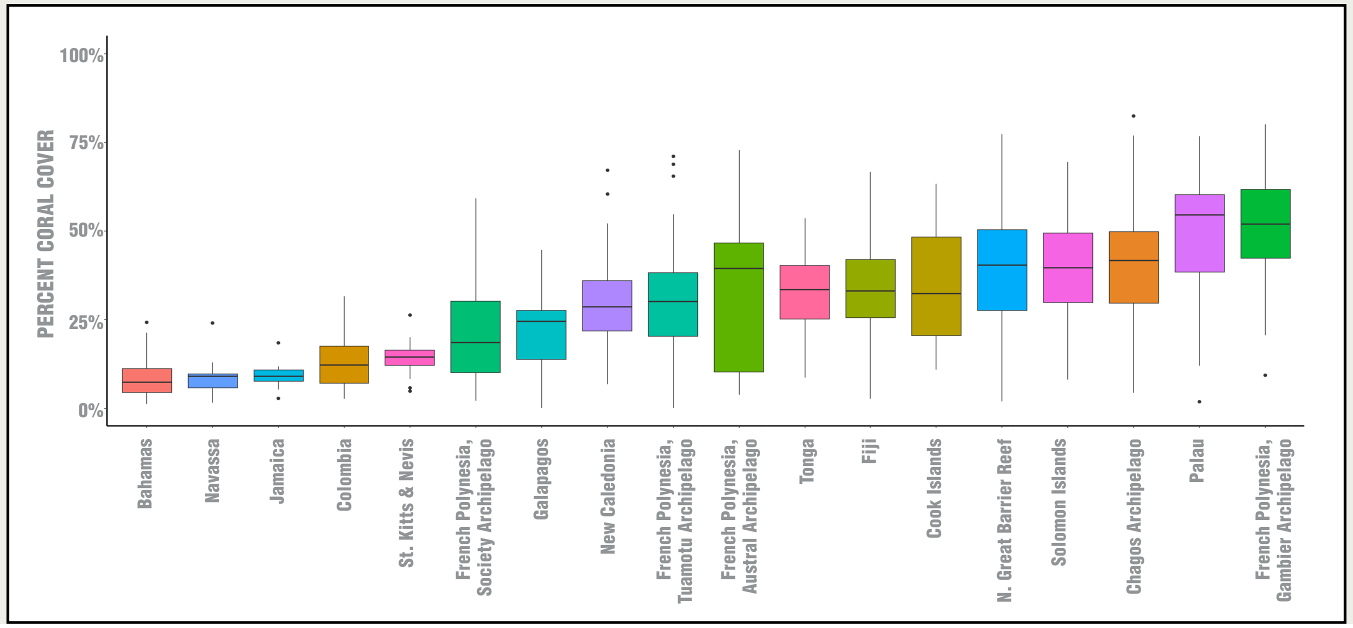



**Figure 17** BOXPLOTS IN ASCENDING ORDER OF MEAN NUMBER OF CORAL GENERA OBSERVED PER 10 M IN LOCATIONS SURVEYED IN THE CARIBBEAN, PACIFIC AND INDIAN OCEANS. SITE MEAN NUMBER OF CORAL GENERA MEASURED PER 10 M TRANSECT MEASURED AT EACH LOCATION. CORAL GENERA RICHNESS WAS HIGHEST IN AREAS LOCATED GEOGRAPHICALLY CLOSE TO THE CORAL TRIANGLE. THE DOTS INDICATE OUTLIERS AND MEDIAN IS SHOWN BY THE CROSSBAR.

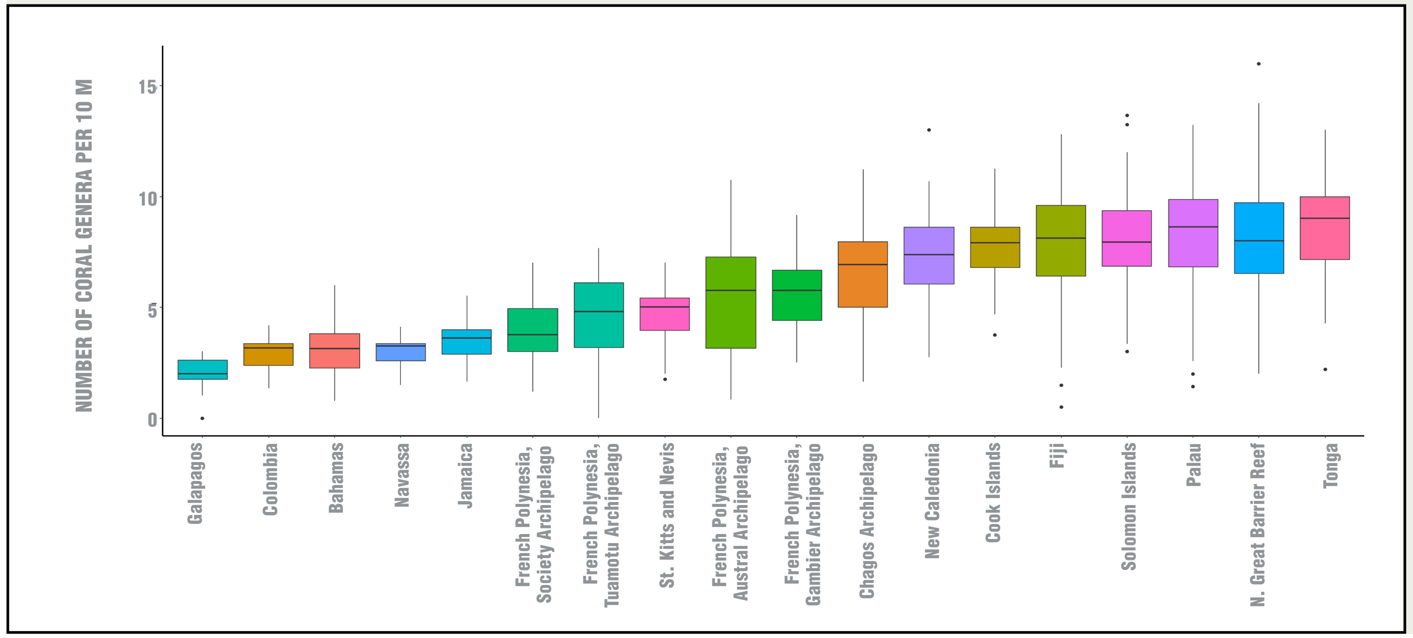



**Table 4** CORAL DIVERSITY FOR LOCATIONS SURVEYED IN THE PACIFIC AND INDIAN OCEANS WAS CALCULATED USING THE SIMPSON DIVERSITY INDEX. CORAL DIVERSITY WAS MEASURED USING CORAL GENERA CLASSIFICATIONS AS THE LOWEST TAXONOMIC IDENTIFICATION. CORAL GENERA DIVERSITY MEASURES WERE NORMALIZED ACROSS THE PACIFIC AND INDIAN OCEANS LOCATIONS SURVEYED. A VALUE CLOSE TO ZERO INDICATES LOW DIVERSITY AND A VALUE CLOSE TO ONE INDICATES HIGH DIVERSITY.

| COUNTRY | SIMPSON DIVERSITY INDEX |
|---|---|
| Chagos Archipelago | 0.83 |
| Cook Islands | 0.90 |
| French Polynesia- Austral Archipelago | 0.88 |
| French Polynesia- Gambier Archipelago | 0.79 |
| French Polynesia- Society Archipelago | 0.83 |
| French Polynesia- Tuamotu Archipelago | 0.82 |
| Galapagos Islands | 0.63 |
| Lau Province, Fiji | 0.86 |
| New Caledonia | 0.86 |
| N. Great Barrier Reef | 0.89 |
| Palau | 0.85 |
| Solomon Islands | 0.90 |
| Tonga | 0.86 |

It is worth noting that the genera richness and biodiversity calculations should not be used exclusively to assess the status of a reef. For example, many transects within the Chagos Archipelago had nearly 100% coral cover, but that coral community consisted entirely of table-forming *Acropora*. Because of the many large monospecific stands found in Chagos, the coral diversity was 0.827 and had the third-lowest mean number of genera recorded on each transect (6.6±2.9 coral genera per 10 m).

The mean percentage of total algae in the Pacific and Indian Oceans was 48±18% and predominantly consisted of CCA and turf algae (Figure 18). New Caledonia (60±12%) and the Cook Islands (61±15%) had the highest algal cover recorded, both dominated by CCA. Aitutaki, an atoll in the Cook Islands, was severely impacted by COTS prior to the time of our surveys and had overall low live coral cover, with many dead coral colonies found. Algae had begun to colonize the dead corals, leading to a higher algal cover at this location. Although the Society Archipelago, French Polynesia, and the reefs of the Galapagos had the lowest coral cover recorded, these locations did not have the highest algae recorded (Figure 19). Instead, a high percentage of bare substrate was observed in these two areas. In the Galapagos, sand accounted for most of the bare substrate, and in the Society Archipelago, the bare substrate was due to the recent COTS outbreak and remaining dead coral that had not been colonized by other benthic organisms.

**Figure 18** MEAN PERCENTAGE OF ALGAE GROUPS SURVEYED IN THE PACIFIC AND INDIAN OCEANS. ALGAE GROUPS RECORDED ON THE BENTHOS WERE CRUSTOSE CORALLINE ALGAE (CCA), CYANOBACTERIA, ERECT CALCAREOUS ALGAE, MACROALGAE, TURF, AND TURF MIXED WITH SEDIMENT. CCA AND TURF WERE THE MOST COMMON ALGAL TYPES RECORDED IN ALL LOCATIONS.

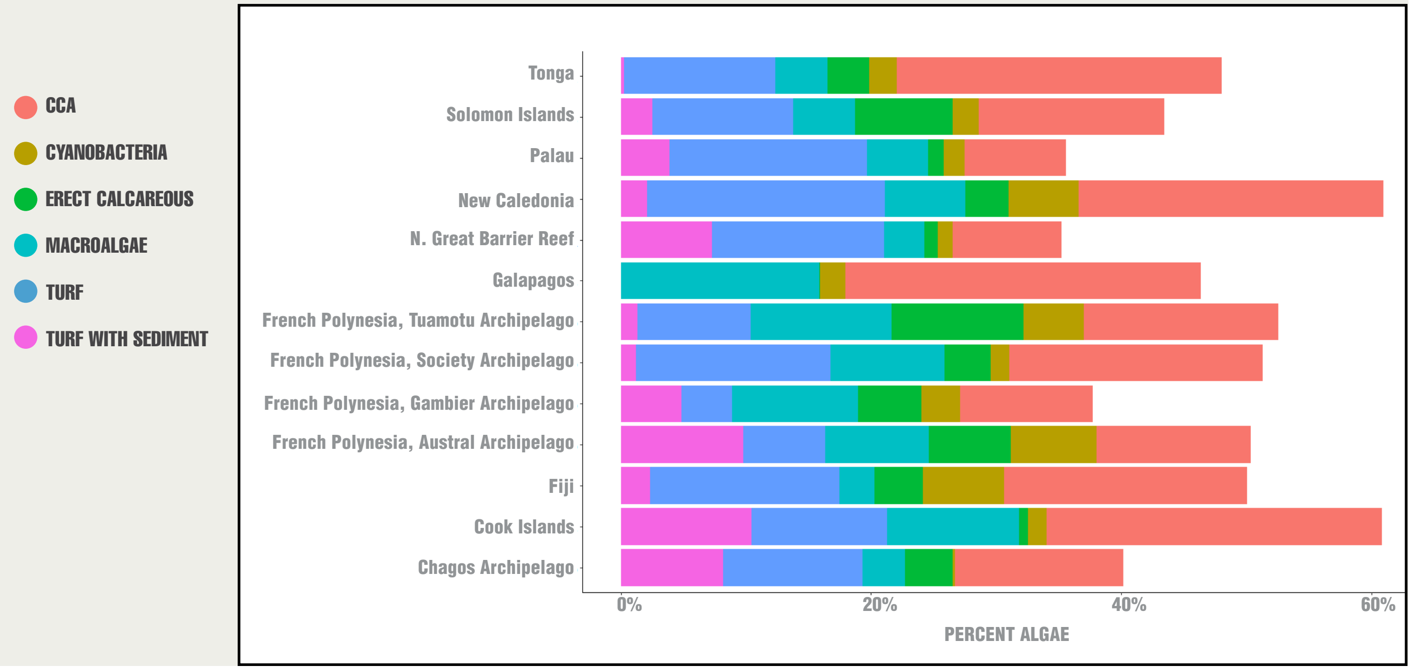
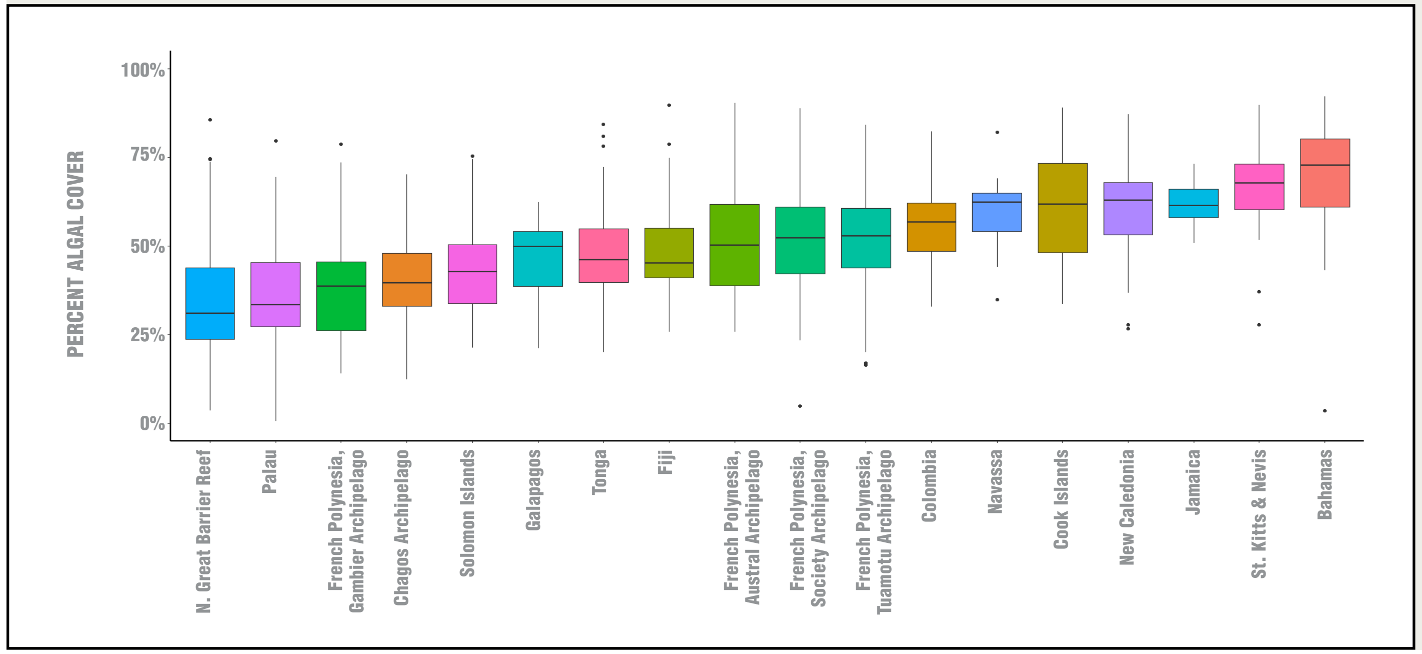





**Figure 19** BOXPLOTS IN ASCENDING ORDER OF MEAN TOTAL PERCENT ALGAL COVER IN LOCATIONS SURVEYED IN THE CARIBBEAN, PACIFIC, AND INDIAN OCEANS. TOTAL PERCENT ALGAE WAS CALCULATED FROM THE SUM OF ALL ALGAE GROUPS (CCA, MACROALGAE, TURF, TURF MIXED WITH SEDIMENT, CYANOBACTERIA, AND ERECT CALCAREOUS ALGAE). ALGAL COVER WAS LOWEST IN THE N.GBR, PALAU, AND GAMBIER ARCHIPELAGO IN FRENCH POLYNESIA. THE DOTS INDICATE OUTLIERS AND MEDIAN IS SHOWN BY THE CROSSBAR.

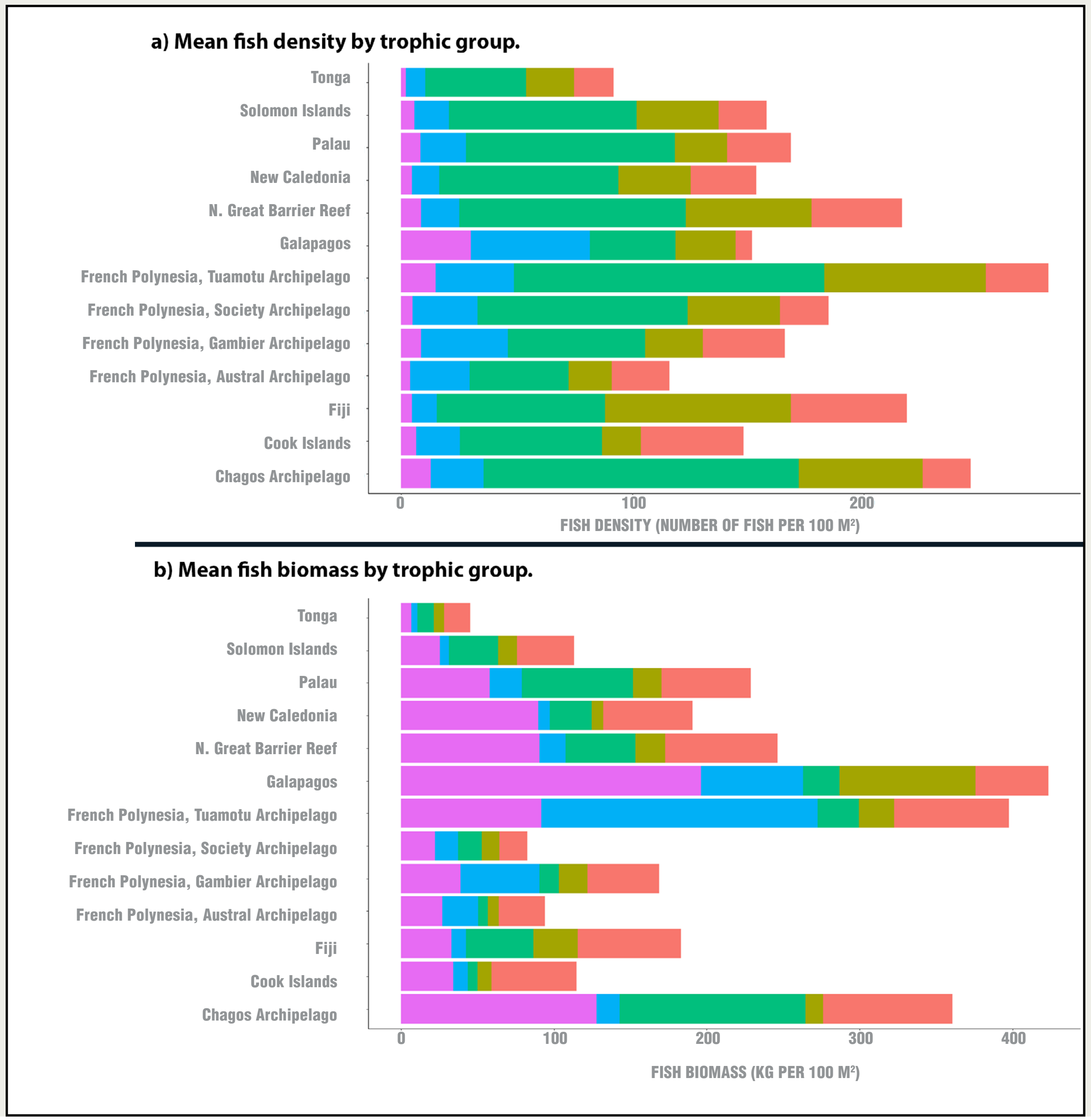



## 4.3 c PACIFIC AND INDIAN OCEANS REEF FISH ASSEMBLAGE

The combined data of the Pacific and Indian Oceans had a mean (±S.D.) fish density of 194±116 fish per 100 m$^2$ and mean fish biomass of 22±29 kg per 100 m$^2$. The highest mean fish density (279±165 fish per 100 m$^2$) and second-highest mean fish biomass (39±48 kg per 100 m$^2$) was found in the Tuamotu Archipelago in French Polynesia. The reefs of the Tuamotu Archipelago had the most fish in the 2.5-2.9 and 3.0-3.4 trophic groups, and the second-highest number of fish in the highest trophic level 4.0-4.5, which includes top predators like barracuda, groupers, and sharks (Figure 20a). The highest fish biomass (42±20 kg per 100 m$^2$) was found in the Galapagos (Figure 20b) and can be attributed to the high density of top predators, such as sharks, recorded here. Numerous shark species were commonly seen on the reefs in the Galapagos, more than observed at any other location surveyed. Although the fish biomass was high in the Galapagos, the fish density (151±85 fish per 100 m$^2$) fell in the midrange of all the countries visited. Tonga had alarmingly low fish density (92±46 fish

## Figure 20

FISH COMMUNITY STRUCTURE IN THE PACIFIC AND INDIAN OCEAN LOCATIONS SURVEYED ON THE GRE. (A) MEAN FISH DENSITY (NUMBER OF FISH PER 100 M²); AND (B) MEAN FISH BIOMASS (KG PER 100 M²) OF FISH ARE GROUPED BY TROPHIC LEVEL (2.0-2.4, 2.5-2.9, 3.0-3.4, 3.5-3.9, AND 4.0-4.5) FOR EACH LOCATION SURVEYED IN THE PACIFIC AND INDIAN OCEANS. MOST LOCATIONS HAD THE HIGHEST DENSITY OF FISH IN TROPHIC LEVEL 3.0-3.4 WHICH INCLUDE LARGER BODIED HERBIVORES AND PLANKTIVORES SUCH AS WRASSES, SOME SPECIES OF BUTTERFLYFISH, AND DAMSELFISH. THE TUAMOTU ARCHIPELAGO IN FRENCH POLYNESIA HAD THE HIGHEST FISH BIOMASS IN TROPHIC LEVEL 3.5-3.9 AND 4.0-4.5, WHICH IS DUE TO THE HIGH NUMBER OF SHARK AND GROUPERS OBSERVED HERE.



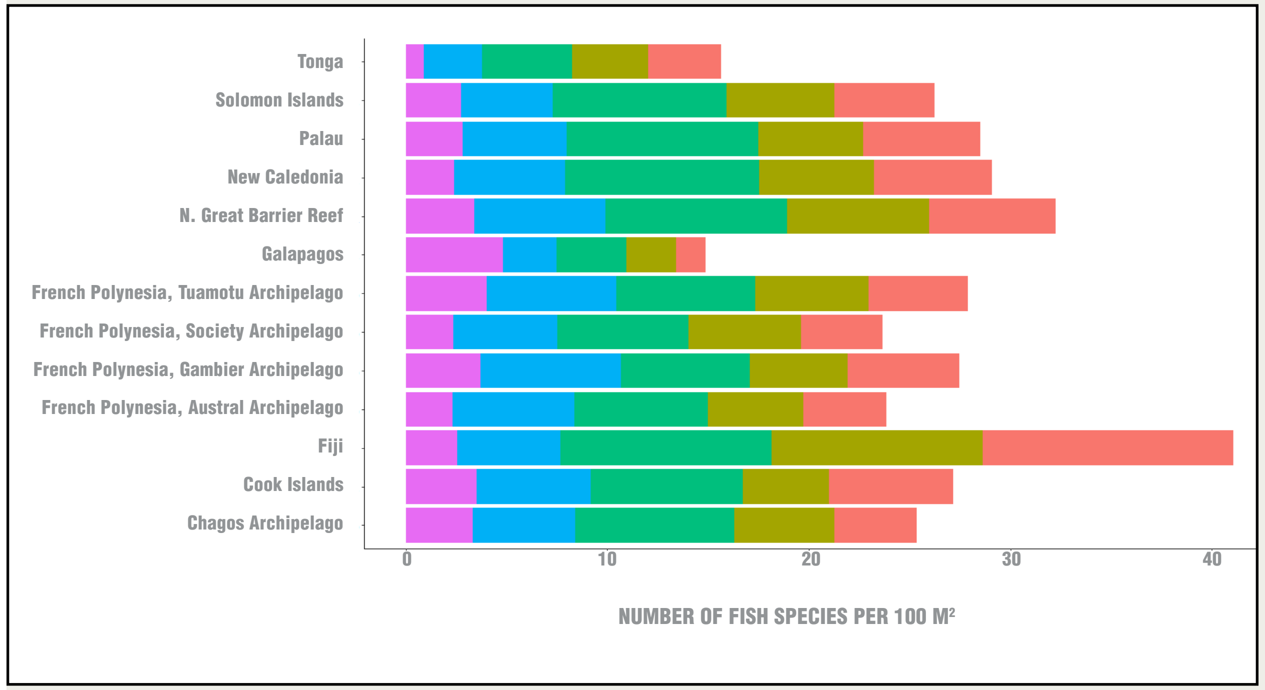



per 100 m²) and biomass (4.5±4.1 kg per 100 m²) (Figure 20a and b), the lowest in all the locations surveyed in the Pacific and Indian Oceans. Some studies suggest baseline fish biomass on reefs should be between 11 and 19 kg per 100 m², and Tonga's fish biomass was substantially below that threshold[81–83].

