



CCMI

**CENTRAL CARIBBEAN
MARINE INSTITUTE**

2017/18 ANNUAL REPORT



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CCMI *Highlights*

100

Visiting scientists

1km

Coral grown

20+

PhD and MSc students

1000+

Local scholarships

100+

Published scientific papers

100,000s

Of supporters from around the world

CONTACT

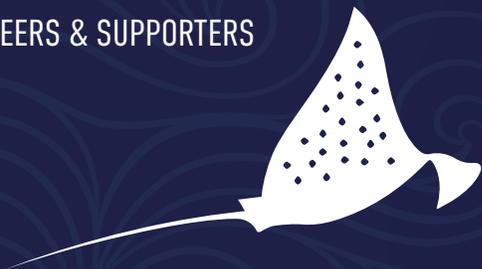
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PRESIDENT'S MESSAGE

Confronting declines in the ocean's biodiversity requires transformative approaches and significant scientific and society-level solutions. For coral reefs, these solutions are more urgent than ever. CCMI is dedicated to unlocking the secrets of coral reef resiliency. We work to deliver scientific discoveries that aim to improve our understanding of how coral reefs and key species can thrive under the current threats due to climate change and direct human impacts. Humanity is going to have to reckon with a mass extinction event that will be hard to fathom. In my lifetime, I have witnessed corals on the Florida reefs become degraded. We are racing now to keep this from happening across the entire Caribbean. What we know is that Little Cayman has coral reefs that are among the healthiest in the Caribbean. We have corals regenerating, Nassau grouper increasing in numbers, an abundance of turtles, and lionfish are declining due to an active local culling effort. CCMI's work over the last two years has made important discoveries demonstrating that we can manipulate corals so they are more resilient to climate change. Now, we must discover the mechanisms that drive resilience. We advocate for the protection of coral reef ecosystems, and now that the Cayman Island's marine protected areas are expanding to 48% from 14%, we have enormous hope for the future of our reefs locally.

In 2018, CCMI celebrated our 20th anniversary, and we continued contributing to the global dialogue on ocean acidification and climate change at the Monaco Symposium, culminating in the release of the review paper "Ecological and socioeconomic strategies to sustain Caribbean coral reefs in a high-CO2 world". I was honoured to be the keynote speaker last year in Guadeloupe, invited by the Caribbaea Initiative to present a paper on "Coral Reef Biodiversity and Climate Change". We furthered our work with collaborators, PhD and MSc students from several universities, who are making discoveries on the mechanisms of resilience by studying a wide variety of topics and species. Exciting work has been conducted at CCMI, including experiments to optimize coral restoration, understand sea grass adaptation and grouper reproduction (larvae) effects due to climate change, and measure sea urchins and herbivorous fish productivity.



CARRIE MANFRINO, PHD PRESIDENT DIRECTOR OF RESEARCH AND CONSERVATION

In 2012, CCMI conducted a series of experiments to determine whether coral restoration could succeed in the Cayman Islands. We now manage and maintain the region's largest coral nursery(s). This enormous resource is abundant with hundreds of corals that we are using to create resilient and robust specimens that can be outplanted to boost the wild population. This project explores the potential to grow and restore threatened coral species, and it has been successful - but requires enormous human and financial resources to scale up the positive impacts. We acknowledge that changing the current trajectory of climate is fundamental to coral survival. However, we are teaming up with scientists from major institutions who are working to understand coral adaptations and find new strategies that might assist evolution. The enormity of the problem has to be addressed from a collaborative, scientific-basis.

The Healthy Reefs Report, which resulted from a three-island wide survey in 2018, is a continuation of our long-term monitoring, which began 20 years ago (see story on page 12). We have tracked the changes of local reefs over time and more importantly, we can identify long-term indicators of declining or improving reef health. This activity gives us an important snapshot as to how local reefs are performing in the Cayman Islands, providing a benchmark for reef health that is critical to the future planning and protection of the coral reef ecosystem.

(President's Message cont)

PRESIDENT'S MESSAGE

In 2017 and 2018, we also saw the progression of the Darwin Plus Initiative project, which is a three-year effort to examine how herbivorous fish are working to improve **resilience** on the reefs around the Cayman Islands. The work is investigating the productivity of key herbivores, which can consume enormous quantities of algae and keep the reef substrates free and available for new corals to grow. We have made a new discovery that certain species are more important than previously thought. These species have the greatest potential for improving our prospect of reversing coral reef declines. However, critical knowledge gaps exist on how to effectively design practices to protect herbivory, which will in turn promote coral regeneration. As our results are compiled, we will work to be an important voice in this research area. Working with the Cayman Islands Department of Environment, we will propose a new Biodiversity Action Plan for herbivorous fish.

Finally, a core goal is to transform our scientific discoveries into action, and 2017 and 2018 saw a giant leap forward in our delivery of this activity. The International Year of the Reef lecture series and 'Reefs Go Live' broadcasts reached over 60,000 people all over the world. For the first time, our scientists are connecting to the world, livestreaming from the reefs in Little Cayman. This innovative programme is an incredible opportunity to generate the societal level changes that are required for saving coral reefs. CCMI's outreach component continues to flourish, presenting solutions for our community that will reduce their impact to the ocean.

We would like to thank all of our supporters, our Navigators, board members, and volunteers for believing in our mission and helping us on the journey to ensure a world with vibrant oceans and healthy coral reefs.

Dr. Carrie Manfrino, CCMI President and Director of Research and Conservation





CHRISTOPHER HUMPHRIES
CHAIRMAN



CHAIRMAN'S MESSAGE

Having been involved with CCMI since the early days when I volunteered to help incorporate a marine institute in the Cayman Islands, I was pleased to take on the Chairmanship in 2016. The greatest challenge as Chairman has been the enormous responsibility that we have as an organization to find solutions to declining coral reef health.

It is unthinkable that scientists are predicting that corals may become extinct in our children's lifetime. CCMI has reached great achievements, but there isn't time to stand still; we must continue to progress research and conservation in a timely manner to find the solutions to protecting coral reef health for the future.

Both 2017 and 2018 have been significant in many ways. As an organisation, we have hit a milestone of being 20 years old, and we have also come to a natural period of change, as we have grown considerably in terms of output and financial abilities. Internally, we have implemented many operational measures to become the best version of ourselves – transparent, fiscally responsible and achieving our goals. The refocus on two key research themes in 2018, Healthy Reefs and Resilience and Restoration has allowed for a clearer focus. We have seen unprecedented levels of education activity and scholarships being offered for students in Government schools. In the last two years, we have offered over 100 scholarships per annum for students from