The fish species richness across the Pacific and Indian Oceans ranged from 15-41 species per 100 m², with a mean of 28±10 species per 100 m². Because of its inclusion in the boundary of the Coral Triangle, we expected the reefs surveyed in the Solomon Islands to have the highest fish species richness, but this was not the case. Instead, the Lau Province, Fiji, had substantially higher species richness (41±7 species per 100 m²) than countries located geographically within or close to the boundary of the Coral Triangle. This high number of fish species indicates Lau Province, Fiji, is a unique area of the world that needs further consideration for conservation (Figure 21). N. GBR, which is geographically closer to the Coral Triangle, had the second-highest species richness (32±13 species per 100 m²), which was an average of nine fewer fish species seen per 100 m² than seen in Fiji.

## Figure 21

FISH SPECIES RICHNESS (NUMBER FISH SPECIES PER 100 M²) IN PACIFIC AND INDIAN OCEAN LOCATIONS SURVEYED ON THE GRE. FISH SPECIES ARE GROUPED BY TROPHIC LEVEL (2.0-2.4, 2.5-2.9, 3.0-3.4, 3.5-3.9, AND 4.0-4.5) FOR EACH LOCATION SURVEYED IN THE PACIFIC AND INDIAN OCEANS. FIJI HAD THE MOST FISH SPECIES OBSERVED, BUT SIMILAR TO CORAL SPECIES RICHNESS, AS DISTANCE FROM THE CORAL TRIANGLE INCREASED, THE NUMBER OF FISH SPECIES OBSERVED DECREASED. THE MAJOR EXCEPTION WAS FOUND IN TONGA, WHERE FEW FISH RECORDED.



4.3 d

## IDENTIFYING TRENDS ON THE REEFS OF THE PACIFIC AND INDIAN OCEANS

Due to the similar reef habitats and potential for connectivity of the reef organisms[84], data from the Pacific and Indian Oceans was combined for regression analysis to assess widespread trends on the reefs. Identifying the relationship between common algae types (CCA, turf, and macroalgae), live coral cover, and reef fish community composition is an important metric that can be used by managers to understand the status of a reef and develop specific goals for their management plans.

Regression analysis between the Pacific and Indian Oceans of percent coral cover against the individual algae groups yielded weak but significant correlations across all algal types, with the most significant correlations with CCA ($R=-0.32$, $p<2.2^{e-16}$) and turf ($R=-0.34$, $p<2.2e^{-16}$). As expected, as coral cover decreased, the percent cover of CCA and turf increased at almost the same rate, highlighting the dominance of these two algae groups.

To assess whether the fish populations have a correlation to the amount of coral or algal cover, regression analyses were run. This included running regression analyses of total fish density, total fish biomass, and fish species richness against coral and the different algae groups. We did this to try to identify which fish and benthic metrics can be used to monitor the status of a reef. In all regression analyses between fish biomass, density, and fish species richness against coral and total algae, we found no significant correlation. This was true even when using trophic grouping of fish and individual algal groups such as CCA, turf, and macroalgae. The lack of relationship between the fish and benthic communities, even at a finer scale using trophic groupings, and highly variable results from analysis at the country level suggest external drivers are impacting the benthic and fish communities independently. The lowest trophic group (2.0-2.5) primarily consists of herbivores, and when regressed against the algae groups, including macroalgae, there was no significant relationship, suggesting the herbivorous fish are not directly controlling the benthic organisms. It is more likely that acute disturbances such as bleaching or fishing pressure are independently impacting the benthic and fish populations on these reefs.

[ Accute disturbances, such as **bleaching** and **fishing** are impacting **coral reefs.** ]

[ **Overfishing** was evident at **nearly every location** surveyed on the **Global Reef Expedition.** ]

# 5.0 DISCUSSION

## 5.0 THE STATUS OF THE WORLD'S REEFS

*A research expedition of this magnitude provides a plethora of data that can be used to better understand global trends on coral reefs. The GRE allowed us to map and collect vital data on the status of the world's reefs in some of the most remote locations that had never been studied before. The data collected on the GRE provides valuable insight into the world's reef dynamics, threats to coral reefs, and the ability of reefs to rebound from acute disturbances, which can help communities and managers battle the ongoing coral reef crisis.*

## 5.1 CARIBBEAN REEFS AND IMPLICATIONS OF SHIFTING REEF DYNAMICS

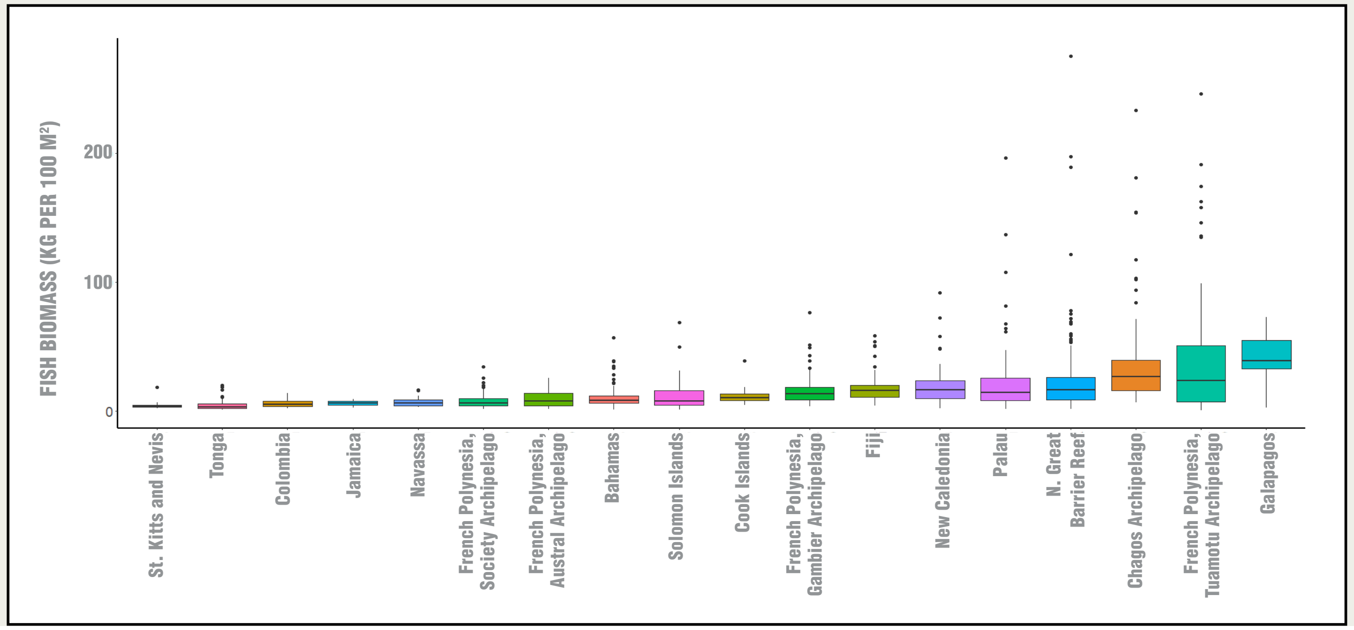
Caribbean reefs had some of the lowest live coral cover, highest macroalgal cover, and lowest fish density and biomass of all the sites visited on the GRE (Figure 22). Our findings from the Caribbean show that despite widespread correlation between coral and macroalgae, regional or country-wide studies will be more useful in understanding shifting reef dynamics. A study by Precht et al. (2020) used coral and macroalgal survey data, collected between 1977 and 2001, from 197 sites throughout the Caribbean to better understand the possible phase shift from coral- to macroalgal-dominated reefs[85]. They found that in some locations, macroalgae was more dominant than coral, while in others, such as Jamaica, the reef dominance shifted back to coral after a recovery period. The data collected on the GRE in Jamaica supports this hypothesis, as it showed no significant relationship between coral and macroalgae. Instead, the Jamaican reefs had a more even spread of algae groups than seen in other Caribbean countries. At the time of this study, it is possible Jamaican reefs were undergoing a phase shift from macroalgal-dominated reefs back to coral-dominated reefs, as suggested by Precht et al. (2020).

> **Caribbean reefs** generally had low **coral cover**, few **fish**, and lots of **algae.**

Many factors have contributed to the phase shift from coral to macroalgae in the Caribbean, and understanding the recovery mechanisms of these reefs will be an ongoing task for scientists and managers. One of the most interesting discoveries from the Precht et al. (2020) study was that herbivorous fish do not seem to have a significant effect on the abundance of live coral or macroalgae. Our data generally supported this hypothesis when looking at Caribbean-wide findings, as we saw a weak negative relationship between herbivorous fish density and biomass and macroalgal cover. However, when looking at country-wide trends, we instead found the relationship was more variable. In areas where macroalgae was more prevalent, such as in The Bahamas and Navassa, there was a much stronger relationship between macroalgal cover and herbivorous fish biomass, suggesting that the relationship between herbivorous fish and benthic cover is more nuanced and that Caribbean-wide conclusions about this correlation cannot be made.



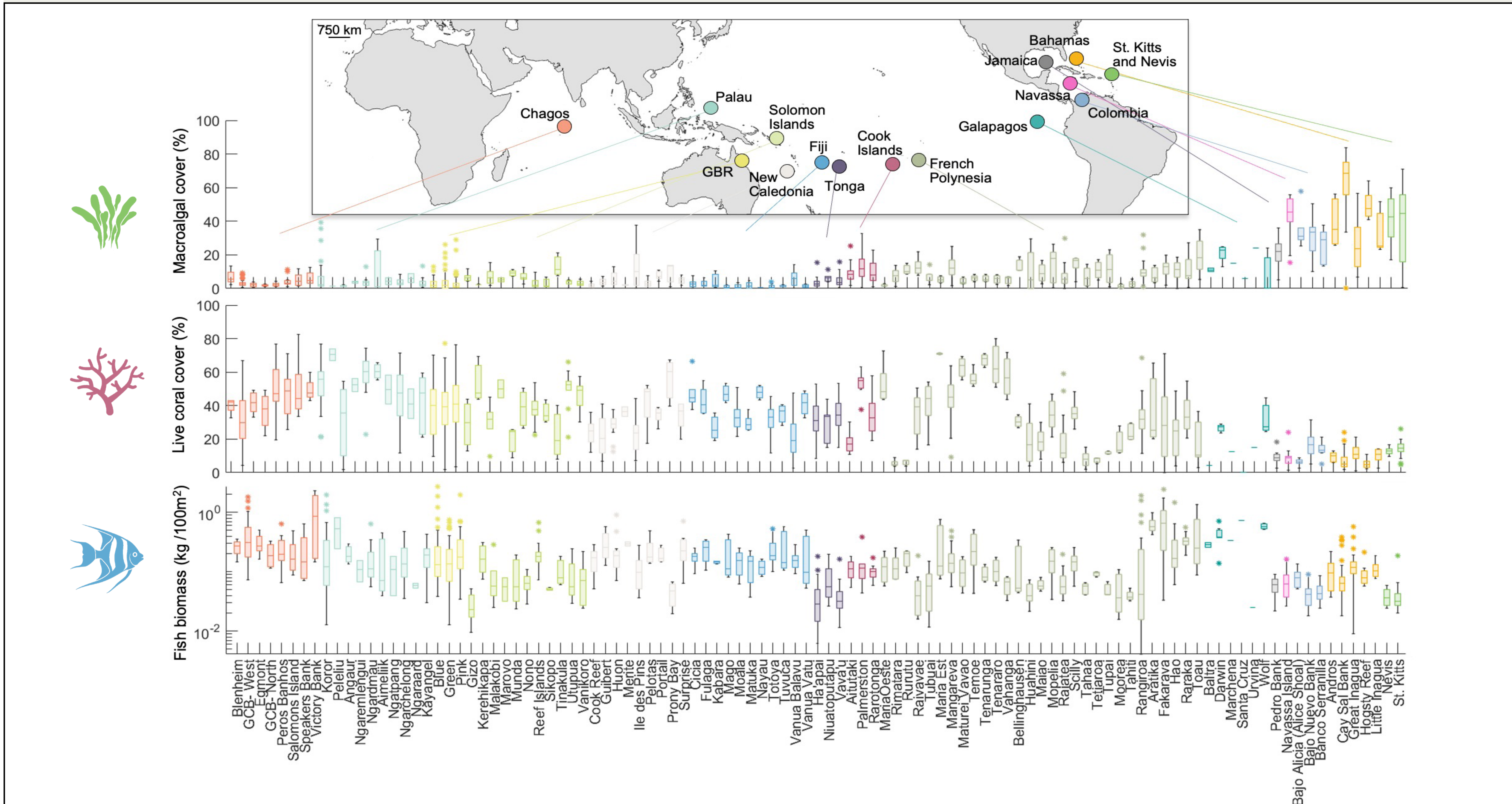
**Figure 23** BOXPLOTS IN ASCENDING ORDER OF MEAN FISH BIOMASS (KG PER 100M²) IN LOCATIONS SURVEYED IN THE CARIBBEAN, PACIFIC, AND INDIAN OCEAN. BOXPLOTS WERE CREATED USING MEAN FISH BIOMASS FROM SITE DATA IN EACH OF THE LOCATIONS SURVEYED. TONGA HAD VERY LOW FISH BIOMASS THAT WAS SIMILAR TO THE MEAN FISH BIOMASS SEEN IN THE CARIBBEAN. DOTS INDICATE OUTLIER SITE FISH BIOMASS DATA AND MEDIAN IS SHOWN BY THE CROSSBAR.




## 5.2 OVERFISHING: A GLOBAL PROBLEM?

Reefs in the Pacific and Indian Oceans generally had higher fish biomass and density than what was seen in the Caribbean (Figure 23). Some studies estimate that reef fish biomass targets should be between 11 and 19 kg per 100$m^2$, and most countries had mean fish biomass at or below this threshold[26,82,83]. The data used to establish these thresholds was expansive and was collected in both the western Indian Ocean (McClanahan et al. 2015) and the Caribbean (Karr et al. 2015). The data collected in these studies overlapped many locations surveyed on the GRE. The Caribbean study by Karr et al. (2015) confirmed that the baseline threshold suggested by McClanahan et al. (2015) can be applied to Caribbean reefs and found that the mean fish biomass of unfished reefs in the Caribbean was higher than the mean biomass measured in the Indian Ocean. It is worth noting that due to well-documented degradation of the Caribbean reefs, Karr et al. (2015) also suggests that a ratio between fish biomass on fished and unfished reefs measured locally may provide a more accurate metric for managers to use when determining a baseline threshold for their country. Using the thresholds suggested by these studies, we found Colombia, Jamaica, Navassa, St. Kitts and Nevis, Tonga, and the Society and Austral Archipelagoes of French Polynesia all had mean fish biomass below this threshold; The Bahamas, the Cook Islands, the Gambier Archipelago of French Polynesia, and the Solomon Islands fell within the range. At the time of our surveys, many of these countries that had low fish biomass lacked substantial reef fisheries management and will need aggressive regulations and enforcement to prevent these reef fish populations from declining further. New Caledonia and Palau each had fish biomass of 19.1 kg per 100 $m^2$ and should continue to monitor and manage their reef fisheries to stay above this suggested baseline threshold.

**Figure 22** BOXPLOTS OF LIVE MACROALGAE COVER (%), LIVE CORAL COVER (%), AND MEAN FISH BIOMASS (KG PER 100 M²) OF ALL ISLANDS SURVEYED ON THE GLOBAL REEF EXPEDITION. ISLANDS ARE GROUPED BY COUNTRY BASED ON COLOR INDICATED IN THE MAP.

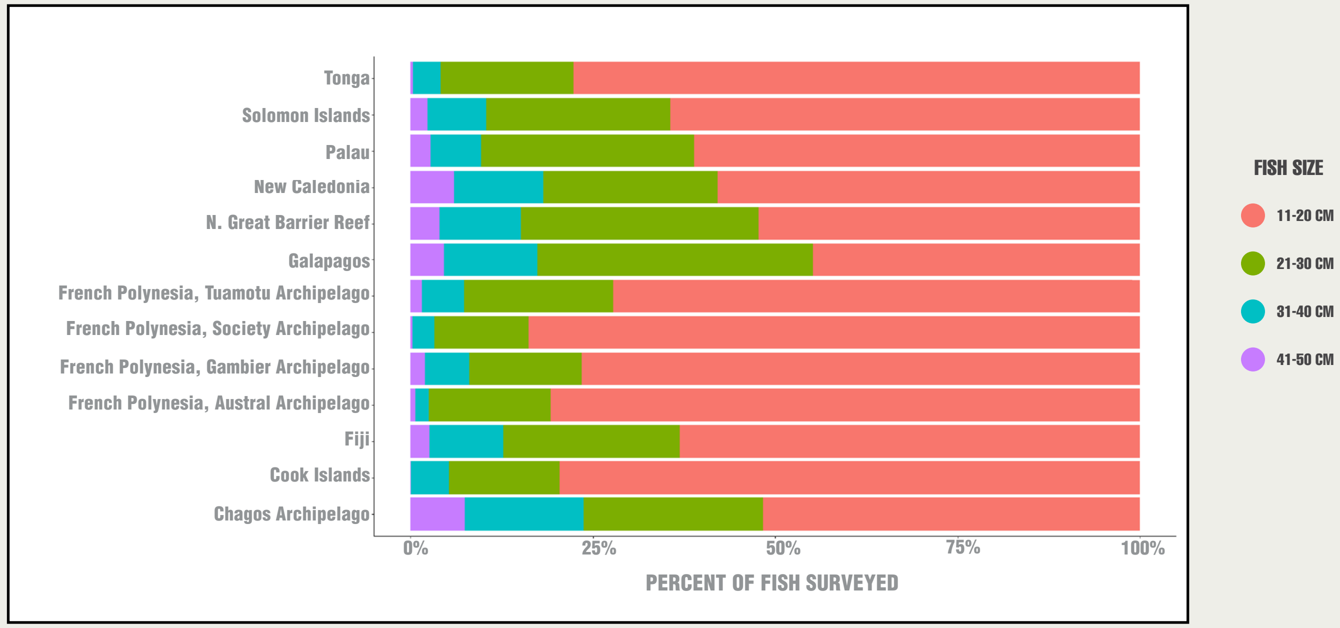


One of the most interesting findings was the high fish species richness and moderate fish biomass of the Lau Province, Fiji. The Lau Province is a group of remote, sparsely populated islands and atolls found in the southeast region of Fiji. The fish communities there had high diversity, but most of the fish were small, with few large fish remaining (Figure 24). Most of the fish density, biomass, and species richness were made up of fish from lower trophic levels that are typically small and not important for local fishers (Figures 20a and b).

Across all countries surveyed in the Pacific Ocean, most of the ecologically and economically important species (Family: Acanthuridae, Carangidae, Haemulidae, Lethrinidae, Lutjanidae, Nemipteridae, Scaridae, Serranidae, and Siganidae) were less than 20 cm in length (Figure 24). This indicates that the larger reef fish of these families are being overexploited, and this could have long-term repercussions on reef fish populations in the future. The Chagos Archipelago had the highest level of protection and is a no-take, no-entry MPA. The reef fish of Chagos had a more even size distribution in these same families. (Figure 24).

**Coral reefs in Lau Province, Fiji had surprisingly high fish species richness.**

**Figure 24** THE RELATIVE SIZE DISTRIBUTION (%) OF SELECTED IMPORTANT FISH FAMILIES IN LOCATIONS SURVEYED IN THE PACIFIC AND INDIAN OCEANS. FAMILIES INCLUDED WERE: ACANTHURIDAE, CARANGIDAE, HAEMULIDAE, LETHRINIDAE, LUTJANIDAE, NEMIPTERIDAE, SCARIDAE, SERRANIDAE, AND SIGANIDAE. FISH WITH TOTAL LENGTHS BELOW 10 CM AND GREATER THAN 50 CM WERE EXCLUDED. IN ALL LOCATIONS, FISH LESS THAN 20 CM ACCOUNTED FOR THE HIGHEST PROPORTION OF FISH SURVEYED IN THESE FAMILIES. THIS INDICATES THAT IN MOST LOCATIONS, COMMERCIALLY IMPORTANT REEF FISH POPULATIONS ARE MADE UP OF SMALL FISH.






## 5.3 IMPACT OF ACUTE DISTURBANCES ON REEFS IN THE PACIFIC AND INDIAN OCEANS

Large-scale coral cover trends were hard to identify because, for the past century, corals have been impacted greatly by both natural and anthropogenic disturbances. In numerous locations in the Pacific Ocean, we found that acute disturbances, such as COTS outbreaks and cyclone and tsunami damage, had greatly reduced the live coral cover on reefs[56,57,61]. However, we did not find a significant correlation between lower coral cover and fish biomass or a shift in the algal composition. It is possible that not enough time had passed between the disturbance and our surveys to see a measurable change in the correlation of these metrics.

The areas with the lowest coral cover in the Pacific Ocean had, at the time of surveying, very recently been ravished by a COTS outbreak. This was particularly evident in the Society and Austral Archipelagoes of French Polynesia and the Cook Islands. For example, at Aitutaki, an atoll surveyed in the Cook Islands, KSLOF scientists witnessed an active outbreak of COTS, and we removed over 600 COTS from the reef (Figure 25). The coral cover at one site had been reduced to 10%[56]. In French Polynesia, it appeared an outbreak of COTS first hit the Society Archipelago and then the Austral Archipelago. While surveying the reefs in the Society Archipelago, we found that entire reef systems had been ravaged by these corallivores, but we also found encouraging evidence of recovery. We saw many small coral recruits, and a recent study by Pérez-Rosales et al. (2021) found that the Society Archipelago was able to more successfully recover from COTS outbreaks than other French Polynesian archipelagoes[86].

**Figure 25** SCIENTISTS ON THE GLOBAL REEF EXPEDITION REMOVED HUNDREDS OF CROWN-OF-THORNS STARFISH FROM THE CORAL REEFS OF AITUTAKI IN THE COOK ISANDS.

## 5.4 A SIGN OF HOPE FOR THE WORLD'S REEFS

*The coral reef crisis was evident everywhere the Global Reef Expedition surveyed. Reefs in the Caribbean had low coral cover and few fish, and overfishing was evident in nearly every country we visited. However, there were still signs of hope. Large marine protected areas and adaptive management plans have been shown to be successful in conserving coral reefs, and may be the best tool we have to combat the coral reef crisis.*

In the Pacific and Indian Oceans, the reefs with the highest coral cover, fish biomass, and fish density were found in either remote locations or areas with high protection and management. The Gambier Archipelago of French Polynesia had the highest mean live coral cover (52±14%), and the Tuamotu Archipelago had the highest mean fish density (278±165 fish per 100 $m^2$) and second-highest mean fish biomass (40±48 kg per 100 $m^2$) seen on the GRE. These archipelagoes had the lowest direct impact from humans in French Polynesia[57] and, at the time of the surveys, had not experienced a significant natural disturbance in recent years.

However, remote areas were not the only locations with high coral cover and a stable reef fish community. Palau, while having a substantial human population that directly relies on the reefs, had the second-highest coral cover in the Pacific and fish biomass above the baseline threshold, indicating a stable reef fishery. Since the 1950s, Palauans have prioritized conserving their coral reefs by establishing management plans protecting their reefs from direct human impacts, particularly focusing on subsistence fishing, managing runoff, and recreational use. These management efforts have likely helped relieve pressure on the reef organisms so they can better withstand natural disturbances. Palau is one of the few places that were able to endure the recent global bleaching events with minimal impacts[87]. The lack of additional pressure from humans has likely helped Palau's coral reefs recover and be more resilient to these otherwise catastrophic events.

The GRE visited many sites that had well-established reef management plans and parks. The Chagos Archipelago is one of largest and oldest no-take, no-entry marine parks in the world and boasted some of the highest coral cover and fish biomass seen on the GRE. However, it is not realistic for most reefs to have this level of protection.

The Northern Great Barrier Reef in Australia is an example of a large managed area that has regions zoned as no-take, no-entry, or fished. We found the reefs of the N.GBR to be some of the best seen on the GRE, as they had some of the lowest algal cover and highest coral richness, and the second-highest mean fish species richness seen on the GRE (Figure 21). Using data collected on the Global Reef Expedition, our partners at the University of Queensland, Australia, used data from sites surveyed in the farthest north region of the Great Barrier Reef Marine Park to assess whether marine reserves were benefiting the benthic and reef fish communities. Castro-Sanguino et al. (2017) found that the marine reserves enhanced the biomass of highly targeted piscivores and other less targeted carnivores. They suggest that protection from fishing benefits fish populations in even lightly fished areas on the GBR[88]. These findings highlight the benefits of large marine parks and the need for adaptive management practices to be implemented and enforced across the globe in order to help conserve the world's reefs.



**Large marine parks** and **adaptive management practices** are needed to **conserve coral reefs.**

# 6.0 EDUCATION & OUTREACH

6.0

## EDUCATION & OUTREACH ON THE GRE

*Education and outreach were critical components of the Global Reef Expedition. The foundation launched several in-country programs, which were designed to share the foundation's knowledge about coral reefs with community members, local and traditional leaders, teachers, and schoolchildren, but also to learn from communities who depended heavily upon coral reefs for their lives and livelihoods. In addition, the foundation created education and outreach programs to share the beauty and wonder of coral reefs with people around the world, improve ocean literacy, and educate and inspire the next generation of ocean advocates.*

Initially, the foundation conducted educational seminars for hundreds of elementary and high school students in the Washington, D.C., area. Presentations covered a range of topics about coral reefs and the Global Reef Expedition. After successful implementation of local school seminars, the foundation expanded its educational programs to stakeholders in GRE countries. The education team provided coral reef seminars to a variety of different audiences including schools, communities, government officials, and tourists. Tours of the *M/Y Golden Shadow* were provided in some countries, which provided students, community members, and government officials with detailed information about the research being conducted. Cultural liaisons and scientific advisors from the partner country were invited on GRE missions to consult with communities and assist with education programs and ship tours. The foundation also hosted numerous community events to share our research, learn how communities were using their coastal marine resources, and showcase the wonders of the ocean through films. In total, over 7,000 people attended coral reef seminars, community events, and ship tours in Jamaica, French Polynesia, Tonga, Fiji, and the Solomon Islands (Figure 26).

**Figure 26** THE GLOBAL REEF EXPEDITION EDUCATED THOUSANDS OF LOCAL STUDENTS ABOUT THE IMPORTANCE OF THEIR CORAL REEFS, INCLUDING THESE STUDENTS FROM TUVUCA, FIJI.

The government and community seminars proved to be especially important. Not only was the foundation providing education about coral reefs, but we also received valuable local environmental information from the participants. Government officials and community members shared knowledge about the usage of reef resources and the issues that they observed, and discussed possible solutions and alternatives to these problems. The foundation learned about deadly crown-of-thorns starfish outbreaks, destructive fishing practices, targeted species being harvested, and species no longer seen on their reefs. Concerned community members also expressed that they wanted to protect their reefs by implementing marine managed areas and sustainable fishing practices. Most also commented on a need for further school and community education programs.

The foundation provided teachers with an opportunity to join scientists on some expeditions through the Coral Reef Educator on the Water (CREW) program. While on the mission, CREW teachers conducted education workshops and presentations for local students and community members, developed educational materials, and broadcast lessons to students online. When they completed the expedition, CREW teachers continued to improve ocean literacy by sharing the knowledge and experience they gained on the GRE with students in their classes and schools.

One common theme that was recognized on the GRE was the lack of knowledge about coral reefs and adjoining ecosystems such as mangrove forests and seagrass beds. As a result, the foundation decided to help mitigate the environmental degradation of marine ecosystems through education. Three education programs were developed to help address this need: the Mangrove Education and Restoration Program, the Coral Reef Ecology Curriculum, and the Science Without Borders® Challenge.

In addition to the educational programs for students, community members, and government officials, the foundation provided fellowships for Ph.D. students and postdoctoral scholars. In total, the foundation supported nine Global Reef Expedition Fellows, who joined a portion of the expedition to conduct their own coral reef research and support the scientific research goals of the GRE.

The foundation also sought to educate people about the marine environment by sharing the beauty and wonder of the places we visited on the Global Reef Expedition through films and photographs. Award-winning cinematographers and photographers joined many of the GRE missions, showcasing remarkable coral reefs, educating people about threats to coastal marine ecosystems, and illustrating important marine conservation success stories. The films and photographs created on the Global Reef Expedition have been shown around the world, transporting people to places they may never have a chance to visit themselves and giving them a glimpse into the remarkable underwater world that may otherwise be out of sight and out of mind.

**Education** and **outreach** were **critical components** of the **Global Reef Expedition.**

## 6.1 COMMUNITY EDUCATION AND OUTREACH

*The Global Reef Expedition revealed a need for ocean education around the world. The foundation responded by developing various education curricula and programs for different audiences. These programs leveraged the films and photographs that were produced during the GRE to bring the underwater world to audiences and inspire people to preserve the ocean. Each year, these programs continue to grow and expand, teaching thousands of youth, educators, and communities from all around the world about the importance of the ocean and how to protect it.*

### 6.1a WASHINGTON, D.C.

Close to 250 elementary and high school students attended educational presentations in the Washington, D.C., area. The seminars covered a variety of coral reef themes, including basic information about corals, threats and benefits of reefs, and food webs. Many seminars also brought the GRE to life for many students. Some classrooms were able to connect with scientists on board the ship who taught students about ship life and how to conduct scientific research on coral reefs. These interactions with scientists allowed students to ask probing questions about coral reefs and what it is like to be a scientist.

### 6.1b JAMAICA

For the first time, land-based education programs were implemented during the GRE in Jamaica. While the *M/Y Golden Shadow* was in Port Antonio, education programs were conducted. A Conservation Planning Workshop was held for Port Antonio High School and the College of Agriculture, Science, and Education (CASE) students to understand more about the importance of coral reefs and what can be done to protect them. After the workshop, students toured the ship to get a firsthand glimpse at how coral research is conducted.

A workshop was also held for local fishers in the area. The workshop included initial results from the GRE about the current status of fish populations on Pedro Bank. To showcase the foundation's new education efforts while on the GRE, a film called *Getting People Interested in Vital Research* was produced.

### 6.1c TUAMOTU ARCHIPELAGO, FRENCH POLYNESIA

As the foundation continued to circumnavigate the globe, education continued on the GRE. When the ship docked in the Tuamotu Archipelago in French Polynesia, it allowed 50 students from Fakarava Primary School to board the *M/Y Golden Shadow* to learn about corals and the research that was being conducted from the ship. At the end of the tour, students were able to ask mission scientists questions about coral reefs.



**Figure 27** STUDENTS AT THE PRIMARY SCHOOL IN TOTOYA, FIJI PARTICIPATE IN AN ACTIVITY THAT TEACHES THEM ABOUT THE CORAL REEF FOOD WEB.

### 6.1d LAU PROVINCE, FIJI

During the Fiji GRE mission, land-based coral reef education seminars were provided throughout the Lau Province to primary and secondary schools as well as village communities. Overall, the foundation conducted 14 school and eight village seminars. Additional seminars were provided in Fiji's capital, Suva, for faculty and students at the University of the South Pacific, government officials at the Ministry of Fisheries, and various coral reef stakeholders at the International Union for Conservation of Nature (IUCN). In total, these educational programs reached almost 1,500 people on 10 different islands in the Lau Province.

This was the first time in the foundation's history that a single GRE mission was dedicated to providing extensive land-based education programs in conjunction with scientific research **(Figure 27)**. This pilot program later provided critical insight for future GRE education programs in Tonga and the Solomon Islands. A short film called *A Fabulous Encounter in Fiji: Coral Reef Outreach and Education* was produced to demonstrate the success of the foundation's Fiji education program.

These educational efforts were conducted in partnership with local Fijian representatives. In Fiji, each village is responsible for protecting its marine resources, especially in protected areas called Locally Managed Marine Areas (LMMAs). Dedicated to the foundation's education mission, the liaisons helped to establish community and school relationships and provide the seminars in Fijian. The Fijian liaison roles were critical not only to the success of the education programs but also for granting permission for foundation scientists to conduct research near local villages.

## 6.1 e KINGDOM OF TONGA

After completing an effective pilot coral reef education program in Fiji, the foundation decided to implement the program in the Kingdom of Tonga. The programs were provided on 19 different islands in three different island groups: Ha'apai, Vava'u, and Niuatoputapu (Figure 28). Once again, a variety of different targeted stakeholders were invited to attend the coral reef seminars. Overall, the foundation conducted 15 school, 17 community, one tourist, and one government meeting, and three ship seminars, reaching just over 2,300 people. These educational efforts were conducted in partnership with local Tongan representatives from the Government of Tonga and a local nongovernmental organization (NGO) called Vava'u Environmental Protection Association (VEPA). Like the Fijian representatives, the Tongan liaisons were crucial to the success of the entire mission.

The land-based education efforts in Tonga paved the way for future school-based education programs in Vava'u. The willingness of the Tongans and overwhelming outpouring for coral reef education from local schools made Tonga an ideal partner to pilot additional programming over the next two years. The foundation produced a film about these educational efforts called *Reefs on the Road*.

**Figure 28** THE GOVERNMENT PRIMARY SCHOOL (GPS) TU'ANEKIVALE IN VAVA'U ISLAND GROUP IN TONGA WELCOMES THE KHALED BIN SULTAN LIVING OCEAN'S EDUCATION TEAM TO THEIR SCHOOL. KSLOF CONTINUED WORKING WITH LOCAL SCHOOLS ON CORAL REEF EDUCATION PROGRAMS LONG AFTER THE MISSION TO TONGA WAS COMPLETED.




## 6.1 f SOLOMON ISLANDS

While on the Solomon Islands mission, the education team once again provided land-based education seminars throughout the Western, Choiseul, Isabel, and Temotu Provinces at schools and communities. During the mission, schools were either taking exams or on holiday break, so most of the seminars were provided to communities, where men, women, and children attended the talks. Overall, the foundation conducted four school and 25 community seminars and four ship tours, reaching a total of 2,891 people. This was the greatest number of people reached on a single GRE mission.

Just as in Fiji and Tonga, the seminars focused on teaching islanders about corals, the threats to coral reefs, how people benefit from this ecosystem, and what they can do to protect their coral reefs (Figure 29). Each seminar ended with a community discussion. Often, it was the community chiefs and elders who would address the community and voice their concerns about protecting the coral reef.

**Figure 29** EDUCATION AND OUTREACH SEMINARS IN THE SOLOMON ISLANDS FOCUSED ON TEACHING ISLANDERS ABOUT CORAL REEFS, THE THREATS THEY FACE, AND HOW PEOPLE BENEFIT FROM THIS COASTAL MARINE ECOSYSTEM.

## 6.2 CORAL REEF EDUCATOR ON THE WATER PROGRAM

*The Coral Reef Educator on the Water (CREW) program offered high school science teachers the opportunity to join the GRE on missions aboard our research ship (Figure 30). The program was designed to give teachers firsthand experience of life on board a working scientific research vessel, a greater understanding of the importance of coral reefs, and the inspiration to convey what they learned to their students and members of their community.*

As part of the GRE, each CREW participant worked with the science team to develop educational content and lesson plans, hosted a live Q&A session for students from on board the ship, and developed a conservation action challenge for their classroom. They also participated in educational outreach efforts to share our knowledge of coral reefs with local students, teachers, and community members where we conducted research.

**Figure 30** THE CORAL REEF EDUCATOR ON THE WATER (CREW) PROGRAM OFFERED HIGH SCHOOL SCIENCE TEACHERS THE OPPORTUNITY TO JOIN THE GLOBAL REEF EXPEDITION.

## 6.3 INTERNATIONAL EDUCATION PROGRAMS

*While educating both students and adults around the world, one thing became apparent – there was a lack of knowledge and resources to teach people about the ocean. As a result, education programs and materials were developed to aid people in learning about ocean ecosystems, especially coral reefs and mangroves. Three education programs evolved from the GRE: the Mangrove Education and Restoration Program, the Coral Reef Ecology Curriculum, and the Science Without Borders® Challenge.*

### 6.3 a MANGROVE EDUCATION & RESTORATION PROGRAM

One successful education initiative, developed to educate teachers and youth about mangrove ecosystems, is called the Mangrove Education and Restoration Program. Many local partnerships with governments and nonprofit environmental organizations were shaped during the GRE. As a result, the foundation partnered with these organizations to implement the Mangrove Education and Restoration Program in The Bahamas and Jamaica. This extensive two-year mangrove program provides students with an in-depth learning experience. For two years, students learn about the basic ecology of mangroves using a combination of lectures, reinforcement activities, field experience, and two long-term scientific investigations (eight months each). During the first year, students conduct a mangrove growth experiment. They grow and monitor their mangroves, and plant them at the end of their experiment. In the second year of the program, students set up quadrats to monitor the forest and investigate mangrove disease. Students collect and analyze data during their investigations and then draw conclusions from it. Over time, students and teachers can see the positive change they make to the forest and their coastal community.

### 6.3 b CORAL REEF ECOLOGY CURRICULUM

To address the lack of coral reef education around the world, the foundation developed a robust, award-winning Coral Reef Ecology Curriculum. The curriculum is hosted on the foundation's Education Portal, making it easily accessible to anyone around the world who wants to learn about coral reefs. The curriculum was developed for use in K-12 classrooms, and it has been particularly beneficial to e-learning since the beginning of the COVID-19 pandemic, which has required students to learn online. There are 12 units currently available, and they include a variety of educational resources such as videos, interactives, activities, and quizzes. Almost 300,000 people have accessed the Education Portal from 167 countries and all 50 US states. Additionally, the foundation offers two-day teacher professional development workshops to educate teachers about coral reefs and the use of the Education Portal materials in their classrooms.

## 6.3 C SCIENCE WITHOUT BORDERS® CHALLENGE

Despite creating robust mangrove and coral reef curricula, the foundation observed that some youth were not as engaged in learning about science. The foundation was eager to create a program that would inspire young students to learn about the ocean through a different learning path – art. Therefore, the foundation developed an annual international art contest called the Science Without Borders® Challenge to inspire youth all around the world to learn about various ocean conservation issues by creating artwork. Each year, a new ocean conservation theme is revealed.

The contest is open to all students 11-19 years old who are enrolled in primary school, secondary school, or the homeschool equivalent. The artwork is judged in two categories: 11- to 14-year-olds and 15- to 19-year-olds. Winners in each category receive a prize of up to $500. Since 2013, almost 3,000 students from 90 countries have participated in the contest (Figure 31). The foundation uses the students' artwork to raise awareness and spark conversations about ocean conservation.

**Figure 31** THOUSANDS OF STUDENTS HAVE PARTICIPATED IN THE FOUNDATION'S ANNUAL OCEAN ART CONTEST, THE SCIENCE WITHOUT BORDERS® CHALLENGE, INCLUDING ONE OF THE 2021 WINNERS, "STOP, LET'S PRESERVE OUR MANGROVES" BY 16-YEAR-OLD MICHELLE YANG.


## 6.4 FELLOWS

The foundation sponsored a fellowship program for doctoral students and postdoctoral scholars whose research focused on activities that contribute to a better understanding of the health and resilience of coral reefs in countries surveyed throughout the Global Reef Expedition. This fellowship program welcomed scientists from around the world, regardless of citizenship or nationality, with a career interest in coral reef science or management. In addition to graduate students and postdocs working at a university, the program welcomed recent graduates employed by a government agency and conducting research on coral reef conservation and management. Fellows received generous support from the foundation, including an award to cover legitimate educational and research expenses, such as tuition and research fieldwork. All costs (lodging, meals, diving activities, etc.) while on board our research ships, as well as travel to the research location, was covered by the foundation so these early-career scientists could participate in this once-in-a-lifetime research expedition.

**THE KHALED BIN SULTAN LIVING OCEANS FOUNDATION HONORED NINE SCHOLARS WITH RESEARCH FELLOWSHIPS TO JOIN THE GLOBAL REEF EXPEDITION:**

- **Dr. Sarah Hamylton**, a postdoctoral scholar working on marine resource management at Southampton University, joined us on our research missions to the Red Sea.
- **Gwilym Rowlands**, a student working under Dr. Sam Purkis at Nova Southeastern University. His KSLOF Fellowship project "A spatial perspective on coral reef development in the Saudi Arabian Red Sea" allowed him to participate in the Global Reef Expedition research in the Red Sea.
- **Renata Farreri**, a doctoral student at the University of Exeter working with Dr. Pete Mumby. She used her KSLOF Fellowship to join us on the Global Reef Expedition to study the effects of coral-algae competition on the growth rate and mortality of coral colonies.
- **Jeremy Kerr**, a doctoral student working under Dr. Sam Purkis at Nova Southeastern University. His KSLOF Fellowship allowed him to participate in Global Reef Expedition missions in the Caribbean and the Pacific and Indian Oceans, mapping coral reefs using a combination of satellite imagery and field observations.
- **Sonia Bejarano**, a postdoctoral scholar from Colombia, joined the GRE missions in the Caribbean and in French Polynesia to study fish grazing as a source of reef resilience.
- **João Monteiro**, a Ph.D. student at the University of the Azores who joined the Global Reef Expedition on many of our research missions in the Pacific Ocean to study *Symbiodinium spp.* diversity.
- **Badi R. Samaniego**, a doctoral student at the University of the Philippines working on coral reef fish ecology. His KSLOF Fellowship allowed him to participate in most of the GRE missions to the Pacific and Indian Oceans and study reef fish communities.
- **Dr. Anderson Mayfield**, a postdoctoral scholar working on coral genetics at the National Museum of Marine Biology and Aquarium in Taiwan. His KSLOF Fellowship allowed him to sample corals from various sites visited on the Global Reef Expedition to assess their resiliency.
- **Dr. Steve Saul**, a postdoctoral scholar working at the National Marine Fisheries Service. For his KSLOF Fellowship, he developed models that look at how coral-reef-dependent fisheries can most appropriately be managed to meet subsistence needs while protecting biodiversity in small island developing states.

# 6.5 MEDIA

*At the Khaled bin Sultan Living Oceans Foundation, we know that studying and understanding our oceans is critically important, but to save our oceans, we need to inspire people to protect them. The foundation brings joy and a deeper understanding of the ocean to people around the world through engaging films and photography. These types of media have the potential to transport people to places they may never otherwise see, make complicated science easy to understand, and connect people viscerally and emotionally to the incredible beauty of the natural world.*

## 6.5 a FILMS

Since the start of the Global Reef Expedition, the foundation has produced over 100 films. These films shared the beauty and wonder of coral reefs with people around the world, showcased the foundation's work in the field, and provided engaging educational material for our Coral Reef Ecology Curriculum. They have been recognized for their outstanding production and conservation value as well as their conservation message by earning 42 awards. Many of the foundation's community outreach programs showcased films produced on the Global Reef Expedition, sharing the beauty and wonder of the underwater world. The award-winning films have been showcased at film festivals around the world, broadcast on television, streamed online, and incorporated into the foundation's educational materials.

All the foundation's full-length films have won awards and international acclaim. One film, *Sharks of the Coral Canyon*, won the 2015 Suncoast Emmy® Award for Best Environment Program. This film was shot on the Global Reef Expedition in French Polynesia. It tells the story of how sharks and coral reefs are intricately linked and uncovers how they depend on one another and must be protected together if either of them is to survive into the future.

## 6.5 b PHOTOGRAPHY

The foundation invited professional underwater photographers on several Global Reef Expedition missions to capture the beauty of coral reefs and the threats they face. Some of the best images from the GRE come from the foundation's partnership with the International League of Conservation Photographers (iLCP), a nonprofit organization that enlists some of the world's best conservation photographers to advance conservation communication efforts around the world.

Three iLCP photographers took part in the expedition. Michele Westmorland joined the GRE to capture the vibrant reefs of French Polynesia, Jürgen Freund documented the scientific research conducted on the Northern Great Barrier Reef, and Keith Ellenbogen shot amazing photos of the diversity and abundance of life on reefs in Palau. Not only do these beautiful images document the foundation's journey, but they also show people, viscerally and emotionally, the wonders of coral reefs and illustrate why they should be protected.



**Studying** our oceans is critically **important,** but to **save our oceans** we need to **inspire** people to **protect them.**

# 7.0 CONSERVATION

# 7.0 THE FUTURE OF THE WORLD'S REEFS

*In every location we surveyed on the GRE, evidence of the coral reef crisis was apparent, regardless of remoteness or protected status. Given that the GRE began nearly 10 years ago, it is important to note that the coral reef crisis has only worsened, and we expect many of the reef conditions to have declined. Drastic measures are needed to help conserve the world's reefs. The following are five conservation takeaways the GRE.*

## 1. SWIFT ACTION IS NEEDED TO ADDRESS CLIMATE CHANGE.

Currently, the biggest threat to coral reefs is climate change. Climate change is not only affecting ocean temperatures, but also is acidifying the world's oceans, increasing storm frequency and severity in the tropics, and more frequent and prolonged warming events are causing massive die-offs of corals at an astounding rate[16,92,93].

On the very last survey location of the GRE, in the Chagos Archipelago, our team of scientists first documented what would become a historic bleaching event that spread across the globe. In Chagos, we saw some of the most pristine reefs of the world, with live coral cover reaching 82% at some sites. After this bleaching event, when the area was resurveyed, Sheppard et al. (2017) found the coral cover had been reduced to 5-15% two years later[94]. Chagos is one of the most highly protected areas in the world, and has been largely undisturbed for the last 50 years. The fact that this remote reef system experienced unprecedented bleaching is alarming and highlights the magnitude of the impact the coral reef and climate crises are having on the world.

> The **biggest threat** to **coral reefs** is **climate change.**

Ocean acidification (OA) is also having widespread impacts on the world's reefs, regardless of remoteness or protection level. Ocean acidification is a direct result of climate change and is caused by the uptake of atmospheric $CO_2$ by the world's oceans. This increase in $CO_2$ in seawater causes an overall decrease in pH, making the oceans more acidic. This decrease in pH has been shown to depress calcification of reef organisms, particularly coral, which can lead to weaker skeletons and make them more vulnerable to biologically-mediated chemical dissolution, as well as impacting non-calcifying organisms such as reef fish[87,95,96].

Our partners from the US National Oceanic and Atmospheric Administration (NOAA) joined the GRE to measure pH at locations surveyed throughout the Pacific Ocean. Manzello et al. (2021) found that areas of high coral cover are actually boosting OA by making the water more acidic through respiration. They also suggest that the duration and magnitude of exposure to lower pH may be greatest on reefs with the highest coral cover[93]. These findings imply that even reefs with the best conditions may face a more substantial impact from climate change, particularly ocean acidification, if nothing is done to address this global problem.



## 2. REEF FISH POPULATIONS ARE BEING OVEREXPLOITED GLOBALLY.

One of the most worrisome findings on the GRE was that nearly every country surveyed showed signs of overfishing (Figure 32). All countries in the Caribbean and four locations in the Pacific had total fish biomass at or below the estimated threshold for a sustainable reef fish community. Including size class assessments of families fished for subsistence and commercial fisheries, nearly every country had predominantly small fish remaining, indicating the world's reef fish populations are at risk of being overexploited.

Around the world, nearly 500 million people rely on coral reefs for sustenance, subsistence, coastal protection, and tourism-based income[100]. Most reef fish populations are unable to withstand the fishing pressure they are currently experiencing. It is important to recognize that reef fish play a larger role than just providing sustenance to humans. They are a critical component in a stable reef system. A study completed on the Great Barrier Reef immediately following a large-scale bleaching event showed that large herbivorous fish played a vital role in managing macroalgae growth following the disturbance. The study showed that in areas where large herbivores were protected and abundant, coral cover nearly doubled when compared to the fished, unprotected reefs[88].

We commend the many communities and managers throughout the world working on enforcing management plans to address local overfishing. We hope our maps and findings from this report can be used in their management efforts.

**Figure 32** NEARLY EVERY COUNTRY SURVEYED ON THE GLOBAL REEF EXPEDITION SHOWED SIGNS OF OVERFISHING. SMALL FISH WERE ABUNDANT ON MANY REEFS, SUCH AS THIS REEF IN THE SOLOMON ISLANDS, BUT FEW LARGE FISH REMAINED. THIS INDICATES CORAL REEF FISH ARE AT RISK OF BEING OVEREXPLOITED.

## 3. IDENTIFYING AND ADDRESSING ACUTE REEF DISTURBANCES CAN AID IN REEF RECOVERY.

The world's reefs are being dismantled from all sides and without substantial conservation and mitigation efforts, it is probable that they may never recover. Natural and human-caused acute disturbances, such as COTS outbreaks, storm damage, high nutrient runoff, and overfishing have caused extensive damage to reefs around the world[97–99].

Throughout the GRE, we saw the substantial impacts acute disturbances can have on a reef. In the Red Sea, French Polynesia, Tonga, and the Solomon Islands, we saw evidence of COTS outbreaks, and in the Cook Islands at Aitutaki, we witnessed an active outbreak. We removed over 600 individual COTS at Aitutaki and returned a two years later to help reassess the damage caused by the outbreak. After two years, we did not see substantial changes to the live coral cover, but this was expected as most coral communities take decades to recover.

Acute disturbances such as storms and tsunami damage are hard to mitigate but managing the reef in a way that reduces pressure from other factors such as overfishing and nutrient runoff can help aid in reef recovery.

## 4. MARINE PROTECTED AREAS WORK IN CONSERVING CORAL REEFS.

The GRE took place at a critical time. Shifts in the expanse of coral reefs and their unique habitats are imminent given the rapidly changing climate. The GRE highlighted that remote and undisturbed reefs had the best reef systems. The Gambier and Tuamotu Archipelagoes of French Polynesia and the Chagos Archipelago in the Indian Ocean had low human populations and, in the case of Chagos, the highest protection. These areas displayed some of the best reef systems with high coral cover and fish biomass and density and should be protected and preserved as these reefs may have the best chance of survival.

On the GRE, we were encouraged by countries such as Australia (N.GBR), Palau, and New Caledonia, which have large human populations utilizing the reefs, and have prioritized establishing large protected and managed areas to conserve their nearshore reef ecosystems. Described in more detail in the individual final country reports, in each of these cases, the sites with the strictest protections had the most stable reef ecosystems.

Strict no-take and no-entry zones have been proven to be successful in conserving coral reefs and the greatest example of this is the Chagos Archipelago. At the time of the research mission, the Chagos Archipelago had high fish density, biomass, and coral cover and after previous large-scale disturbance events and had nearly full recovery within 10 years[94]. Protecting remote reefs and using marine spatial planning to strategically place no-take, no-entry MPAs can help global coral reef resilience as the coral reef crisis shows no signs of slowing.

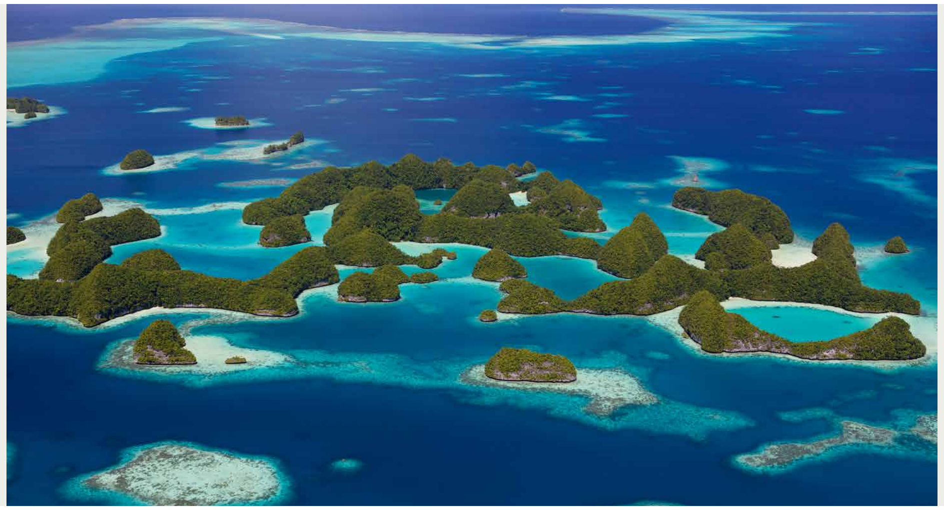
Currently, the foundation is using the maps and data collected on the GRE to develop a global coral reef resilience model that can be used by managers to help focus conservation efforts in areas where reefs have the highest chance of survival, given the rapidly changing climate. We are at a time where strong action is needed to conserve coral reefs, and are excited to share our resilience models with managers to help in prioritizing conservation efforts.

**Strong action is needed to conserve coral reefs.**



**Figure 33**

DRASTIC EFFORTS WILL BE NEEDED TO ADDRESS THE CORAL REEF CRISIS. ONE STEP IN THE RIGHT DIRECTION WAS TAKEN BY PALAU, WHICH PLEDGED TO EFFECTIVELY MANAGE AT LEAST 50% OF THEIR WATERS BY 2030. THEY ALREADY SUSTAINABLY MANAGE MUCH OF THEIR WATERS, SUCH AS THE ICONIC ROCK ISLANDS, PICTURED HERE.



## 5. COLLABORATION WITH LOCAL COMMUNITIES HAS THE BIGGEST IMPACT ON REEF CONSERVATION.

Aggressive management of the world's reefs will be key to their long-term survival. KSLOF found success in combining high-resolution habitat maps and working directly with local scientists and managers to establish large-scale conservation efforts. One of the biggest takeaways from the GRE was that nearly every community we worked with around the world expressed, and continues to express, the want and need for conservation of its reef systems. Working directly with the communities, sharing our findings, and expanding on their current management efforts has proven to be the most successful in conserving the reefs visited on the GRE. Our work on the GRE has been used to conserve reefs in The Bahamas, Fiji, and the Cook Islands.

Many communities we visited use traditional management tools to conserve their marine resources. The Cook Islands have revived customary management practices such as ra'ui to regulate fishing practices[101], and since the time of our mission, they have expanded and designated their entire exclusive economic zone as an MPA and are working to improve their nearshore fisheries management[102]. While working in the Cook Islands, KSLOF partnered with local managers and planners by sharing our findings and maps to aid in the designation and implementation of the Marae Moana, the Cook Islands Marine Park. Communities in the Lau Province of Fiji have also worked closely with KSLOF scientists to establish a locally recognized protected area and are currently working to have this become an internationally recognized MPA.

Palauans have practiced effective management to conserve their marine resources for thousands of years. Starting January 1, 2020, Palau designated over 475,000 km$^2$ as an MPA and has made huge strides in conservation by initiating the Micronesia Challenge, in which Palau partnered with neighboring countries to effectively manage at least 50% of its marine resources by 2030[103,104]. Drastic measures such as these are critical in protecting the world's reefs against the coral reef crisis (Figure 33).

The efforts and urgency of local communities provide much-needed hope that the world's reefs may survive the swift changes they are currently experiencing. KSLOF hopes our peer-reviewed publications and maps, our education and outreach materials, and the findings in this report and all of our country reports from the GRE, will continue to be used by local communities, governments, scientists, educators, and managers in the ongoing fight against the coral reef crisis and to preserve the world's coral reefs for generations to come.

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We only worked in countries where we were explicitly invited to conduct our research and are grateful to the governments, ministries, leaders, and officials of the Kingdom of Saudi Arabia, The Bahamas, Navassa, Jamaica, Colombia, St. Kitts and Nevis, Ecuador, French Polynesia, the Cook Islands, the Kingdom of Tonga, Fiji, New Caledonia, Australia, the Solomon Islands, the Republic of Palau, and the United Kingdom for granting us permission to sample and study the reefs of your country.

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The Global Reef Expedition benefited from Captain Steve Breen and the officers and crew of the *M/Y Golden Shadow*. The GRE lasted nearly ten years, spanning over 50,000 km, and the crew worked day and night to get the ship to each country and territory we studied, helped with ground transportation for participants, managed all logistics on the ship, and went above and beyond to ensure every participant on the ship was treated with exceptional care. They were responsible for getting us safely to our research sites, getting our education team safely to shore so they could work with communities around the world, and conducting all logistical operations of the dive and research vessels. They ensured that each researcher had access to the study sites and proper working tools and equipment needed to complete the work and had highly capable engineers and electricians who repaired and fabricated gear when we ran into complications. Behind the scenes, the crew worked at all hours to support all participants on the Global Reef Expedition, and for that, we are immensely grateful.

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# APPENDIX 1 | HABITAT MAPPED BY AREA (KM$^2$)

| Habitat Classifications | Bahamas | Peros Banhos, Chagos Archipelago | Colombia | Cook Islands | Lau Province, Fiji | French Polynesia, Austral Archipelago | French Polynesia, Gambier Archipelago | French Polynesia, Society Archipelago | French Polynesia, Tuamotu Archipelago | Galapagos Islands | New Caledonia | Saudi Arabia | Solomon Islands | Tonga |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Acropora palmata* framework | - | - | 10.29 | - | - | - | - | - | - | - | - | - | - | - |
| *Acropora palmata* patch reefs | - | - | 0.83 | - | - | - | - | - | - | - | - | - | - | - |
| Back reef coral bommies | - | - | - | 0.93 | 0.89 | 0.89 | 0.47 | 0.34 | 11.95 | - | - | - | 1.50 | - |
| Back reef coral framework | - | - | - | 18.19 | 5.64 | 6.54 | 5.33 | 37.44 | 37.89 | - | - | - | 15.16 | - |
| Back reef pavement | - | - | - | 14.11 | 96.11 | 15.28 | 6.14 | 25.58 | 120.47 | - | - | - | 55.68 | - |
| Back reef rubble dominated | - | - | - | 5.97 | 44.49 | 8.94 | 2.85 | 34.20 | 29.41 | - | - | - | 49.14 | - |
| Back reef sediment dominated | - | - | - | 29.35 | 7.62 | 27.88 | 8.36 | 89.74 | 98.37 | - | - | - | 23.81 | - |
| Backreef coral | - | - | - | - | - | - | - | - | - | - | 41.59 | - | - | 13.53 |
| Basalt boulders | - | - | - | - | - | - | - | - | - | 0.82 | - | - | - | - |
| Basalt rock | - | - | - | - | - | - | - | - | - | 60.78 | - | - | - | - |
| Beach rock | - | 0.16 | - | - | - | - | - | - | - | - | - | - | - | - |
| Beach sand | - | 0.71 | - | 1.38 | 1.53 | 1.41 | 3.14 | 5.35 | 29.36 | - | - | - | - | - |
| Blue hole | 0.46 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Buried lagoonal coral framework | - | - | - | 2.93 | - | - | - | - | - | - | - | - | - | - |
| Carbonate blocks | - | - | - | 0.29 | - | 1.56 | 10.72 | - | 54.86 | - | - | - | - | - |
| Carbonate hardground and reef flats | - | - | - | - | - | - | - | - | - | - | - | 273.91 | - | - |
| Columnar frameworks | - | - | - | - | - | - | - | - | - | - | - | 618.58 | - | - |
| Coral framework | 62.14 | - | - | - | - | - | - | - | - | 0.09 | - | - | - | - |

# APPENDIX 1 | HABITAT MAPPED BY AREA ($KM^2$)



| Habitat Classifications | Bahamas | Peros Banhos, Chagos Archipelago | Colombia | Cook Islands | Lau Province, Fiji | French Polynesia, Austral Archipelago | French Polynesia, Gambier Archipelago | French Polynesia, Society Archipelago | French Polynesia, Tuamotu Archipelago | Galapagos Islands | New Caledonia | Saudi Arabia | Solomon Islands | Tonga |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coral rubble | - | - | - | 0.01 | - | 0.48 | 2.22 | 3.87 | 24.08 | - | - | - | - | - |
| Coralline algal ridge | - | 2.26 | - | 3.74 | 13.02 | 4.74 | 3.41 | 7.80 | 17.98 | - | - | - | - | - |
| Cyanobacteria mats on sand | - | - | - | - | - | - | - | - | - | - | - | 12.44 | - | - |
| Deep fore reef slope | - | 6.70 | - | 11.81 | 51.55 | 62.43 | 15.52 | 18.03 | 3.85 | - | 108.60 | - | 52.91 | 70.51 |
| Deep lagoonal sands | - | - | - | - | - | - | - | - | - | - | - | 1,682.34 | - | - |
| Deep lagoonal water | - | 401.09 | - | 27.23 | 589.87 | - | 140.78 | 233.91 | 3,389.13 | - | 1,053.91 | - | - | 1,114.00 |
| Deep ocean water | - | 61.40 | - | - | - | - | - | - | - | - | - | - | - | - |
| Dense *Acropora* thickets | - | - | - | - | - | - | - | - | - | - | - | 25.36 | - | - |
| Dense macroalgae on sediment | - | 0.01 | - | - | 1.40 | - | - | - | - | - | 22.39 | - | 13.36 | - |
| Dense seagrass meadows | 491.72 | 0.38 | - | - | 12.12 | - | - | - | - | - | 3.37 | - | 7.17 | 17.65 |
| Eroded aeolian dunes | 140.69 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Eroded island surface | 0.76 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fore reef sand flats | - | 1.58 | - | 1.35 | 10.79 | 2.23 | 7.28 | 0.01 | - | - | 37.54 | - | 20.60 | 32.89 |
| Gorgonian-dominated fore reef | - | - | 20.30 | - | - | - | - | - | - | - | - | - | - | - |
| Gorgonian-dominated hardground | 202.85 | - | 277.53 | - | - | - | - | - | - | - | - | - | - | - |
| Inland waters | - | 0.02 | - | 0.07 | 0.06 | - | - | 3.72 | 0.02 | - | - | - | 0.04 | - |
| Lagoonal *Acropora* framework | - | - | - | 1.40 | - | - | 135.47 | - | 10.82 | - | - | - | 0.02 | - |
| Lagoonal coral | - | - | - | - | - | - | - | - | - | - | 77.71 | - | - | 73.57 |

# APPENDIX 1 | HABITAT MAPPED BY AREA (KM$^2$)

| Habitat Classifications | Bahamas | Peros Banhos, Chagos Archipelago | Colombia | Cook Islands | Lau Province, Fiji | French Polynesia, Austral Archipelago | French Polynesia, Gambier Archipelago | French Polynesia, Society Archipelago | French Polynesia, Tuamotu Archipelago | Galapagos Islands | New Caledonia | Saudi Arabia | Solomon Islands | Tonga |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lagoonal coral framework | - | - | - | - | - | 0.05 | - | - | - | - | - | - | - | - |
| Lagoonal floor barren | - | 17.69 | - | 45.19 | 210.26 | 61.96 | 162.84 | 45.42 | 771.43 | - | - | - | 198.27 | - |
| Lagoonal floor coral bommies | - | 0.05 | - | 1.12 | 3.40 | 2.45 | 2.52 | 0.05 | 10.35 | - | - | - | 1.59 | - |
| Lagoonal floor macroalgae on sediment | - | - | - | 0.53 | 0.94 | 13.11 | 1.89 | 0.09 | 8.51 | - | - | - | - | - |
| Lagoonal fringing reefs | - | 2.18 | - | - | 35.09 | 5.63 | 12.46 | 23.89 | - | - | - | - | 76.34 | - |
| Lagoonal macroalgae dominated substrate | - | - | - | - | - | - | - | - | - | - | 68.66 | - | - | 7.74 |
| Lagoonal massive coral framework | - | | - | 8.87 | - | - | - | - | - | - | - | - | - | - |
| Lagoonal *Orbicella* framework | - | - | 68.99 | - | - | - | - | - | - | - | - | - | - | - |
| Lagoonal patch reefs | - | 2.83 | - | 2.26 | 1.62 | 3.17 | 3.49 | 1.23 | 11.03 | - | - | - | 6.06 | - |
| Lagoonal pavement | - | - | - | - | - | 0.94 | - | - | - | - | - | - | - | - |
| Lagoonal pinnacle reefs branching coral dominated | - | 9.30 | - | - | - | 0.43 | - | 1.54 | - | - | - | - | 8.50 | - |
| Lagoonal pinnacle reefs calcareous red algal conglomerate | - | - | - | - | - | - | - | - | - | - | - | - | 5.97 | - |
| Lagoonal pinnacle reefs massive coral dominated | - | 12.15 | - | - | 19.55 | 7.75 | - | 18.12 | 31.66 | - | - | - | 60.47 | - |
| Lagoonal sediment apron macroalgae on sediment | - | - | - | - | 0.13 | - | 0.44 | - | 0.36 | - | - | - | 4.57 | - |
| Lagoonal sediment apron sediment dominated | - | - | - | - | 11.26 | - | 2.82 | 7.42 | 8.50 | - | - | - | 30.05 | - |
| Lagoonal substrate | - | - | - | - | - | - | - | - | - | - | 434.08 | - | - | 260.81 |
| Land | 1,924.13 | - | 0.15 | - | - | - | - | - | - | 121.80 | - | - | - | - |

# APPENDIX 1 | HABITAT MAPPED BY AREA ($KM^2$)

| Habitat Classifications | Bahamas | Peros Banhos, Chagos Archipelago | Colombia | Cook Islands | Lau Province, Fiji | French Polynesia, Austral Archipelago | French Polynesia, Gambier Archipelago | French Polynesia, Society Archipelago | French Polynesia, Tuamotu Archipelago | Galapagos Islands | New Caledonia | Saudi Arabia | Solomon Islands | Tonga |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Leeward coral crests | - | - | - | - | - | - | - | - | - | - | - | 127.69 | - | - |
| Macroalgae on sand | 3.09 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Macroalgae, sponges, sandy hardgrounds | - | - | - | - | - | - | - | - | - | - | - | 174.65 | - | - |
| Macroalgal-dominated hardground | 13.34 | - | 227.62 | - | - | - | - | - | - | - | - | - | - | - |
| Mangroves | - | 0.65 | - | - | 3.18 | - | - | - | - | - | - | - | 32.91 | 4.27 |
| Mangroves and nearshore vegetation | - | - | - | - | - | - | - | - | - | - | - | 20.57 | - | - |
| Moderate to dense macroalgae in sand | 2.43 | - | 620.04 | - | - | - | - | - | - | - | - | - | - | - |
| *Orbicella* framework fore reef | - | - | 13.67 | - | - | - | - | - | - | - | - | - | - | - |
| *Orbicella* patch reefs | - | - | 4.80 | - | - | - | - | - | - | - | - | - | - | - |
| Mud | - | - | - | 0.05 | 0.53 | - | - | 0.73 | - | - | 1.29 | - | 5.76 | - |
| Nearshore algal communities | - | - | - | - | - | - | - | - | - | - | 8.12 | - | - | 19.73 |
| Patch reef | 9.01 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pleistocene surface with coral colonies | 58.32 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Reef crest | - | -- | - | - | - | - | - | - | - | - | - | - | 7.63 | - |
| Reef walls and drop-offs | - |  | - | - | - | - | - | - | - | - | - | 29.23 | - | - |
| Reeftop algal mats | - | - | - | - | - | - | - | 0.06 | 0.37 | - | 2.58 | - | - | - |
| Rock | - | - | - | 1.20 | - | - | - | 12.57 | - | - | - | - | - | - |
| Rubble fields | - | - | 7.93 | - | - | - | - | - | - | - | - | - | - | - |

# APPENDIX 1 | HABITAT MAPPED BY AREA ($KM^2$)

| Habitat Classifications | Bahamas | Peros Banhos, Chagos Archipelago | Colombia | Cook Islands | Lau Province, Fiji | French Polynesia, Austral Archipelago | French Polynesia, Gambier Archipelago | French Polynesia, Society Archipelago | French Polynesia, Tuamotu Archipelago | Galapagos Islands | New Caledonia | Saudi Arabia | Solomon Islands | Tonga |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sand | 74.91 | - | - | - | - | - | - | - | - | 27.48 | - | - | - | - |
| Sand and mud flats | - | - | - | - | - | - | - | - | - | - | - | 365.65 | - | - |
| Sand with algae | - | - | - | - | - | - | - | - | - | 5.14 | - | - | - | - |
| Scoured channels | - | - | - | - | - | - | - | - | - | - | - | 3.06 | - | - |
| Scoured hardground | 116.09 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Seagrass meadows | - | - | - | - | - | - | - | - | - | - | - | 67.53 | - | - |
| Sediment apron | - | - | 7.06 | - | - | - | - | - | - | - | - | - | - | - |
| Shallow coral framework | 16.77 | - | 11.44 | - | - | - | - | - | - | - | - | - | - | - |
| Shallow fore reef community | - | - | - | - | - | - | - | - | - | - | 105.14 | - | - | 79.71 |
| Shallow fore reef slope | - | 7.14 | - | 10.42 | 25.18 | 31.97 | 40.44 | 16.13 | 61.91 | - | - | - | 54.18 | - |
| Shallow fore reef terrace | - | 7.56 | - | 6.84 | 18.32 | 9.68 | 10.15 | 11.78 | 26.19 | - | - | - | 48.88 | - |
| Shallow sand sheets | - | - | - | - | - | - | - | - | - | - | - | 3,226.58 | - | - |
| Shelf-edge coral framework | 28.93 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Soil | - | - | - | - | - | 1.67 | 1.86 | 4.09 | - | - | - | - | - | - |
| Sparse corals, rubble, and sand | - | - | - | - | - | - | - | - | - | - | - | 579.47 | - | - |
| Sparse to medium density seagrass | 78.61 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Submerged vegetation | - | - | - | - | - | - | - | - | - | 0.02 | - | - | - | - |
| Terrestrial vegetation | - | 7.20 | - | 96.18 | 290.64 | 100.19 | 34.22 | 343.02 | 86.38 | - | 267.15 | - | 559.14 | 206.91 |

# APPENDIX 1 | HABITAT MAPPED BY AREA (KM²)

| Habitat Classifications | Bahamas | Peros Banhos, Chagos Archipelago | Colombia | Cook Islands | Lau Province, Fiji | French Polynesia, Austral Archipelago | French Polynesia, Gambier Archipelago | French Polynesia, Society Archipelago | French Polynesia, Tuamotu Archipelago | Galapagos Islands | New Caledonia | Saudi Arabia | Solomon Islands | Tonga |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Turf-algal-dominated hardground | 4.02 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Unconsolidated sand sheets | - | - | 458.92 | - | - | - | - | - | - | - | - | - | - | - |
| Unvegetated terrestrial | - | - | - | 0.17 | 26.09 | - | - | - | - | - | - | - | 12.14 | - |
| Urban | - | - | - | 3.55 | 0.61 | 2.71 | 0.44 | 10.32 | 2.57 | - | 0.35 | - | 1.52 | 2.46 |
| Wetlands | - | 0.30 | - | - | - | - | - | - | - | - | - | - | - | - |
| Windward coral crests | - | - | - | - | - | - | - | - | - | - | - | 127.43 | - | - |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 1 | 16.91612 | 42.29254 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 2 | 16.92904 | 42.28852 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 3 | 16.89894 | 42.25025 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 4 | 17.07091 | 41.93261 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 5 | 17.09743 | 41.91989 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 6 | 17.06367 | 41.90481 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 7 | 17.08736 | 41.91079 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 8 | 17.00145 | 41.36283 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 9 | 16.94038 | 41.35460 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 10 | 16.73097 | 41.78627 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 11 | 16.74176 | 41.74350 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 12 | 16.69473 | 41.82946 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 13 | 16.70569 | 41.80913 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 14 | 16.63576 | 41.88818 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 15 | 16.63294 | 41.87719 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 16 | 16.81433 | 41.54255 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 17 | 16.89461 | 41.56198 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 18 | 16.86874 | 41.44787 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 19 | 16.79890 | 41.51369 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 20 | 16.80602 | 41.62758 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 21 | 16.80747 | 41.61946 | May 2006 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Islands | 22 | 16.55966 | 42.23502 | May 2006 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 1 | 28.049800 | 34.984300 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 2 | 28.045600 | 34.987500 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 3 | 28.094100 | 34.996800 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 4 | 28.019100 | 34.961700 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 5 | 27.996500 | 35.010900 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 6 | 28.002900 | 35.007900 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 7 | 27.993000 | 34.951900 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 8 | 27.996500 | 34.998200 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 9 | 27.973300 | 35.147500 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 10 | 27.979600 | 35.154300 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 11 | 28.067000 | 35.095600 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 12 | 28.014900 | 35.111900 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 13 | 27.962300 | 35.149300 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 14 | 27.883200 | 35.221700 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 15 | 27.898400 | 35.168800 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 16 | 27.923500 | 35.241400 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 17 | 27.923300 | 35.238000 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 18 | 27.894200 | 35.073300 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Ras Al-Qasabah | 19 | 27.903300 | 35.082600 | Sept 2007 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 1 | 25.410930 | 36.823370 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 2 | 25.359050 | 36.883830 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 3 | 25.404270 | 36.952460 | May 2008 |

# APPENDIX 2 | DIVE SITES AND SITE DESCRIPTIONS

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 4 | 25.641990 | 36.479300 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 5 | 25.581810 | 36.547780 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 6 | 25.568170 | 36.684450 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 7 | 25.559070 | 36.824010 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 8 | 25.523890 | 36.835330 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 9 | 25.565400 | 36.629300 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 10 | 25.649640 | 36.695530 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 11 | 25.604590 | 36.683010 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 12 | 25.761020 | 36.577790 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 13 | 25.835790 | 36.599550 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 14 | 25.815220 | 36.538970 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 15 | 25.877004 | 36.591466 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 16 | 25.866670 | 36.608060 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 17 | 25.805480 | 36.659600 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 18 | 25.817110 | 36.600350 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 19 | 25.392830 | 36.687410 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 20 | 25.330060 | 36.768950 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Al Wajh | 21 | 35.339888 | 36.762017 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Yanbu | 1 | 23.181700 | 38.720340 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Yanbu | 2 | 23.173280 | 38.679780 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Yanbu | 3 | 23.431130 | 38.539210 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Yanbu | 4 | 23.454900 | 38.539890 | May 2008 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Red Sea | Kingdom of Saudi Arabia | Yanbu | 5 | 23.875423 | 38.205989 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Yanbu | 6 | 23.855330 | 38.241910 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Yanbu | 7 | 23.836960 | 38.164420 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Yanbu | 8 | 23.682880 | 38.324170 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Yanbu | 9 | 23.701890 | 38.344370 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Yanbu | 10 | 23.829240 | 38.274140 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Yanbu | 11 | 23.840210 | 38.132580 | May 2008 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 1 | 19.98585 | 40.11390 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 2 | 19.95083 | 40.15405 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 3 | 19.97410 | 39.94327 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 4 | 19.97135 | 39.95163 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 5 | 19.93499 | 39.99026 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 6 | 19.84162 | 39.92428 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 7 | 19.84000 | 39.93333 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 8 | 19.77177 | 40.20365 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 9 | 19.79441 | 40.14799 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 10 | 19.73251 | 40.14767 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 11 | 19.75891 | 40.26950 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 12 | 19.76498 | 40.29776 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 13 | 19.75843 | 40.31802 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 14 | 19.64091 | 40.30381 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 15 | 19.63983 | 40.05317 | April 2009 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 16 | 19.64205 | 40.04946 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 17 | 19.70419 | 40.30751 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 18 | 19.66434 | 40.43226 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 19 | 19.67330 | 40.44167 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 20 | 19.61684 | 40.40340 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 21 | 19.53389 | 40.11900 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 22 | 19.52500 | 40.12940 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 23 | 19.65140 | 40.23876 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 24 | 19.59761 | 40.24142 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 25 | 19.66434 | 40.43226 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 26 | 19.66420 | 40.44222 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 27 | 19.60009 | 40.63850 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 28 | 19.48476 | 40.72180 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 29 | 19.24685 | 40.97718 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 30a | 19.24748 | 40.98206 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 30b | 19.28833 | 40.98666 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 30c | 19.24833 | 40.98166 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 31 | 19.19353 | 40.71233 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 32 | 19.15886 | 40.53606 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 33 | 19.12629 | 40.58944 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 34 | 19.17681 | 40.72295 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 35 | 19.01122 | 40.60947 | April 2009 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 36 | 19.00666 | 40.62473 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 37 | 19.14720 | 40.68010 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 38 | 19.06971 | 40.61148 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 39 | 19.05488 | 40.63392 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 40 | 19.21296 | 40.70494 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 41 | 19.23090 | 40.52824 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 42 | 19.21110 | 40.62551 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 43 | 19.21129 | 40.70736 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 44 | 18.81185 | 40.84597 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 45 | 18.86103 | 40.70445 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 46 | 18.85695 | 40.71630 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 47 | 18.93308 | 40.78437 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 48 | 18.86361 | 40.81184 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 49 | 18.86317 | 40.80553 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 50 | 18.86361 | 40.81184 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 51 | 18.60553 | 41.06599 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 52 | 18.76667 | 41.04833 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 53 | 18.74029 | 41.01057 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 54 | 18.57837 | 41.07859 | April 2009 |
| Red Sea | Kingdom of Saudi Arabia | Farasan Banks | 55 | 18.86454 | 40.38068 | April 2009 |
| Caribbean | The Bahamas | Andros Shelf | AN-01 | 23.56202 | -77.32854 | October 2011 |
| Caribbean | The Bahamas | Andros Shelf | AN-02 | 23.55205 | -77.33203 | October 2011 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Caribbean | The Bahamas | Andros Shelf | AN-03 | 23.58253 | -77.33286 | October 2011 |
| Caribbean | The Bahamas | Andros Shelf | AN-04 | 23.60288 | -77.34055 | October 2011 |
| Caribbean | The Bahamas | Andros Shelf | AN-05 | 23.67619 | -77.37133 | October 2011 |
| Caribbean | The Bahamas | Andros Shelf | AN-06 | 23.72853 | -77.39325 | October 2011 |
| Caribbean | The Bahamas | Andros Shelf | AN-07 | 23.78030 | -77.41680 | October 2011 |
| Caribbean | The Bahamas | Andros Shelf | AN-08 | 25.39198 | -77.82326 | October 2011 |
| Caribbean | The Bahamas | Andros Shelf | AN-09 | 25.39158 | -77.82007 | October 2011 |
| Caribbean | The Bahamas | Andros Shelf | AN-10 | 25.43290 | -78.00849 | October 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-01 | 23.55521 | -79.57055 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-02 | 23.58089 | -79.59282 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-03 | 23.59069 | -79.60298 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-04 | 23.42404 | -79.57460 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-05 | 23.43012 | -79.65046 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-06 | 23.60639 | -79.61355 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-07 | 23.74519 | -79.68191 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-08 | 23.69257 | -79.65529 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-09 | 23.64930 | -79.61062 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-10 | 23.86417 | -79.80456 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-11 | 23.89696 | -79.80958 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-12 | 23.83794 | -79.74358 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-13 | 23.81405 | -79.72993 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-14 | 23.72230 | -79.95085 | April-May 2011 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Caribbean | The Bahamas | Cay Sal Bank | CSB-15 | 24.01154 | -79.80262 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-16 | 23.95870 | -79.79111 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-17 | 23.88732 | -79.76373 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-18 | 24.01195 | -79.81213 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-19 | 23.99049 | -79.80727 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-20 | 24.03841 | -79.95461 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-21 | 24.04608 | -79.96050 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-22 | 24.04664 | -80.11508 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-23 | 23.96898 | -80.38522 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-24 | 24.00787 | -80.30127 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-25 | 23.91085 | -80.48680 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-26 | 23.93244 | -80.47313 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-27 | 23.95722 | -80.44592 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-28 | 23.92997 | -80.47625 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-29 | 23.85814 | -80.49263 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-30 | 23.77863 | -80.47765 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-31 | 23.79921 | -80.47932 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-32 | 23.81126 | -80.47852 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-33 | 23.68629 | -80.40205 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-34 | 23.78584 | -80.27232 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-35 | 23.64939 | -80.18733 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-36 | 23.49485 | -79.89154 | April-May 2011 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Caribbean | The Bahamas | Cay Sal Bank | CSB-37 | 23.48346 | -79.85194 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-38 | 23.49066 | -79.87989 | April-May 2011 |
| Caribbean | The Bahamas | Cay Sal Bank | CSB-39 | 23.49395 | -79.88530 | April-May 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-01 | 21.11241 | -73.67271 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-02 | 21.13884 | -73.57152 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-03 | 21.12559 | -73.65472 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-04 | 21.13290 | -73.61866 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-05 | 21.08957 | -73.65251 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-06 | 21.02854 | -73.69021 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-07 | 21.01152 | -73.70364 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-08 | 20.97379 | -73.68474 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-09 | 21.03189 | -73.66754 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-10 | 21.03934 | -73.65972 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-11 | 21.17747 | -73.52147 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-12 | 21.19241 | -73.43532 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-13 | 20.89164 | -73.12965 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-14 | 20.94855 | -73.15150 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-15 | 20.93535 | -73.20407 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-16 | 21.00912 | -73.12897 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-17 | 20.95075 | -73.24772 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-18 | 20.92930 | -73.38667 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | GI-19 | 21.08023 | -73.64886 | August 2011 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Caribbean | The Bahamas | Great Inagua Shelf | LI-01 | 21.48096 | -73.07515 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | LI-02 | 21.51139 | -73.07539 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | LI-03 | 21.50169 | -73.08015 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | LI-04 | 21.43566 | -73.05491 | August 2011 |
| Caribbean | The Bahamas | Great Inagua Shelf | LI-05 | 21.54370 | -73.01575 | August 2011 |
| Caribbean | The Bahamas | North Inagua Shelf | HR-01 | 21.70200 | -73.84700 | August 2011 |
| Caribbean | The Bahamas | North Inagua Shelf | HR-02 | 21.69500 | -73.85200 | August 2011 |
| Caribbean | The Bahamas | North Inagua Shelf | HR-03 | 21.69210 | -73.76202 | August 2011 |
| Caribbean | The Bahamas | North Inagua Shelf | HR-04 | 21.70448 | -73.78361 | August 2011 |
| Caribbean | The Bahamas | North Inagua Shelf | HR-05 | 21.70942 | -73.81771 | August 2011 |
| Caribbean | The Bahamas | North Inagua Shelf | HR-06 | 21.67358 | -73.79047 | August 2011 |
| Caribbean | The Bahamas | North Inagua Shelf | HR-07 | 21.66686 | -73.81847 | August 2011 |
| Caribbean | The Bahamas | North Inagua Shelf | HR-08 | 21.68317 | -73.81777 | August 2011 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COAL-01 | 16.01037 | -79.32291 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COAL-02 | 16.02593 | -79.29423 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COAL-03 | 16.01540 | -79.30450 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COAL-04 | 16.06520 | -79.29410 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COAL-05 | 16.08638 | -79.29887 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COAL-06 | 16.09838 | -79.29893 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COAL-07 | 16.05280 | -79.29040 | April 2012 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COAL-08 | 16.10570 | -79.30490 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COAL-09 | 16.10680 | -79.30870 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-10 | 15.89660 | -78.65770 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-11 | 15.89080 | -78.64640 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-12 | 15.88270 | -78.65160 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-13 | 15.84350 | -78.67990 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-14 | 15.82080 | -78.73930 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-15 | 15.86180 | -78.68070 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-16 | 15.84760 | -78.71100 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-25 | 15.89460 | -78.62660 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-26 | 15.92650 | -78.59350 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-27 | 15.87650 | -78.61990 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-28 | 15.91250 | -78.56710 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-29 | 15.90370 | -78.57220 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-30 | 15.90830 | -78.57710 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-31 | 15.82770 | -78.67890 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | CONU-32 | 15.87610 | -78.64170 | April 2012 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COSE-17 | 15.85760 | -79.81270 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COSE-18 | 15.81990 | -79.84400 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COSE-19 | 15.83890 | -79.83340 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COSE-20 | 15.87080 | -79.86780 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COSE-21 | 15.79140 | -79.84990 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COSE-22 | 15.90390 | -79.69770 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COSE-23 | 15.87030 | -79.87060 | April 2012 |
| Caribbean | Colombia | Eastern Colombia-Caribbean Shelf | COSE-24 | 15.87870 | -79.86840 | April 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-01 | 17.00640 | -77.81349 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-02 | 16.93884 | -77.83963 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-03 | 16.93192 | -77.79698 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-04 | 17.04509 | -77.76067 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-06 | 17.03978 | -77.68607 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-07 | 17.04917 | -77.72060 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-08 | 16.97170 | -77.79070 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-09 | 17.00256 | -77.78744 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-10 | 16.93080 | -77.91980 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-11 | 16.83950 | -78.08710 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-12 | 16.84350 | -78.10010 | March 2012 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-13 | 16.88980 | -77.99265 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-14 | 17.04736 | -77.51462 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-15 | 17.03267 | -77.53016 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-16 | 16.93983 | -77.57468 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-17 | 16.95351 | -78.66334 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-18 | 16.86968 | -78.10248 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-19 | 16.98122 | -77.79603 | March 2012 |
| Caribbean | Jamaica | Pedro Bank Shelf | JAPB-20 | 16.93890 | -77.82957 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-01 | 18.41420 | -75.01600 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-02 | 18.41400 | -75.02400 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-03 | 18.38910 | -75.01766 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-04 | 18.41609 | -75.02541 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-05 | 18.40362 | -75.02430 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-06 | 18.39626 | -75.02397 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-07 | 18.39145 | -75.02245 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-08 | 18.39393 | -75.02166 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-09 | 18.39250 | -75.01420 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-10 | 18.41413 | -75.01212 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-11 | 18.39730 | -75.02060 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-12 | 18.40010 | -75.02248 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-13 | 18.41000 | -75.03060 | March 2012 |
| Caribbean | Navassa | South Haiti Shelf | NAV-14 | 18.40860 | -75.02870 | March 2012 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Caribbean | Navassa | South Haiti Shelf | NAV-15 | 18.39638 | -75.01888 | March 2012 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-01 | 17.23254 | -62.58743 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-02 | 17.22024 | -62.57822 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-03 | 17.21232 | -62.65492 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-04 | 17.18156 | -62.68222 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-05 | 17.18605 | -62.68056 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-06 | 17.25531 | -62.71649 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-07 | 17.09406 | -62.62101 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-08 | 17.08571 | -62.59632 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-09 | 17.16554 | -62.63558 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-10 | 17.35471 | -62.85279 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-11 | 17.37352 | -62.86853 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-12 | 17.42522 | -62.81744 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-13 | 17.38081 | -62.71470 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-14 | 17.39351 | -62.73745 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-15 | 17.42129 | -62.80548 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-16 | 17.35665 | -62.85536 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-17 | 17.31224 | -62.79892 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-18 | 17.28392 | -62.74776 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-19 | 17.26386 | -62.72036 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-20 | 17.26093 | -62.72467 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-21 | 17.18199 | -62.63269 | June 2011 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-22 | 17.22258 | -62.66441 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-23 | 17.26589 | -62.68679 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-24 | 17.31331 | -62.66471 | June 2011 |
| Caribbean | St. Kitts and Nevis | Saba Shelf | STK-25 | 17.27659 | -62.62533 | June 2011 |
| Indian Ocean | Chagos Archipelago | Blenheim | BIBL82 | -5.2543 | 72.4572 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Blenheim | BIBL83 | -5.2186 | 72.4926 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Blenheim | BIBL86 | -5.1780 | 72.4571 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Blenheim | BIBL87 | -5.2320 | 72.4431 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Egmont | BIEG02 | -6.6671 | 71.3909 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Egmont | BIEG03 | -6.6939 | 71.3786 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Egmont | BIEG04 | -6.6475 | 71.3684 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Egmont | BIEG05 | -6.6425 | 71.3112 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Egmont | BIEG06 | -6.6394 | 71.3395 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Egmont | BIEG07 | -6.6673 | 71.3681 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- North | BINI77 | -5.7059 | 72.3241 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- North | BINI78 | -5.6805 | 72.3815 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- North | BINI79 | -5.6890 | 72.3225 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- North | BINI80 | -5.7125 | 72.0457 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BICC35 | -6.1839 | 71.6403 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BICC36 | -6.2321 | 71.5883 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BICC50 | -6.3995 | 71.6173 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BICC51 | -6.3002 | 71.5696 | March-May 2015 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Indian Ocean | Chagos Archipelago | GCB- West | BIDI08 | -6.3942 | 71.2341 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIDI09 | -6.3793 | 71.2336 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIDI10 | -6.3908 | 71.2462 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIDI12 | -6.4534 | 71.2337 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIDI13 | -6.4611 | 71.2439 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIDI14 | -6.4099 | 71.2562 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIDI15 | -6.3531 | 71.2358 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIDI16 | -6.3409 | 71.2567 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIEA17 | -6.1810 | 71.3483 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIEA18 | -6.2024 | 71.4042 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIEA19 | -6.2020 | 71.3588 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIEA20 | -6.1899 | 71.3633 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIEA22 | -6.2766 | 71.2763 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIEA23 | -6.2422 | 71.2906 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIEA24 | -6.2096 | 71.3043 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIEA25 | -6.1907 | 71.3184 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIEA26 | -6.1722 | 71.3319 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BIEA52 | -6.1988 | 71.4931 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB27 | -6.1562 | 71.5099 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB28 | -6.1384 | 71.5091 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB29 | -6.1346 | 71.4980 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB30 | -6.1640 | 71.5321 | March-May 2015 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Indian Ocean | Chagos Archipelago | GCB- West | BITB32 | -6.1715 | 71.5934 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB33 | -6.1793 | 71.5813 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB34 | -6.1694 | 71.5464 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB37 | -6.1770 | 71.5440 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB38 | -6.1683 | 71.5404 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB39 | -6.1715 | 71.5349 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB40 | -6.1481 | 71.5285 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB41 | -6.0300 | 71.5490 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB42 | -6.0576 | 71.5213 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB43 | -6.1053 | 71.4988 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB44 | -6.0398 | 71.5508 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB45 | -6.0508 | 71.5350 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB46 | -6.0961 | 71.5143 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB47 | -6.0266 | 71.6164 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB48 | -6.0679 | 71.6752 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB49 | -6.1103 | 71.6547 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB53 | -6.1268 | 71.5032 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB54 | -6.1660 | 71.5268 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB55 | -6.1753 | 71.5397 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB56 | -6.1857 | 71.5661 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB57 | -6.1598 | 71.5271 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | GCB- West | BITB58 | -6.1479 | 71.5241 | March-May 2015 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB110 | -5.3175 | 71.9224 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB112 | -5.2373 | 71.9620 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB114 | -5.2572 | 71.9758 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB60 | -5.4434 | 71.7499 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB61 | -5.3912 | 71.7497 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB62 | -5.4272 | 71.7778 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB63 | -5.4152 | 71.7750 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB64 | -5.4624 | 71.8244 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB65 | -5.4108 | 71.8035 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB66 | -5.3813 | 71.7518 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB67 | -5.2810 | 71.7350 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB68 | -5.2563 | 71.7686 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB69 | -5.2964 | 71.7670 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB70 | -5.3252 | 71.8574 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB71 | -5.2551 | 71.8139 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB72 | -5.2761 | 71.8866 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB73 | -5.2673 | 71.8886 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB74 | -5.2611 | 71.9518 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB75 | -5.3050 | 71.9790 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Peros Banhos | BIPB76 | -5.3377 | 71.9806 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Salomon Atoll | BISA102 | -5.3694 | 72.2138 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Salomon Atoll | BISA103 | -5.3490 | 72.2687 | March-May 2015 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Indian Ocean | Chagos Archipelago | Salomon Atoll | BISA104 | -5.3083 | 72.2687 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Salomon Atoll | BISA105 | -5.3343 | 72.2431 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Salomon Atoll | BISA106 | -5.3443 | 72.2039 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Salomon Atoll | BISA107 | -5.3102 | 72.2689 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Salomon Atoll | BISA84 | -5.3173 | 72.2241 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Salomon Atoll | BISA88 | -5.3393 | 72.2361 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Salomon Atoll | BISA91 | -5.3397 | 72.2633 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Salomon Atoll | BISA92 | -5.3289 | 72.2800 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Salomon Atoll | BISA93 | -5.2993 | 72.2579 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Salomons Island | BISA94 | -5.3504 | 72.2200 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Salomons Island | BISA97 | -5.3168 | 72.2373 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Salomons Island | BISA98 | -5.3242 | 72.2190 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Speakers Bank | BISP100 | -4.7843 | 72.3445 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Speakers Bank | BISP101 | -4.7925 | 72.3456 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Speakers Bank | BISP115 | -4.9195 | 72.4370 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Speakers Bank | BISP89 | -4.9518 | 72.3830 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Speakers Bank | BISP90 | -4.9505 | 72.4122 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Speakers Bank | BISP95 | -5.0499 | 72.2873 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Speakers Bank | BISP96 | -4.9659 | 72.2362 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Victory Bank | BIVB108 | -5.5265 | 72.2265 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Victory Bank | BIVB109 | -5.5476 | 72.2188 | March-May 2015 |
| Indian Ocean | Chagos Archipelago | Victory Bank | BIVB81 | -5.5344 | 72.2159 | March-May 2015 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Indian Ocean | Chagos Archipelago | Victory Bank | BIVB99 | -5.5310 | 72.2451 | March-May 2015 |
| Pacific Ocean | Cook Islands | Aitutaki | CIAT13 | -18.9043 | -159.7236 | April-May 2013 |
| Pacific Ocean | Cook Islands | Aitutaki | CIAT14 | -18.8184 | -159.7735 | April-May 2013 |
| Pacific Ocean | Cook Islands | Aitutaki | CIAT15 | -18.8897 | -159.8272 | April-May 2013 |
| Pacific Ocean | Cook Islands | Aitutaki | CIAT16 | -18.8672 | -159.8188 | April-May 2013 |
| Pacific Ocean | Cook Islands | Aitutaki | CIAT17 | -18.8331 | -159.7941 | April-May 2013 |
| Pacific Ocean | Cook Islands | Aitutaki | CIAT18 | -18.9173 | -159.8452 | April-May 2013 |
| Pacific Ocean | Cook Islands | Aitutaki | CIAT19 | -18.8517 | -159.8054 | April-May 2013 |
| Pacific Ocean | Cook Islands | Aitutaki | CIAT20 | -18.9283 | -159.7943 | April-May 2013 |
| Pacific Ocean | Cook Islands | Aitutaki | CIAT21 | -18.9519 | -159.7445 | April-May 2013 |
| Pacific Ocean | Cook Islands | Aitutaki | CIAT22 | -18.9271 | -159.7250 | April-May 2013 |
| Pacific Ocean | Cook Islands | Palmerston | CIPA23 | -17.9926 | -163.1535 | April-May 2013 |
| Pacific Ocean | Cook Islands | Palmerston | CIPA24 | -18.0291 | -163.1178 | April-May 2013 |
| Pacific Ocean | Cook Islands | Palmerston | CIPA25 | -18.0489 | -163.1128 | April-May 2013 |
| Pacific Ocean | Cook Islands | Palmerston | CIPA26 | -18.0885 | -163.1521 | April-May 2013 |
| Pacific Ocean | Cook Islands | Palmerston | CIPA27 | -18.0697 | -163.1293 | April-May 2013 |
| Pacific Ocean | Cook Islands | Palmerston | CIPA28 | -18.0412 | -163.1876 | April-May 2013 |
| Pacific Ocean | Cook Islands | Palmerston | CIPA29 | -18.0057 | -163.1757 | April-May 2013 |
| Pacific Ocean | Cook Islands | Palmerston | CIPA30 | -18.0790 | -163.1817 | April-May 2013 |
| Pacific Ocean | Cook Islands | Raratonga | CIRR02 | -21.2513 | -159.8290 | April-May 2013 |
| Pacific Ocean | Cook Islands | Raratonga | CIRR03 | -21.2136 | -159.8331 | April-May 2013 |
| Pacific Ocean | Cook Islands | Raratonga | CIRR04 | -21.2417 | -159.7225 | April-May 2013 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Cook Islands | Raratonga | CIRR05 | -21.2136 | -159.7330 | April-May 2013 |
| Pacific Ocean | Cook Islands | Raratonga | CIRR06 | -21.1993 | -159.7569 | April-May 2013 |
| Pacific Ocean | Cook Islands | Raratonga | CIRR07 | -21.2642 | -159.8165 | April-May 2013 |
| Pacific Ocean | Cook Islands | Raratonga | CIRR08 | -21.2745 | -159.7725 | April-May 2013 |
| Pacific Ocean | Cook Islands | Raratonga | CIRR09 | -21.2719 | -159.7299 | April-May 2013 |
| Pacific Ocean | Cook Islands | Raratonga | CIRR10 | -21.2007 | -159.7714 | April-May 2013 |
| Pacific Ocean | Cook Islands | Raratonga | CIRR11 | -21.2300 | -159.8335 | April-May 2013 |
| Pacific Ocean | Cook Islands | Raratonga | CIRR12 | -21.1935 | -159.7965 | April-May 2013 |
| Pacific Ocean | Cook Islands | Raratonga | CIRR01 | -21.1941 | -159.8091 | April-May 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | MariaOeste | AUMA26 | -21.8130 | -154.6891 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | MariaOeste | AUMA27 | -21.7901 | -154.7037 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | MariaOeste | AUMA28 | -21.8200 | -154.7239 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | MariaOeste | AUMA29 | -21.7972 | -154.6917 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | MariaOeste | AUMA30 | -21.8008 | -154.7180 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Raivavae | AURV01 | -23.8605 | -147.7151 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Raivavae | AURV02 | -23.8902 | -147.7208 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Raivavae | AURV03 | -23.8318 | -147.6574 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Raivavae | AURV04 | -23.8282 | -147.5901 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Raivavae | AURV05 | -23.8339 | -147.6291 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Raivavae | AURV06 | -23.8962 | -147.7123 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Raivavae | AURV07 | -23.9123 | -147.6609 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Raivavae | AURV08 | -23.9108 | -147.6843 | April 2013 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | French Polynesia-Austral Archipelago | Rimatara | AURM21 | -22.6406 | -152.8223 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Rimatara | AURM22 | -22.6665 | -152.7958 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Rimatara | AURM23 | -22.6440 | -152.7882 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Rimatara | AURM24 | -22.6648 | -152.8163 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Rimatara | AURM25 | -22.6592 | -152.7891 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Rurutu | AURR18 | -22.4522 | -151.3235 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Rurutu | AURR19 | -22.4323 | -151.3760 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Rurutu | AURR20 | -22.5204 | -151.3327 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Tubuai | AUTB09 | -23.4213 | -149.4402 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Tubuai | AUTB10 | -23.3827 | -149.5493 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Tubuai | AUTB11 | -23.4253 | -149.5184 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Tubuai | AUTB12 | -23.4251 | -149.4057 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Tubuai | AUTB13 | -23.3786 | -149.3853 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Tubuai | AUTB14 | -23.3339 | -149.4361 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Tubuai | AUTB15 | -23.3485 | -149.5313 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Tubuai | AUTB16 | -23.3561 | -149.5518 | April 2013 |
| Pacific Ocean | French Polynesia-Austral Archipelago | Tubuai | AUTB17 | -23.4242 | -149.4837 | April 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG33 | -23.0977 | -135.0399 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG34 | -23.0975 | -135.0346 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG35 | -23.1589 | -134.9639 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG36 | -23.0144 | -134.9723 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG37 | -23.0566 | -134.9989 | January-February 2013 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG38 | -23.1440 | -135.0968 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG39 | -23.1911 | -135.0927 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG40 | -23.1780 | -135.0923 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG41 | -23.1697 | -135.0608 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG42 | -23.1489 | -134.8460 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG43 | -23.1374 | -134.9014 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG44 | -23.1890 | -134.9030 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG45 | -23.2164 | -134.8582 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG46 | -23.2241 | -134.9646 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG47 | -23.1548 | -135.0189 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG48 | -23.1675 | -134.9306 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG49 | -23.1763 | -134.9023 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG50 | -23.2017 | -134.9234 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG51 | -23.2360 | -134.9014 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG52 | -23.0791 | -135.0039 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG53 | -23.1694 | -135.0322 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG54 | -23.1418 | -134.9174 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG55 | -23.2607 | -134.9958 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG56 | -23.0776 | -134.8884 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG57 | -23.1104 | -134.8464 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG58 | -23.1772 | -134.8436 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG59 | -23.1691 | -134.8591 | January-February 2013 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG60 | -23.0711 | -134.9108 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG61 | -23.1984 | -134.8733 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG62 | -23.1271 | -134.9097 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG63 | -23.1451 | -134.8559 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG70 | -23.1973 | -135.0646 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Mangareva | GAMG71 | -23.1690 | -135.1252 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Maria Est | GAME30 | -22.0175 | -136.2081 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Maria Est | GAME31 | -22.0228 | -136.1779 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Maria Est | GAME32 | -21.9928 | -136.1895 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Maturei Vavao | GAMV27 | -21.4817 | -136.3659 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Maturei Vavao | GAMV28 | -21.4445 | -136.4037 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Maturei Vavao | GAMV29 | -21.4841 | -136.4157 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Temoe | GATE64 | -23.3158 | -134.4848 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Temoe | GATE65 | -23.3574 | -134.4934 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Temoe | GATE66 | -23.3290 | -134.5060 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Temoe | GATE67 | -23.3436 | -134.4620 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Temoe | GATE68 | -23.3248 | -134.4751 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Temoe | GATE69 | -23.3152 | -134.4956 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Tenararo | GATR18 | -21.3079 | -136.7322 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Tenararo | GATR19 | -21.3135 | -136.7548 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Tenararo | GATR20 | -21.2967 | -136.7591 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Tenarunga | GATG24 | -21.3562 | -136.5310 | January-February 2013 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | French Polynesia-Gambier Archipelago | Tenarunga | GATG25 | -21.3518 | -136.5610 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Tenarunga | GATG26 | -21.3276 | -136.5391 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Vahanga | GAVA21 | -21.3150 | -136.6555 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Vahanga | GAVA22 | -21.3375 | -136.6714 | January-February 2013 |
| Pacific Ocean | French Polynesia-Gambier Archipelago | Vahanga | GAVA23 | -21.3340 | -136.6328 | January-February 2013 |
| Pacific Ocean | French Polynesia-Society Archipelago | Bellinghausen | FPBE15 | -15.7968 | -154.5277 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Bellinghausen | FPBE16 | -15.7986 | -154.5135 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Bellinghausen | FPBE17 | -15.8171 | -154.5463 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Huahini | FPHU21 | -16.6904 | -150.9835 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Huahini | FPHU22 | -16.7173 | -151.0490 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Huahini | FPHU23 | -16.7692 | -151.0458 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Huahini | FPHU24 | -16.7682 | -150.9596 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Huahini | FPHU25 | -16.7976 | -151.0136 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Huahini | FPHU26 | -16.7363 | -151.0572 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Huahini | FPHU27 | -16.7476 | -151.0484 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Maiao | FPMA59 | -17.6489 | -150.6498 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Maiao | FPMA60 | -17.6315 | -150.6356 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Maiao | FPMA61 | -17.6361 | -150.6252 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Maiao | FPTA57 | -16.5527 | -151.4982 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Moorea | MMMO32 | -17.4828 | -149.9020 | March 2013 |
| Pacific Ocean | French Polynesia-Society Archipelago | Moorea | MMMO33 | -17.4848 | -149.8672 | March 2013 |
| Pacific Ocean | French Polynesia-Society Archipelago | Moorea | MMMO34 | -17.4986 | -149.9278 | March 2013 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | French Polynesia-Society Archipelago | Mopelia | FPMO01 | -16.7856 | -153.9803 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Mopelia | FPMO02 | -16.7733 | -153.9703 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Mopelia | FPMO03 | -16.8031 | -153.9937 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Mopelia | FPMO04 | -16.7721 | -153.9689 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Mopelia | FPMO05 | -16.7862 | -153.9697 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Mopelia | FPMO06 | -16.8154 | -153.9952 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Mopelia | FPMO07 | -16.7811 | -153.9768 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Mopelia | FPMO08 | -16.8205 | -153.9530 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA33 | -16.8329 | -151.4962 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA34 | -16.8986 | -151.4718 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA35 | -16.8746 | -151.4938 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA36 | -16.8950 | -151.4921 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA37 | -16.9173 | -151.4675 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA38 | -16.8064 | -151.4992 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA39 | -16.8479 | -151.4952 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA41 | -16.9198 | -151.4602 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA42 | -16.8794 | -151.4759 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA43 | -16.9095 | -151.4196 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA44 | -16.9157 | -151.4135 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA45 | -16.8251 | -151.3479 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA46 | -16.9027 | -151.4282 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA47 | -16.9220 | -151.4817 | September-October 2012 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA48 | -16.9340 | -151.4582 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA49 | -16.9313 | -151.4761 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA50 | -16.8502 | -151.3328 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA51 | -16.7901 | -151.3765 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA52 | -16.8066 | -151.3638 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA53 | -16.7032 | -151.4385 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA54 | -16.7650 | -151.4004 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA55 | -16.8135 | -151.3778 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Raiatea | FPRA58 | -16.8011 | -151.3847 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Scilly | FPSC09 | -16.5683 | -154.7337 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Scilly | FPSC10 | -16.5362 | -154.7325 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Scilly | FPSC11 | -16.4885 | -154.7123 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Scilly | FPSC12 | -16.4940 | -154.6603 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Scilly | FPSC13 | -16.4789 | -154.6907 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Scilly | FPSC14 | -16.5081 | -154.7291 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tahaa | FPTA28 | -16.7036 | -151.4828 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tahaa | FPTA29 | -16.6250 | -151.5799 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tahaa | FPTA30 | -16.5717 | -151.5520 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tahaa | FPTA31 | -16.6814 | -151.5255 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tahaa | FPTA56 | -16.5627 | -151.4461 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tahiti | SOTH01 | -17.4988 | -149.5041 | November-December 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tahiti | SOTH02 | -17.7887 | -149.4195 | November-December 2012 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | French Polynesia-Society Archipelago | Tahiti | SOTH03 | -17.7786 | -149.4332 | November-December 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tahiti | SOTH04 | -17.7808 | -149.4228 | November-December 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tahiti | SOTH05 | -17.6924 | -149.5912 | November-December 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tetiaroa | FPTE62 | -16.9852 | -149.5829 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tetiaroa | FPTE63 | -17.0042 | -149.5931 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tetiaroa | FPTE64 | -16.9816 | -149.5671 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tupai | FPTU18 | -16.2588 | -151.7954 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tupai | FPTU19 | -16.2836 | -151.8361 | September-October 2012 |
| Pacific Ocean | French Polynesia-Society Archipelago | Tupai | FPTU20 | -16.2285 | -151.8300 | September-October 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Aratika | TUAR15 | -15.4902 | -145.5865 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Aratika | TUAR16 | -15.4633 | -145.5712 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Aratika | TUAR17 | -15.5934 | -145.5610 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Aratika | TUAR18 | -15.6273 | -145.5187 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Aratika | TUAR19 | -15.6230 | -145.4911 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK32 | -16.0741 | -145.7056 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK33 | -16.0514 | -145.6568 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK34 | -16.1877 | -145.8216 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK35 | -16.1523 | -145.8247 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK36 | -16.1240 | -145.8150 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK38 | -16.0469 | -145.6355 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK39 | -16.1037 | -145.7856 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK40 | -16.0834 | -145.6942 | November-December 2012 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK41 | -16.2338 | -145.6738 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK42 | -16.2438 | -145.6423 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK43 | -16.2415 | -145.6284 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK44 | -16.2895 | -145.7363 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK45 | -16.2845 | -145.7037 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK46 | -16.3018 | -145.6200 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK47 | -16.4456 | -145.5296 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK48 | -16.5035 | -145.4627 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK49 | -16.5320 | -145.4650 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK50 | -16.4410 | -145.3622 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK51 | -16.5167 | -145.4553 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK53 | -16.3670 | -145.6734 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Fakarava | TUFK54 | -16.2817 | -145.5584 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA01 | -18.0653 | -140.9966 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA02 | -18.0695 | -141.0102 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA03 | -18.0759 | -141.0055 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA04 | -18.1730 | -141.0480 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA05 | -18.0826 | -141.0680 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA06 | -18.0632 | -140.9876 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA07 | -18.3069 | -140.9068 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA08 | -18.0729 | -141.0197 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA09 | -18.1157 | -141.0490 | November-December 2012 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA10 | -18.3901 | -140.7982 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA11 | -18.3806 | -140.7674 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA12 | -18.3040 | -140.8639 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA13 | -18.3503 | -140.8144 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA14 | -18.3418 | -140.8414 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA15 | -18.3452 | -140.8609 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA16 | -18.0642 | -140.9526 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Hao | TUHA17 | -18.0958 | -140.9095 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA01 | -15.1270 | -147.9418 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA02 | -15.0886 | -147.9428 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA03 | -14.9792 | -147.6160 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA04 | -15.1656 | -147.9089 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA05 | -15.0561 | -147.9392 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA06 | -15.0113 | -147.9093 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA07 | -14.9762 | -147.8772 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA08 | -14.9151 | -147.8344 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA09 | -14.9555 | -147.6449 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA10 | -15.2359 | -147.6532 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA11 | -15.2556 | -147.5754 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA12 | -15.2362 | -147.7561 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA13 | -14.9481 | -147.6703 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA14 | -14.9898 | -147.5970 | March 2013 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA16 | -14.9295 | -147.7640 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA17 | -14.9826 | -147.6346 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA18 | -15.0137 | -147.5730 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA19 | -14.9721 | -147.6221 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA20 | -15.0048 | -147.5792 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA21 | -15.0262 | -147.5650 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA22 | -15.0015 | -147.8808 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA23 | -14.9344 | -147.7090 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA24 | -14.9615 | -147.6318 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA25 | -15.0467 | -147.5406 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA26 | -14.9417 | -147.6896 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA27 | -15.1447 | -147.4247 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA28 | -15.1040 | -147.4769 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA29 | -14.9200 | -147.8015 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA30 | -14.9684 | -147.6247 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | MMRA31 | -15.2364 | -147.2797 | March 2013 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | TURA06 | -14.9723 | -147.6221 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | TURA07 | -14.9554 | -147.7099 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | TURA08 | -15.0192 | -147.7572 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | TURA09 | -14.9321 | -147.8594 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | TURA10 | -14.9567 | -147.8670 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | TURA11 | -14.9562 | -147.7880 | November-December 2012 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | TURA12 | -15.1409 | -147.8095 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | TURA13 | -15.1987 | -147.7607 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Rangiroa | TURA14 | -14.9351 | -147.7060 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Raraka | TURK21 | -16.2701 | -144.9073 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Raraka | TURK22 | -16.2871 | -144.8584 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Raraka | TURK23 | -16.0889 | -144.9563 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Raraka | TURK24 | -16.0956 | -144.9539 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Raraka | TURK25 | -16.1171 | -145.0056 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Raraka | TURK26 | -16.0944 | -144.9525 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Raraka | TURK27 | -16.1117 | -144.8296 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Raraka | TURK28 | -16.0970 | -144.8640 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Raraka | TURK29 | -16.0884 | -144.9393 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Raraka | TURK30 | -16.2518 | -144.8106 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Raraka | TURK31 | -16.2020 | -144.7741 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Toau | TUTO56 | -15.9293 | -145.9535 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Toau | TUTO57 | -15.9289 | -145.9903 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Toau | TUTO58 | -15.9065 | -145.8987 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Toau | TUTO59 | -15.9135 | -145.8888 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Toau | TUTO60 | -15.9120 | -145.8955 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Toau | TUTO61 | -15.8982 | -145.9108 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Toau | TUTO62 | -15.8907 | -146.0718 | November-December 2012 |
| Pacific Ocean | French Polynesia-Tuamotu Archipelago | Toau | TUTO63 | -15.8859 | -146.0357 | November-December 2012 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Galapagos Islands | Baltra | GABA13 | -0.4710 | -90.2549 | June 2012 |
| Pacific Ocean | Galapagos Islands | Baltra | GABA14 | -0.4819 | -90.2527 | June 2012 |
| Pacific Ocean | Galapagos Islands | Darwin | GADA04 | 1.6760 | -91.9948 | June 2012 |
| Pacific Ocean | Galapagos Islands | Darwin | GADA05 | 1.6760 | -91.9937 | June 2012 |
| Pacific Ocean | Galapagos Islands | Darwin | GADA08 | 1.6772 | -91.9938 | June 2012 |
| Pacific Ocean | Galapagos Islands | Darwin | GADA09 | 1.6751 | -91.9925 | June 2012 |
| Pacific Ocean | Galapagos Islands | Darwin | GADA10 | 1.6761 | -92.0080 | June 2012 |
| Pacific Ocean | Galapagos Islands | Darwin | GADA11 | 1.6772 | -91.9947 | June 2012 |
| Pacific Ocean | Galapagos Islands | Darwin | GADA12 | 1.6730 | -91.9890 | June 2012 |
| Pacific Ocean | Galapagos Islands | Wolf | GAWO07 | 1.6758 | -91.9952 | June 2012 |
| Pacific Ocean | Galapagos Islands | Florena | GAFL17 | -1.2160 | -90.4235 | June 2012 |
| Pacific Ocean | Galapagos Islands | Florena | GAFL18 | -1.2382 | -90.3879 | June 2012 |
| Pacific Ocean | Galapagos Islands | Florena | GAFL19 | -1.2368 | -90.4063 | June 2012 |
| Pacific Ocean | Galapagos Islands | Marchena | GAMA01 | 0.3122 | -90.4015 | June 2012 |
| Pacific Ocean | Galapagos Islands | Santa Cruz | GASC15 | -0.7003 | -89.2462 | June 2012 |
| Pacific Ocean | Galapagos Islands | Urvina | GAUR23 | -0.3927 | -91.2665 | June 2012 |
| Pacific Ocean | Galapagos Islands | Wolf | GAWO02 | 1.3873 | -91.8168 | June 2012 |
| Pacific Ocean | Galapagos Islands | Wolf | GAWO03 | 1.3856 | -91.8146 | June 2012 |
| Pacific Ocean | Galapagos Islands | Wolf | GAWO06 | 1.3850 | -91.8133 | June 2012 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA01 | -19.8064 | -174.3803 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA02 | -19.7979 | -174.3845 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA03 | -19.8561 | -174.4268 | September 2013 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA04 | -19.8668 | -174.4824 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA05 | -19.8198 | -174.4426 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA06 | -19.9850 | -174.5085 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA07 | -20.0581 | -174.4856 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA08 | -20.0668 | -174.5032 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA09 | -20.0714 | -174.5074 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA10 | -20.0566 | -174.5468 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA11 | -19.9271 | -174.8158 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA12 | -19.9155 | -174.8055 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA13 | -19.9071 | -174.7584 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA14 | -20.0938 | -174.7885 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA15 | -20.0817 | -174.7574 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA16 | -20.0600 | -174.6799 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA17 | -19.9261 | -174.7279 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA18 | -20.0016 | -174.7918 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA19 | -19.9478 | -174.6852 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA20 | -20.0623 | -174.6646 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA21 | -19.8148 | -174.7138 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA22 | -19.7542 | -174.6488 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA23 | -19.8429 | -174.5321 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA24 | -19.8334 | -174.3369 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA25 | -19.8923 | -174.3881 | September 2013 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA26 | -19.8413 | -174.5209 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA27 | -19.7457 | -174.3773 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA28 | -19.7176 | -174.4283 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA29 | -19.6711 | -174.4013 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA30 | -19.5992 | -174.4702 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA31 | -19.6309 | -174.4875 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Ha'apai | TOHA32 | -19.6430 | -174.4929 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Niuatoputapu | TONI54 | -15.9819 | -173.7913 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Niuatoputapu | TONI55 | -15.9751 | -173.8108 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Niuatoputapu | TONI56 | -15.9380 | -173.8299 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Niuatoputapu | TONI57 | -15.9256 | -173.7670 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Niuatoputapu | TONI58 | -15.9329 | -173.7977 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Niuatoputapu | TONI59 | -15.9308 | -173.7800 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA33 | -18.7570 | -174.1228 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA34 | -18.7244 | -174.1064 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA35 | -18.7328 | -174.0845 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA36 | -18.6574 | -174.0700 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA37 | -18.6610 | -174.0677 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA38 | -18.6380 | -174.0675 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA39 | -18.6470 | -174.0670 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA40 | -18.7308 | -174.0098 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA41 | -18.6688 | -174.1035 | September 2013 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA42 | -18.6909 | -174.0289 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA43 | -18.6883 | -174.0699 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA44 | -18.7434 | -174.1119 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA45 | -18.7966 | -174.1095 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA46 | -18.7192 | -174.1512 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA47 | -18.7989 | -174.0451 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA48 | -18.5830 | -174.0057 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA49 | -18.6162 | -174.0286 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA50 | -18.7386 | -174.0424 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA51 | -18.7634 | -174.0206 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA52 | -18.7740 | -174.0054 | September 2013 |
| Pacific Ocean | Kingdom of Tonga | Vava'u | TOVA53 | -18.7705 | -174.0207 | September 2013 |
| Pacific Ocean | Lau Province, Fiji | Cicia | FJCC44 | -17.7167 | -179.3243 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Cicia | FJCC45 | -17.7238 | -179.3386 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Cicia | FJCC46 | -17.7265 | -179.3408 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Cicia | FJCC47 | -17.7671 | -179.3491 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Cicia | FJCC48 | -17.7520 | -179.3490 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Fulaga | FJFU24 | -19.1240 | -178.5480 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Fulaga | FJFU25 | -19.0940 | -178.5809 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Fulaga | FJFU26 | -19.1011 | -178.6011 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Fulaga | FJFU27 | -19.1299 | -178.6174 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Fulaga | FJFU28 | -19.1411 | -178.5706 | June 2013 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Lau Province, Fiji | Kabara | FJKA30 | -18.9414 | -178.9847 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Kabara | FJKA31 | -18.9194 | -178.9577 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Kabara | FJKA33 | -18.9545 | -178.9874 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Kabara | FJKA34 | -18.9228 | -178.9363 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Mago | FJMG49 | -17.4785 | -179.1672 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Mago | FJMG50 | -17.4639 | -179.1877 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Mago | FJMG51 | -17.4249 | -179.1655 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Matuka | FJMT10 | -19.1178 | 179.7382 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Matuka | FJMT11 | -19.1585 | 179.7304 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Matuka | FJMT12 | -19.1534 | 179.7401 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Matuka | FJMT13 | -19.1172 | 179.7783 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Matuka | FJMT14 | -19.1290 | 179.7866 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Moala | FJML15 | -18.5919 | 179.9731 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Moala | FJML16 | -18.5204 | 179.9656 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Moala | FJML17 | -18.5325 | 179.9200 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Moala | FJML18 | -18.5461 | 179.9013 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Moala | FJML19 | -18.5794 | 179.8201 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Moala | FJML20 | -18.5577 | 179.8785 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Moala | FJML21 | -18.5972 | 179.9337 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Moala | FJML22 | -18.6168 | 179.9389 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Moala | FJML23 | -18.5575 | 179.9851 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Nayau | FJNA38 | -17.9512 | -179.0670 | June 2013 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Lau Province, Fiji | Nayau | FJNA39 | -17.9759 | -179.0767 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Nayau | FJNA40 | -17.9651 | -179.0789 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Totoya | FJTO01 | -18.9960 | -179.9032 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Totoya | FJTO02 | -18.9728 | -179.9068 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Totoya | FJTO03 | -18.9273 | -179.8907 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Totoya | FJTO04 | -18.8886 | -179.8677 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Totoya | FJTO05 | -18.8981 | -179.8836 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Totoya | FJTO06 | -18.9976 | -179.8473 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Totoya | FJTO07 | -19.0032 | -179.8485 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Totoya | FJTO08 | -19.0230 | -179.8808 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Tuvuca | FJTV41 | -17.6498 | -178.8354 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Tuvuca | FJTV42 | -18.6909 | -174.0289 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Tuvuca | FJTV43 | -17.6935 | -178.8325 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB52 | -17.3028 | -179.0309 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB53 | -17.1394 | -179.0600 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB54 | -17.2376 | -179.0386 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB55 | -17.1534 | -179.0049 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB56 | -17.1395 | -179.0599 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB57 | -17.1715 | -178.8871 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB58 | -17.1960 | -178.8707 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB60 | -17.1206 | -178.8265 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB61 | -17.1518 | -178.8512 | June 2013 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB62 | -17.2877 | -178.9281 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB63 | -17.2923 | -178.8856 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB64 | -17.3364 | -178.8600 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB65 | -17.3355 | -178.8337 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB66 | -17.3234 | -178.8167 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB67 | -17.2709 | -178.7774 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB68 | -17.1066 | -178.6897 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB69 | -17.0895 | -178.7692 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Balavu | FJVB70 | -17.1352 | -178.7775 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Vatu | FJVV35 | -18.3864 | -179.2786 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Vatu | FJVV36 | -18.3439 | -179.2803 | June 2013 |
| Pacific Ocean | Lau Province, Fiji | Vanua Vatu | FJVV37 | -18.3584 | -179.2848 | June 2013 |
| Pacific Ocean | New Caledonia | Cook Reef | NCCR27 | -18.9483 | 163.5726 | October 2013 |
| Pacific Ocean | New Caledonia | Cook Reef | NCCR28 | -18.8709 | 163.5514 | October 2013 |
| Pacific Ocean | New Caledonia | Cook Reef | NCCR29 | -18.8359 | 163.4847 | October 2013 |
| Pacific Ocean | New Caledonia | Cook Reef | NCCR30 | -19.0986 | 163.5593 | October 2013 |
| Pacific Ocean | New Caledonia | Cook Reef | NCCR31 | -18.9857 | 163.5055 | October 2013 |
| Pacific Ocean | New Caledonia | Cook Reef | NCCR32 | -18.8845 | 163.4145 | October 2013 |
| Pacific Ocean | New Caledonia | Cook Reef | NCCR33 | -19.0529 | 163.6825 | October 2013 |
| Pacific Ocean | New Caledonia | Cook Reef | NCCR34 | -19.0606 | 163.6304 | October 2013 |
| Pacific Ocean | New Caledonia | Cook Reef | NCCR35 | -18.8774 | 163.4398 | October 2013 |
| Pacific Ocean | New Caledonia | Cook Reef | NCCR36 | -18.8493 | 163.5305 | October 2013 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | New Caledonia | Cook Reef | NCCR37 | -18.8523 | 163.4477 | October 2013 |
| Pacific Ocean | New Caledonia | Cook Reef | NCCR38 | -18.8539 | 163.4346 | October 2013 |
| Pacific Ocean | New Caledonia | Guilbert | NCGU55 | -17.9990 | 163.1097 | October 2013 |
| Pacific Ocean | New Caledonia | Guilbert | NCGU56 | -18.0148 | 163.1291 | October 2013 |
| Pacific Ocean | New Caledonia | Guilbert | NCGU58 | -18.0174 | 163.0889 | October 2013 |
| Pacific Ocean | New Caledonia | Guilbert | NCGU59 | -18.0578 | 163.0752 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU43 | -17.8873 | 162.8975 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU44 | -17.9362 | 162.8921 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU45 | -17.9977 | 162.9063 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU46 | -18.0613 | 162.8282 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU47 | -17.9782 | 162.8960 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU48 | -18.0360 | 162.9162 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU49 | -18.2326 | 162.8883 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU50 | -18.1956 | 162.8412 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU51 | -18.1325 | 162.8159 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU52 | -17.9198 | 162.9225 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU53 | -17.9514 | 162.8922 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU54 | -17.9691 | 162.9323 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU57 | -17.9695 | 162.9171 | October 2013 |
| Pacific Ocean | New Caledonia | Huon | NCHU60 | -18.0202 | 162.9656 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCNE10 | -22.5694 | 167.1961 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI01 | -22.6651 | 167.3512 | October 2013 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI02 | -22.6522 | 167.3525 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI03 | -22.6476 | 167.3696 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI04 | -22.4963 | 167.3709 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI05 | -22.5147 | 167.4135 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI06 | -22.5763 | 167.3013 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI07 | -22.6397 | 167.5641 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI08 | -22.5994 | 167.5492 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI09 | -22.7178 | 167.4490 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI13 | -22.5812 | 167.3090 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI14 | -22.7193 | 167.5872 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI15 | -22.7006 | 167.3740 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI16 | -22.7405 | 167.5422 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI17 | -22.4588 | 167.3006 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI18 | -22.4864 | 167.2364 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI19 | -22.6398 | 167.3065 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI20 | -22.5543 | 167.5330 | October 2013 |
| Pacific Ocean | New Caledonia | Ile des Pins | NCPI21 | -22.5144 | 167.4423 | October 2013 |
| Pacific Ocean | New Caledonia | Merite | NCME64 | -18.2002 | 163.0282 | October 2013 |
| Pacific Ocean | New Caledonia | Merite | NCME65 | -18.2146 | 163.0172 | October 2013 |
| Pacific Ocean | New Caledonia | Pelotas | NCNE11 | -22.5594 | 167.2079 | October 2013 |
| Pacific Ocean | New Caledonia | Pelotas | NCPE25 | -18.5976 | 163.2353 | October 2013 |
| Pacific Ocean | New Caledonia | Pelotas | NCPE26 | -18.5709 | 163.2119 | October 2013 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | New Caledonia | Pelotas | NCPE75 | -18.5390 | 163.2528 | October 2013 |
| Pacific Ocean | New Caledonia | Pelotas | NCPE76 | -18.6014 | 163.1869 | October 2013 |
| Pacific Ocean | New Caledonia | Portail | NCPO39 | -18.5081 | 162.9084 | October 2013 |
| Pacific Ocean | New Caledonia | Portail | NCPO40 | -18.4582 | 162.8889 | October 2013 |
| Pacific Ocean | New Caledonia | Portail | NCPO41 | -18.4627 | 162.8376 | October 2013 |
| Pacific Ocean | New Caledonia | Portail | NCPO42 | -20.2633 | 163.8723 | October 2013 |
| Pacific Ocean | New Caledonia | Portail | NCPO72 | -18.4764 | 162.8420 | October 2013 |
| Pacific Ocean | New Caledonia | Portail | NCPO73 | -18.5194 | 162.8704 | October 2013 |
| Pacific Ocean | New Caledonia | Prony Bay | NCPR22 | -22.3139 | 166.8440 | October 2013 |
| Pacific Ocean | New Caledonia | Prony Bay | NCPR23 | -22.3659 | 166.8905 | October 2013 |
| Pacific Ocean | New Caledonia | Prony Bay | NCPR24 | -22.3520 | 166.8510 | October 2013 |
| Pacific Ocean | New Caledonia | Surprise | NCSU61 | -18.5063 | 163.1277 | October 2013 |
| Pacific Ocean | New Caledonia | Surprise | NCSU62 | -18.4967 | 163.2274 | October 2013 |
| Pacific Ocean | New Caledonia | Surprise | NCSU63 | -18.4298 | 163.2314 | October 2013 |
| Pacific Ocean | New Caledonia | Surprise | NCSU66 | -18.4647 | 163.0246 | October 2013 |
| Pacific Ocean | New Caledonia | Surprise | NCSU67 | -18.3128 | 163.1197 | October 2013 |
| Pacific Ocean | New Caledonia | Surprise | NCSU68 | -18.2784 | 163.0400 | October 2013 |
| Pacific Ocean | New Caledonia | Surprise | NCSU69 | -18.2997 | 162.9874 | October 2013 |
| Pacific Ocean | New Caledonia | Surprise | NCSU70 | -18.3959 | 162.9912 | October 2013 |
| Pacific Ocean | New Caledonia | Surprise | NCSU71 | -18.4972 | 163.1004 | October 2013 |
| Pacific Ocean | New Caledonia | Surprise | NCSU74 | -18.4632 | 163.0799 | October 2013 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU116153 | -13.5010 | 144.0700 | September-October 2014 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU116154 | -13.5176 | 144.0656 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU116155 | -13.5044 | 144.0823 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU116156 | -13.5382 | 144.0760 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU116157 | -13.5457 | 144.1068 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU116158 | -13.5599 | 144.0805 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU122135 | -11.2006 | 144.0388 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU122136 | -11.2036 | 144.0570 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU122137 | -11.1897 | 144.0472 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU122138 | -11.1994 | 144.0530 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU238141 | -11.9191 | 143.8412 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU238142 | -11.9221 | 143.8590 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU238144 | -11.9274 | 143.8487 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU2577 | -11.0519 | 143.0694 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU2578 | -11.0487 | 143.0817 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU2591 | -11.0861 | 143.1077 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU2592 | -11.0596 | 143.1140 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU2593 | -11.0660 | 143.0690 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU2594 | -11.0929 | 143.0923 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU3973 | -11.2464 | 143.2569 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU3974 | -11.2477 | 143.2627 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU3975 | -11.2390 | 143.2490 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU3976 | -11.2364 | 143.2494 | September-October 2014 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU3995 | -11.2430 | 143.2520 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU3996 | -11.2401 | 143.2625 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU4331 | -15.4057 | 145.5040 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU4332 | -15.4236 | 145.5459 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU4333 | -15.4050 | 145.4933 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU4334 | -15.4447 | 145.5309 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU4335 | -15.4364 | 145.4773 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU4336 | -15.4541 | 145.5005 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU5R139 | -11.8605 | 143.8412 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU5R140 | -11.8655 | 143.8498 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU5R143 | -11.9091 | 143.8470 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU5R145 | -11.9038 | 143.8259 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AU5R146 | -11.8783 | 143.8323 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUHK43 | -14.4440 | 145.4994 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUHK44 | -14.4757 | 145.5019 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUHK45 | -14.4548 | 145.4680 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUHK46 | -14.4292 | 145.4502 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUHK47 | -14.4580 | 145.5100 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUHK48 | -14.4435 | 145.4562 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUJW55 | -14.4056 | 145.3892 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUJW56 | -14.3714 | 145.3846 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUJW57 | -14.4195 | 145.3643 | September-October 2014 |

# APPENDIX 2 | DIVE SITES AND SITE DESCRIPTIONS

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUJW58 | -14.3935 | 145.4051 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUPK59 | -14.4350 | 145.3450 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUPK60 | -14.4318 | 145.3499 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUR513 | -15.3836 | 145.7739 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUR514 | -15.3910 | 145.7817 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUR515 | -15.3492 | 145.7789 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUR516 | -15.3304 | 145.7788 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUR517 | -15.3622 | 145.7911 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Blue Zone | AUR518 | -15.3750 | 145.7940 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU3479 | -11.1548 | 143.0872 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU3480 | -11.1695 | 143.1137 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU3481 | -11.1862 | 143.0960 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU3482 | -11.1609 | 143.1016 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU3483 | -11.1720 | 143.0830 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU3484 | -11.1947 | 143.1204 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU74147 | -13.4976 | 144.0491 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU74148 | -13.4570 | 144.0568 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU74149 | -13.4824 | 144.0321 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU74150 | -13.4739 | 144.0349 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU74151 | -13.4982 | 144.0507 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU74152 | -13.4989 | 144.0600 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU96117 | -11.4296 | 143.9669 | September-October 2014 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU96119 | -11.4212 | 143.9708 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU96120 | -11.4308 | 143.9705 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU96121 | -11.4214 | 143.9701 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AU96122 | -11.4236 | 143.9824 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUEY163 | -14.6870 | 145.3910 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUEY164 | -14.6852 | 145.3821 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AULK19 | -15.2760 | 145.6484 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AULK20 | -15.2672 | 145.5805 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AULK21 | -15.3040 | 145.6046 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AULK22 | -15.2921 | 145.6253 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AULK29 | -15.2745 | 145.5243 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AULK30 | -15.3100 | 145.5800 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUMO100 | -11.4740 | 143.1741 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUMO101 | -11.4565 | 143.1428 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUMO102 | -11.4796 | 143.1512 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUMO97 | -11.4643 | 143.1607 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUMO98 | -11.4867 | 143.1702 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUMO99 | -11.4681 | 143.1427 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUR701 | -15.2073 | 145.7542 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUR702 | -15.2238 | 145.7512 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUR703 | -15.2077 | 145.7543 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUR704 | -15.1930 | 145.7331 | September-October 2014 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUR705 | -15.2022 | 145.7531 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUR706 | -15.2221 | 145.7391 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUSD129 | -11.5210 | 143.6524 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUSD130 | -11.5208 | 143.6667 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUSD131 | -11.5155 | 143.6577 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUSD132 | -11.5220 | 143.6591 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUSD133 | -11.5159 | 143.6478 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUSD134 | -11.5143 | 143.6555 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUWD104 | -11.8108 | 143.9824 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUWD106 | -11.8134 | 143.9662 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUWO103 | -11.8199 | 143.9829 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUWO105 | -11.8157 | 143.9677 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUYG37 | -14.6189 | 145.6184 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUYG38 | -14.5837 | 145.6303 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUYG39 | -14.5888 | 145.6162 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUYG40 | -14.6045 | 145.6325 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUYG41 | -14.6150 | 145.6350 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Green Zone | AUYG42 | -14.6000 | 145.6230 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AU61A61 | -13.3893 | 143.9565 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AU61A62 | -13.4224 | 143.9888 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AU61A63 | -13.3844 | 143.9608 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AU61A64 | -13.4098 | 143.9930 | September-October 2014 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AU61A65 | -13.3980 | 143.9674 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AU61A66 | -13.3945 | 143.9877 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AU91111 | -11.4030 | 143.9556 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AU91112 | -11.3986 | 143.9677 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AU91113 | -11.3999 | 143.9617 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AU91114 | -11.4006 | 143.9570 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AU91115 | -11.4037 | 143.9703 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AU91116 | -11.4040 | 143.9650 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AU96118 | 143.9775 | -11.4211 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUCT49 | -14.5579 | 145.5849 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUCT50 | -14.5696 | 145.6088 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUCT51 | -14.5281 | 145.5691 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUCT52 | -14.5461 | 145.6021 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUCT53 | -14.5300 | 145.5870 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUCT54 | -14.5425 | 145.5755 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUHI159 | -14.4280 | 145.4295 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUHI160 | -14.4410 | 145.3949 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUHI161 | -14.4301 | 145.4030 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUHI162 | -14.4585 | 145.3980 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUHI165 | -14.4410 | 145.4264 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUHI166 | -14.4641 | 145.4119 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUMM85 | -11.1758 | 143.0355 | September-October 2014 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUMM86 | -11.1975 | 143.0387 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUMM87 | -11.1658 | 143.0099 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUMM88 | -11.1913 | 143.0481 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUMM89 | -11.1770 | 143.0170 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUMM90 | -11.1880 | 143.0266 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUPE123 | -11.5620 | 143.7091 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUPE124 | -11.5590 | 143.7189 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUPE125 | -11.5716 | 143.7120 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUPE126 | -11.5643 | 143.7275 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUPE127 | -11.5596 | 143.7142 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUPE128 | -11.5729 | 143.7202 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUPS67 | -11.4604 | 143.1227 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUPS670 | -11.4588 | 143.1246 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUPS68 | -11.4606 | 143.1266 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUPS69 | -11.4691 | 143.1194 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUPS70 | -11.4588 | 143.1246 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUPS71 | -11.4710 | 143.1320 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUPS72 | -11.4603 | 143.1154 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUR607 | -15.2677 | 145.7576 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUR608 | -15.2720 | 145.7600 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUR609 | -15.2928 | 145.7520 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUR610 | -15.2714 | 145.7597 | September-October 2014 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUR611 | -15.2813 | 145.7423 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUR612 | -15.2840 | 145.7600 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUWL23 | -15.3480 | 145.5594 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUWL24 | -15.3482 | 145.5934 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUWL25 | -15.3793 | 145.5897 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUWL26 | -15.3720 | 145.5570 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUWL27 | -15.3466 | 145.5278 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUWL28 | -15.3670 | 145.6200 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUYD107 | -11.9396 | 143.9603 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUYD108 | -11.9663 | 143.9947 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUYD109 | -11.9509 | 143.9761 | September-October 2014 |
| Pacific Ocean | Northern Great Barrier Reef, Australia | Pink Zone | AUYD110 | -11.9400 | 143.9989 | September-October 2014 |
| Pacific Ocean | Republic of Palau | Aimeliik | PA32 | 7.4967 | 134.3828 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Aimeliik | PA34 | 7.4101 | 134.4500 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Aimeliik | PA83 | 7.4828 | 134.4219 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Angaur | PA24 | 6.9211 | 134.1231 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Angaur | PA25 | 6.8979 | 134.1150 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Angaur | PA26 | 6.9071 | 134.1542 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Kayangel | PA54 | 8.1677 | 134.6079 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Kayangel | PA55 | 8.1823 | 134.6136 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Kayangel | PA56 | 8.1993 | 134.6074 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Kayangel | PA57 | 8.0940 | 134.6924 | January-February 2015 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Republic of Palau | Kayangel | PA58 | 8.0679 | 134.6816 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Kayangel | PA59 | 8.0716 | 134.6870 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Kayangel | PA66 | 8.1538 | 134.6099 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Kayangel | PA67 | 8.1481 | 134.6346 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Kayangel | PA68 | 8.1909 | 134.6116 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Kayangel | PA79 | 8.0480 | 134.6827 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Kayangel | PA80 | 8.0840 | 134.6879 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA01 | 7.3271 | 134.4949 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA02 | 7.3355 | 134.4221 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA03 | 7.3617 | 134.4249 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA04 | 7.2693 | 134.3528 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA05 | 7.2799 | 134.3954 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA06 | 7.2927 | 134.4153 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA07 | 7.2581 | 134.5238 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA08 | 7.2840 | 134.5632 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA09 | 7.3564 | 134.2954 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA10 | 7.3010 | 134.2364 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA11 | 7.2962 | 134.2580 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA12 | 7.2623 | 134.2460 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA13 | 7.3423 | 134.2592 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA14 | 7.2505 | 134.2391 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA15 | 7.2586 | 134.1856 | January-February 2015 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Republic of Palau | Koror | PA16 | 7.2836 | 134.2448 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA17 | 7.2659 | 134.2456 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA20 | 7.1112 | 134.2398 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA21 | 7.1356 | 134.2204 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA22 | 7.1722 | 134.2204 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA23 | 7.1181 | 134.2707 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA27 | 7.4129 | 134.3370 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA28 | 7.4407 | 134.3509 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA85 | 7.3267 | 134.4950 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA86 | 7.3228 | 134.4995 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Koror | PA87 | 7.3223 | 134.4911 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngaraard | PA50 | 7.6674 | 134.5992 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngaraard | PA74 | 7.6327 | 134.5951 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA37 | 7.6917 | 134.5583 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA39 | 8.0103 | 134.5405 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA40 | 7.8514 | 134.5070 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA41 | 7.7810 | 134.5594 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA42 | 7.7125 | 134.5644 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA44 | 7.6761 | 134.5506 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA45 | 7.7717 | 134.5653 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA46 | 7.7439 | 134.5705 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA48 | 7.7156 | 134.5841 | January-February 2015 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Republic of Palau | Ngarchelong | PA53 | 7.6815 | 134.5835 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA60 | 7.8708 | 134.5042 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA61 | 7.8905 | 134.5871 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA62 | 7.9654 | 134.5774 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA63 | 7.9626 | 134.5023 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA64 | 7.9805 | 134.5091 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA65 | 7.9539 | 134.6266 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA69 | 7.7746 | 134.5882 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA70 | 7.8139 | 134.5305 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA71 | 7.8025 | 134.6044 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA76 | 7.8293 | 134.5202 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA77 | 7.7605 | 134.5683 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA78 | 7.8936 | 134.4925 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA81 | 7.8157 | 134.5712 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngarchelong | PA82 | 7.7844 | 134.6214 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngardmau | PA30 | 7.5988 | 134.4801 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngardmau | PA33 | 7.6323 | 134.5213 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngardmau | PA36 | 7.6569 | 134.5459 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngardmau | PA38 | 7.6464 | 134.5360 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngardmau | PA43 | 7.6563 | 134.5653 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngardmau | PA47 | 7.6403 | 134.5473 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngardmau | PA49 | 7.6448 | 134.5815 | January-February 2015 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Republic of Palau | Ngardmau | PA51 | 7.5986 | 134.5081 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngardmau | PA52 | 7.6254 | 134.5609 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngardmau | PA72 | 7.6572 | 134.5796 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngardmau | PA73 | 7.6105 | 134.4962 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngaremlengui | PA29 | 7.5478 | 134.4587 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngaremlengui | PA31 | 7.5451 | 134.4879 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngatpang | PA35 | 7.5315 | 134.4363 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Ngatpang | PA84 | 7.5074 | 134.4454 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Peleliu | PA18 | 7.0626 | 134.2489 | January-February 2015 |
| Pacific Ocean | Republic of Palau | Peleliu | PA19 | 7.0827 | 134.2625 | January-February 2015 |
| Pacific Ocean | Solomon Islands | Gizo | SOGZ04 | -8.1602 | 156.8210 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Gizo | SOGZ05 | -8.1569 | 156.8961 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Gizo | SOGZ06 | -8.1272 | 156.8621 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Gizo | SOGZ07 | -8.0868 | 156.7701 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Gizo | SOGZ08 | -8.1006 | 156.7978 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Gizo | SOGZ09 | -8.1141 | 156.8862 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Kerehikapa | SOKR10 | -7.4963 | 158.0532 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Kerehikapa | SOKR11 | -7.4829 | 158.0466 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Kerehikapa | SOKR12 | -7.4483 | 158.0211 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Malakobi | SOML16 | -7.3042 | 158.0440 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Malakobi | SOML17 | -7.4064 | 158.1562 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Malakobi | SOML18 | -7.3645 | 158.1978 | October-November 2014 |

# APPENDIX 2 | DIVE SITES AND SITE DESCRIPTIONS

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Solomon Islands | Malakobi | SOML19 | -7.3348 | 158.0199 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Malakobi | SOML20 | -7.3482 | 158.0541 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Malakobi | SOML21 | -7.3504 | 158.0761 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Marovo | SOMO28 | -8.4066 | 157.9170 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Marovo | SOMO29 | -8.4327 | 157.9820 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Munda | SOMU01 | -8.3853 | 157.2227 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Munda | SOMU02 | -8.3498 | 157.2117 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Munda | SOMU03 | -8.3513 | 157.2239 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Nono | SONN22 | -8.7721 | 157.7869 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Nono | SONN23 | -8.7354 | 157.8394 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Nono | SONN24 | -8.8227 | 157.8087 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Nono | SONN25 | -8.6753 | 157.8055 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Nono | SONN26 | -8.7733 | 157.7663 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Nono | SONN27 | -8.7472 | 158.0933 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Nono | SONN30 | -8.6435 | 157.7931 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI52 | -10.2840 | 166.1470 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI53 | -10.2940 | 166.2950 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI54 | -10.2830 | 166.1270 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI55 | -10.2638 | 166.3691 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI56 | -10.2580 | 166.3330 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI57 | -10.3150 | 166.3450 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI58 | -10.1840 | 166.2270 | October-November 2014 |



| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Solomon Islands | Reef Islands | SORI59 | -10.1970 | 166.1110 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI60 | -10.2842 | 166.2708 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI61 | -10.1937 | 166.1922 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI62 | -10.2168 | 166.0722 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI63 | -10.2856 | 166.2272 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI64 | -10.1640 | 166.2482 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI65 | -10.1519 | 166.1976 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Reef Islands | SORI66 | -10.2550 | 166.2501 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Sikopo | SOSI13 | -7.4614 | 157.9996 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Sikopo | SOSI14 | -7.4666 | 158.0013 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Sikopo | SOSI15 | -7.4301 | 157.9617 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Tinakula | SOTI67 | -10.3735 | 165.8133 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Tinakula | SOTI68 | -10.3966 | 165.7904 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Tinakula | SOTI69 | -10.3762 | 165.7941 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Utupua | SOUT32 | -11.2818 | 166.4478 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Utupua | SOUT33 | -11.2966 | 166.4656 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Utupua | SOUT34 | -11.2645 | 166.4449 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Utupua | SOUT35 | -11.1880 | 166.5327 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Utupua | SOUT36 | -11.2097 | 166.4722 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Utupua | SOUT37 | -11.2402 | 166.4523 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Utupua | SOUT38 | -11.2278 | 166.5986 | October-November 2014 |

| Ocean Basin | Location | Island | Site Name | Latitude | Longitude | Date Surveyed |
|---|---|---|---|---|---|---|
| Pacific Ocean | Solomon Islands | Utupua | SOUT39 | -11.3309 | 166.5210 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Utupua | SOUT40 | -11.2900 | 166.5955 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Utupua | SOUT41 | -11.3038 | 166.4747 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Utupua | SOUT42 | -11.3061 | 166.4617 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Vanikoro | SOVA43 | -11.5856 | 166.9534 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Vanikoro | SOVA44 | -11.5777 | 166.9413 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Vanikoro | SOVA45 | -11.5844 | 166.9124 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Vanikoro | SOVA46 | -11.5730 | 167.0009 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Vanikoro | SOVA47 | -11.5952 | 166.9456 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Vanikoro | SOVA48 | -11.5641 | 166.8685 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Vanikoro | SOVA49 | -11.6150 | 166.7848 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Vanikoro | SOVA50 | -11.5850 | 166.8088 | October-November 2014 |
| Pacific Ocean | Solomon Islands | Vanikoro | SOVA51 | -11.5629 | 166.8267 | October-November 2014 |

# APPENDIX 3 | PARTICIPANT LIST

| Participant | Affiliation | Saudi Arabian Red Sea | Bahamas | St. Kitts and Nevis | Jamaica | Navassa | Colombia | Galapagos | French Polynesia | Cook Islands | Lau Province, Fiji | Tonga | New Caledonia | Northern Great Barrier Reef | Solomon Islands | Palau | Chagos Archipelago |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Andrew Bruckner** | Former KSLOF Chief Scientist | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| **Philip Renaud** | Former KSLOF Executive Director | x | x | x | x | x | | x | x | | x | | x | x | | x | x |
| **Samuel Purkis** | University of Miami, Rosenstiel School of Marine and Atmospheric Science (RSMAS) & Current KSLOF Chief Scientist | x | x | | | | | x | x | | | | | | | | x |
| **Bernhard Riegl** | Nova Southeastern University, National Coral Reef Institute (NCRI) | x | x | | | | | x | | | | | | | | | x |
| **Gwilym Rowlands** | KSLOF Fellow, Former KSLOF, NCRI | x | | | | | | | | | x | | x | | | | |
| **Abdullah Alsuhaibany** | Contractor | x | | | | | | | | | | | | | | | |
| **Ahmed Al-Mansi** | National Commission for Wildlife Conservation and Development (NCWCD) | x | | | | | | | | | | | | | | | |
| **Alasdair Harris** | Blue Ventures | x | | | | | | | | | | | | | | | |
| **Alastair Kennel** | Contractor | x | | | | | | | | | | | | | | | |
| **Ameer Abdullah** | International Union for Conservation of Nature (IUCN) Global Marine Programme | x | | | | | | | | | | | | | | | |
| **Anas Sambas** | Contractor | x | | | | | | | | | | | | | | | |
| **Anelise Hagan** | Former KSLOF Executive Director | x | | | | | | | | | | | | | | | |
| **Anthony Rouphael** | IUCN Global Marine Program | x | | | | | | | | | | | | | | | |
| **Ben Stobart** | Contractor | x | | | | | | | | | | | | | | | |
| **David Obura** | IUCN Global Marine Program | x | | | | | | | | | | | | | | | |
| **Frederique Kandel** | Contractor | x | | | | | | | | | | | | | | | |
| **Glen Page** | SustainaMetrix | x | | | | | | | | | | | | | | | |
| **Hatem Al-Yami** | Saudi Wildlife Commission | x | | | | | | | | | | | | | | | |

| Participant | Affiliation | Saudi Arabian Red Sea | Bahamas | St. Kitts and Nevis | Jamaica | Navassa | Colombia | Galapagos | French Polynesia | Cook Islands | Lau Province, Fiji | Tonga | New Caledonia | Northern Great Barrier Reef | Solomon Islands | Palau | Chagos Archipelago |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Herbert Ripley** | Contractor | x | | | | | | | | | | | | | | | |
| **Hussein bin Hajji** | King Saud University | x | | | | | | | | | | | | | | | |
| **Jeff Parks** | Contractor | x | | | | | | | | | | | | | | | |
| **Khalid Al-Shaikh** | Jubail Marine Wildlife Sanctuary | x | | | | | | | | | | | | | | | |
| **Martin Callow** | Contractor | x | | | | | | | | | | | | | | | |
| **Nicholas Claxton** | Contractor | x | | | | | | | | | | | | | | | |
| **Omar Al-Kushaim** | NCWCD | x | | | | | | | | | | | | | | | |
| **Raymond Buckley** | Washington State University | x | | | | | | | | | | | | | | | |
| **Sarah Hamylton** | KSLOF Fellow, Southampton University | x | | | | | | | | | | | | | | | |
| **Amanda Williams** | Former KSLOF, GIS Analyst | | x | x | | | | | | | | | | | | | |
| **Kenneth Marks** | Atlantic and Gulf Rapid Reef Assessment (AGRRA) | | x | | x | | | | x | x | x | x | x | x | x | x | x |
| **Alexandra Dempsey** | KSLOF Director of Science Management | | x | | x | x | x | x | x | x | x | x | x | x | x | | x |
| **Nick Cautin** | KSLOF Dive Safety Officer | | x | | x | x | x | x | x | x | x | x | x | | | | |
| **David Grenda** | Florida Aquarium | | x | | x | x | x | x | x | | | | | | | | |
| **Judy Lang** | AGRRA | | x | | x | x | x | | | | | | | | | | |
| **Jeremy Kerr** | KSLOF Fellow, Nova Southeastern University, NCRI | | x | | | | x | x | x | x | x | x | | | | | x |
| **Sonia Bejarano** | KSLOF Fellow, University of Queensland | | x | | | | x | | x | | | | | | | | |
| **Alannah Vellacott** | College of The Bahamas | | x | | | | | | | | | | | | | | |
| **Alexander Henderson** | University of the West Indies | | x | | | | | | | | | | | | | | |

# APPENDIX 3 | PARTICIPANT LIST

| Participant | Affiliation | Saudi Arabian Red Sea | Bahamas | St. Kitts and Nevis | Jamaica | Navassa | Colombia | Galapagos | French Polynesia | Cook Islands | Lau Province, Fiji | Tonga | New Caledonia | Northern Great Barrier Reef | Solomon Islands | Palau | Chagos Archipelago |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Alexio Brown** | Young Bahamian Marine Scientists | | x | | | | | | | | | | | | | | |
| **Ancilleno Davis** | The Nature Conservancy (TNC) | | x | | | | | | | | | | | | | | |
| **Christian Clark** | Contractor | | x | | | | | | | | | | | | | | |
| **Indria Brown** | The Bahamas Department of Marine Resources | | x | | | | | | | | | | | | | | |
| **Lindy Knowles** | Bahamas National Trust (BNT) | | x | | | | | | | | | | | | | | |
| **Matti Kiupel** | Michigan State University | | x | | | | | | x | | | | | | | | |
| **Tavares Thompson** | Contractor | | x | | | | | | | | | | | | | | |
| **Timothy Payne II** | KSLOF Dive Safety Officer | | x | | | | | | | | | | | | | | |
| **Brooke Gintert** | University of Miami, RSMAS | | | x | | | | | | | | | | | | | |
| **Chris Biggs** | TNC | | | x | | | | | | | | | | | | | |
| **Chris Slade** | TNC | | | x | | | | | | | | | | | | | |
| **Cita Chaderton** | Contractor | | | x | | | | | | | | | | | | | |
| **Clare Morall** | St. George's University | | | x | | | | | | | | | | | | | |
| **Daniel Green** | TNC | | | x | | | | | | | | | | | | | |
| **Emma Grigg** | Ross University, School of Veterinary Medicine | | | x | | | | | | | | | | | | | |
| **Graeme Browne** | Ministry of Sustainable Development | | | x | | | | | | | | | | | | | |
| **James Byrne** | TNC | | | x | | | | | | | | | | | | | |
| **Jason Phillip** | Contractor | | | x | | | | | | | | | | | | | |
| **Jeanne Brown** | TNC | | | x | | | | | | | | | | | | | |

# APPENDIX 3 | PARTICIPANT LIST

| Participant | Affiliation | Saudi Arabian Red Sea | Bahamas | St. Kitts and Nevis | Jamaica | Navassa | Colombia | Galapagos | French Polynesia | Cook Islands | Lau Province, Fiji | Tonga | New Caledonia | Northern Great Barrier Reef | Solomon Islands | Palau | Chagos Archipelago |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Jerry Mitchell** | St. George's University | | | x | | | | | | | | | | | | | |
| **Nick Dupre** | National Trust | | | x | | | | | | | | | | | | | |
| **Thierry Beths** | Ross University, School of Veterinary Medicine | | | x | | | | | | | | | | | | | |
| **Tony Hall** | Ross University, School of Veterinary Medicine | | | x | | | | | | | | | | | | | |
| **Brian Beck** | Former KSLOF Coral Reef Ecologist | | | | x | x | x | x | x | x | | | | | | | |
| **Andrew Ross** | Seascape Caribbean | | | | x | | | | | | | | | | | | |
| **Anna Ebanks** | Ministry of Agriculture and Fisheries Jamaica | | | | x | | | | | | | | | | | | |
| **Azra Blythe-Mallet** | Veterinary Services Division (VSD) | | | | x | | | | | | | | | | | | |
| **Ernie Kovacs** | Camera Crew | | | | x | | | | x | x | | | x | | | | |
| **Jesse Williams** | Contractor | | | | x | | | | | | | | | | | | |
| **Julian Smith** | Blogger | | | | x | | | | | | | | | | | | |
| **Llewelyn Meggs** | TNC Jamaica | | | | x | | | | | | | | | | | | |
| **Nathalie Zenny** | TNC Jamaica | | | | x | | x | | | | | | | | | | |
| **Oliver Squire** | Ministry of Agriculture and Fisheries Jamaica | | | | x | | | | | | | | | | | | |
| **Rachel D'Silva** | Contractor | | | | x | | | | | | | | | | | | |
| **Sean Green** | National Environment and Planning Agency (NEPA) | | | | x | | | | | | | | | | | | |
| **Steve Schill** | TNC | | | | x | | | | | | | | | | | | |
| **Edward Gonzalez** | Former KSLOF Education Director | | | | | x | | | x | | | | | | | | |
| **Allan Bright** | University of Miami/Cooperative Institute for Marine and Atmospheric Studies (CIMAS) | | | | | x | | | | | | | | | | | |

# APPENDIX 3 | PARTICIPANT LIST

| Participant | Affiliation | Saudi Arabian Red Sea | Bahamas | St. Kitts and Nevis | Jamaica | Navassa | Colombia | Galapagos | French Polynesia | Cook Islands | Lau Province, Fiji | Tonga | New Caledonia | Northern Great Barrier Reef | Solomon Islands | Palau | Chagos Archipelago |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aurora Alifano** | Island Conservation | | | | | x | | | | | | | | | | | |
| **Brittany Huntington** | National Research Council Postdoc (hosted at Southeast Fisheries Science Center (SEFSC); National Oceanic and Atmospheric Administration (NOAA) diver) | | | | | x | | | | | | | | | | | |
| **Dana Williams** | University of Miami/Cooperative Institute for Marine and Atmospheric Studies (CIMAS) | | | | | x | | | | | | | | | | | |
| **Dave McClellan** | NOAA/National Marine Fisheries Service (NMFS)/ SEFSC | | | | | x | | | | | | | | | | | |
| **Greg Piniak** | NOAA/National Ocean Service (NOS)/Beaufort | | | | | x | | | | | | | | | | | |
| **Jack Javech** | NOAA/NMFS/SEFSC | | | | | x | | | | | | | | | | | |
| **Jean Wiener** | Contractor | | | | | x | | | | | | | | | | | |
| **Jennifer Schull** | NOAA/NMFS/SEFSC | | | | | x | | | | | | | | | | | |
| **Jeremiah Blondeau** | University of Miami/CIMAS | | | | | x | | | | | | | | | | | |
| **Mandy Karnauskas** | NOAA/NMFS/SEFSC | | | | | x | | | | | | | | | | | |
| **Margaret Miller** | NOAA/NMFS/SEFSC | | | | | x | | | | | | | | | | | |
| **Natalia Zurcher** | University of Miami/CIMAS | | | | | x | | | | | | | | | | | |
| **Mike Trimble** | CREW Teacher/Corona del Sol High School | | | | | x | | | | | | | | | | | |
| **Anastasios Stathakopoulos** | Nova Southeastern University, NCRI | | | | | | x | | x | x | | | | | x | | |
| **Alfredo Abril** | CORALINA | | | | | | x | | | | | | | | | | |
| **Alfredo Archbold** | CORALINA | | | | | | x | | | | | | | | | | |
| **Andrea Pacheco** | CORALINA | | | | | | x | | | | | | | | | | |
| **Felipe Cabeza** | Felipe Diving Shop | | | | | | x | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Gloria Hinestroza** | Universidad de los Andes, Bogotá | | | | | | x | | | | | | | | | | |
| **Heins Bent** | CORALINA | | | | | | x | | | | | | | | | | |
| **Joyce Schulke** | Reef Environmental Education Foundation (REEF) | | | | | | x | | | | | | | | | | |
| **Luis Olarte** | Armada Nacional de Colombia - Dirección General Marítima | | | | | | x | | | | | | | | | | |
| **Mark Schrope** | Blogger | | | | | | x | | | | | | | | | | |
| **Michael Haley** | Contractor | | | | | | x | | | | | | | | | | |
| **Nacor Bolanos** | CORALINA | | | | | | x | | | | | | | | | | |
| **Omar Abril** | Universidad Jorge Tadeo Lozano of Bogotá | | | | | | x | | | | | | | | | | |
| **Trisha Forbes** | Fishery Department- Gobernation of the Archipelago of San Andrés, Providence and Santa Catalina | | | | | | x | | | | | | | | | | |
| **Derek Manzello** | University of Miami/NOAA, Atlantic Oceanographic and Meteorological Laboratory (AOML) | | | | | | | x | x | | x | | | | | | x |
| **Joao Monteiro** | KSLOF Fellow, University of the Azores | | | | | | | x | | | x | x | x | | x | x | |
| **Alison Barrat** | Former KSLOF Director of Communications | | | | | | | x | | x | | | x | | | | |
| **Iliana Baums** | Pennsylvania State University | | | | | | | x | | | | | | | | | |
| **Joshua Feingold** | Nova Southeastern University Oceanographic Center | | | | | | | x | | | | | | | | | |
| **Peter Glynn** | University of Miami | | | | | | | x | | | | | | | | | |
| **Tyler Smith** | University of the Virgin Islands | | | | | | | x | | | | | | | | | |
| **Viktor Brandtneris** | University of Miami | | | | | | | x | | | | | | | | | |
| **Anderson Mayfield** | KSLOF Fellow/Taiwan National Museum of Marine Biology and Aquarium | | | | | | | | x | x | x | x | x | x | x | x | x |
| **Badi Samaniego** | KSLOF Fellow, University of the Philippines | | | | | | | x | x | x | x | | x | x | x | x | x |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Renée Carlton** | KSLOF Marine Ecologist and NOAA/AOML/ University of Miami | | | | | | | | x | x | | x | | | x | | x |
| **Marine Couraudon-Reale** | Contractor | | | | | | | | x | x | | | | | | | |
| **Katherine Hillyer** | Victoria University, Wellington | | | | | | | | x | | x | | | | | | |
| **Ian Enochs** | NOAA/University of Miami | | | | | | | | x | | | | x | | | | |
| **Agnes Benet** | Consultancy PROGEM | | | | | | | | x | | | | | | | | |
| **Alexa Elliot** | Public Broadcasting Service (PBS) “Changing Seas” | | | | | | | | x | | | | | | | | |
| **Andre Ung** | Institut Louis Malarde | | | | | | | | x | | | | | | | | |
| **Andrew Calhoun** | NCRI | | | | | | | | x | | | | | | | | |
| **Candice Jwaszko** | CREW Teacher, Ecole Paul Kane High School | | | | | | | | x | | | | | | | | |
| **Claire Dolphin** | Nova Southeastern University, National Coral Reef Institute | | | | | | | | x | | | | | | | | |
| **Claude Payri** | French National Research Institute (IRD) | | | | | | | | x | | | | x | | | | |
| **Erwan Delriue-Trotin** | Pierre and Marie Curie University/Centre for Island Research and Environmental Observatory (CRIOBE) | | | | | | | | x | | | | | | | | |
| **Eva McClure** | University of Queensland | | | | | | | | x | | | | | | | | |
| **Eve Perrin** | Le Meridien Bora Bora | | | | | | | | x | | | | | | | | |
| **Gabriel Haumani** | Direction Des Ressources Marines | | | | | | | | x | | | | | | | | |
| **Gaelle Quere** | Leibniz Center for Tropical Marine Ecology | | | | | | | | x | | | | | | | | |
| **George Roff** | University of Queensland | | | | | | | | x | | | | | | | | |
| **Gerard Mou-Tham** | IRD | | | | | | | | x | | | | | | | | |
| **Gilles Siu** | CRIOBE | | | | | | | | x | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Jeff Williams** | Smithsonian | | | | | | | | x | | | | | | | | |
| **Jenna Moore** | Scripps Institution of Oceanography | | | | | | | | x | | | | | | | | |
| **Jim Evans** | CREW Teacher/School Without Walls | | | | | | | | x | | | | | | | | |
| **John Butscher** | IRD | | | | | | | | x | | | | | | | | |
| **Joseph Campazzoni** | Direction des Ressources Marines | | | | | | | | x | | | | | | | | |
| **Laetitia Hedouin** | French National Centre for Scientific Research (CNRS) | | | | | | | | x | | | | | | | | |
| **Laureline Chabran-Poete** | IRD | | | | | | | | x | | | | | | | | |
| **Maggy Nugues** | CRIOBE | | | | | | | | x | | | | | | | | |
| **Marie Kospartov** | Marie Kospartov Consulting | | | | | | | | x | | | | | | | | |
| **Marine Couraudon-Reale** | Contractor | | | | | | | | x | | | | | | | | |
| **Megan Berkle** | CREW Teacher, Linda Esperanza Marquez Senior High School | | | | | | | | x | | | | | | | | |
| **Megan Cook** | Rolex Scholar | | | | | | | | x | | | | | | | | |
| **Melanie Roue** | IRD | | | | | | | | x | | | | | | | | |
| **Michele Westmorland** | International League of Conservation Photographers (iLCP) | | | | | | | | x | | | | | | | | |
| **Mireille Chinain** | Institut Louis Malarde | | | | | | | | x | | | | | | | | |
| **Pauline Boserelle** | CRIOBE | | | | | | | | x | | | | | | | | |
| **Peter Mumby** | University of Queensland | | | | | | | | x | | | | | | | | |
| **Pierre Sasal** | CNRS | | | | | | | | x | | | | | | | | |
| **Robert Steneck** | University of Maine | | | | | | | | x | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sean Hickey | Public Broadcasting Service (PBS) "Changing Seas" | | | | | | | | x | | | | | | | | |
| Serge Andrefouet | IRD | | | | | | | | x | | | | x | | | | |
| Serge Planes | CNRS | | | | | | | | x | | | | | | | | |
| Simon Van Wynsberge | Universite de Polynesia Francaise | | | | | | | | x | | | | | | | | |
| Sylvain Petek | IRD | | | | | | | | x | | | | | | | | |
| Jean-Claude Gaerter | IRD | | | | | | | | x | | | | | | | | |
| Bertrand Make | Direction des Ressource Naturelles (DIREN) | | | | | | | | x | | | | | | | | |
| Valetina Piveteau | Direction des Ressource Naturelles (DIREN) | | | | | | | | x | | | | | | | | |
| Scott Cutmore | University of Queensland | | | | | | | | x | | | | | | | | |
| Fabian Tertre | Direction des Ressources Marines | | | | | | | | x | | | | | | | | |
| John Ruthven | Film Crew | | x | | | | | x | x | | | | | | | | x |
| Doug Allen | Film Crew | | x | | | | | x | x | | | | | | | | x |
| Erwan Delrieu Trotin | Pierre and Marie Curie University (Paris 6) | | | | | | | | x | | | | | | | | |
| William Robbins | Wildlife Marine | | | | | | | | x | | | | | x | | | |
| Yves-Marie Bozec | University of Queensland | | | | | | | | x | | | | | | | | |
| Joseph Campanozzi-Tarahu | Direction des Ressources Marines | | | | | | | | x | | | | | | | | |
| Gerad Moutham | IRD | | | | | | | | x | | | | | | | | |
| Jacqui Evans | Moana Foundation | | | | | | | | | x | | | | | | | |
| Katangi Kaukura | Cook Islands Ministry of Marine Resources | | | | | | | | | x | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Kate Fraser** | University of Queensland, Independent Contractor | | | | | | | | x | x | | x | x | | | | x |
| **Kevin Iro** | Cook Islands Marine Park | | | | | | | | | x | | | | | | | |
| **Malcolm Cromie** | Film Crew | | | | | | | | | x | | | | | | | |
| **Ngereteina George** | Cook Islands Ministry of Marine Resources | | | | | | | | | x | | | | | | | |
| **Richard Story** | Cook Islands Ministry of Marine Resources | | | | | | | | | x | | | | | | | |
| **Ted Nia** | Cook Islands Ministry of Marine Resources | | | | | | | | | x | | | | | | | |
| **Teina Rongo** | Cook Islands Ministry of Marine Resources | | | | | | | | | x | | | | | | | |
| **Tom Cribb** | University of Queensland | | | | | | | | | x | | | | | | | |
| **Tou Ariki** | High Chief | | | | | | | | | x | | | | | | | |
| **Michael Henry** | Independent Contractor | | | | | | | | | | | | | | | | |
| **Dawn Bailey** | DIVE IN | | | | | | | | | | x | x | x | | | | |
| **Amy Heemsoth** | KSLOF Director of Education | | | | | | | | | | x | x | | | x | | |
| **Janet Eyre** | REEF Check | | | | | | | | | | x | | | | | | |
| **Josefa Cinavilakeba** | Paramount Chief, Pacific Blue Foundation | | | | | | | | | | x | | | | | | |
| **Laitia Raloa** | Protocol Officer for the Lau Provincial Council's Office | | | | | | | | | | x | | | | | | |
| **William Saladrua** | Fiji Ministry of Primary Industries- Fisheries Department | | | | | | | | | | x | | | | | | |
| **Ron Vave** | Wildlife Conservation Society (WCS) | | | | | | | | | | x | | | | | | |
| **Stacy Jupiter** | WCS | | | | | | | | | | x | | | | | | |
| **Robert Gardiner** | NCRI | | | | | | | | | | | x | x | | x | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fiona Webster** | Kingdom of Tonga Ministry of Agriculture, Forestry and Fisheries | | | | | | | | | | | x | | | | | |
| **Apai Moala** | Kingdom of Tonga Ministry of Agriculture, Forestry and Fisheries | | | | | | | | | | | x | | | | | |
| **Hoifua 'Aholahi** | Kingdom of Tonga Ministry of Agriculture, Forestry and Fisheries | | | | | | | | | | | x | | | | | |
| **Karen Stone** | Vava'u Environmental Protection Association (VEPA) | | | | | | | | | | | x | | | | | |
| **Malakai Finau** | Kingdom of Tonga Ministry of Agriculture, Forestry and Fisheries | | | | | | | | | | | x | | | | | |
| **Nate Formel** | University of Miami | | | | | | | | | | | x | | | | | |
| **Sione Tui'moala Mailau** | Kingdom of Tonga Ministry of Agriculture, Forestry and Fisheries | | | | | | | | | | | x | | | | | |
| **Steve Saul** | Nova Southeastern University, National Coral Reef Institute | | | | | | | | | | x | | x | | x | | x |
| **Katie Lubarsky** | University of Hawaii | | | | | | | | | | | | | x | x | x | x |
| **Kristen Stolberg** | Contractor | | | | | | | | | | | | | x | x | x | x |
| **Stefan Andrews** | Contractor | | | | | | | | | | | | | x | x | x | x |
| **Grace Frank** | James Cook University | | | | | | | | | | | | | x | x | x | |
| **Samantha Clements** | Scripps Institution of Oceanography | | | | | | | | | | | | | x | | x | x |
| **Shanee Stopnitzky** | University of California, Santa Cruz | | | | | | | | | | | | | x | | x | |
| **Konrad Hughen** | Woods Hole Oceanographic Institution | | | | | | | | | | | | | x | | | x |
| **Abigail Cannon** | Scripps Institution of Oceanography | | | | | | | | | | | | | x | | | |
| **Bar Avalon** | Contractor | | | | | | | | | | | | | x | | | |
| **Johnathan Barnes** | KSLOF Dive Safety Officer | | | | | | | | | | | | | x | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Kirsty Nash** | Contractor | | | | | | | | | | | | | x | | | |
| **Valeriya Komyakova** | Contractor | | | | | | | | | | | | | x | | | |
| **Yogi Freund** | iLCP | | | | | | | | | | | | | x | | | |
| **Georgia Coward** | Oceans Watch/Contractor | | | | | | | | | | | | | | x | x | x |
| **Benjamin Neal** | XL Catlin Seaview Survey | | | | | | | | | | | | | | x | | |
| **Garret Johnson** | University of Maine | | | | | | | | | | | | | | x | | |
| **Harry Noel** | Department of Fisheries Solomon Islands | | | | | | | | | | | | | | x | | |
| **Ivory Akao** | Department of Fisheries Solomon Islands | | | | | | | | | | | | | | x | | |
| **Kristen Brown** | XL Catlin Seaview Survey | | | | | | | | | | | | | | x | | |
| **Peter Dalton** | XL Catlin Seaview Survey | | | | | | | | | | | | | | x | | |
| **Ulrike Siebeck** | XL Catlin Seaview Survey | | | | | | | | | | | | | | x | | |
| **Wade Fairle** | Film Crew | | | | | | | | | | | | | | x | | |
| **John Laulae** | Solomon Islands Community Liason | | | | | | | | | | | | | | x | | |
| **Chief John Still Niola** | Solomon Islands Community Liason | | | | | | | | | | | | | | x | | |
| **Honorable Earnest Fea** | Solomon Islands Community Liason | | | | | | | | | | | | | | x | | |
| **Justin King** | KSLOF Dive Safety Officer | | | | | | | | | | | | | | x | x | x |
| **Asap Bukurrou** | Palau International Coral Reef Center (PICRC) | | | | | | | | | | | | | | | x | |
| **Geraldine Rengiil** | PICRC | | | | | | | | | | | | | | | x | |
| **Graham Kolodziej** | NOAA/AMOL/University of Miami | | | | | | | | | | | | | | | x | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Julie Hartup | PICRC | | | | | | | | | | | | | | | x | |
| Marine Gouezo | PICRC | | | | | | | | | | | | | | | x | |
| Steve Lindfield | PICRC | | | | | | | | | | | | | | | x | |
| Uli Olsudong | PICRC | | | | | | | | | | | | | | | x | |
| Keith Ellenbogen | iLCP | | | | | | | | | | | | | | | | |
| Carly Reeves | Contractor | | | | | | | | | | | | | | | | x |
| Chris Mirbach | University of Queensland | | | | | | | | | | | | | | | | x |
| Colleen Hansel | Woods Hole Oceanographic Institution | | | | | | | | | | | | | | | | x |
| Gideon Butler | Scripps Institution of Oceanography | | | | | | | | | | | | | | | | x |
| Justin Ossolinkski | Woods Hole Oceanographic Institution | | | | | | | | | | | | | | | | x |
| Lauren Valentino | NOAA/AMOL/University of Miami | | | | | | | | | | | | | | | | x |
| Luis Ramirez | Nova Southeastern University, NCRI | | | | | | | | | | | | | | | | x |

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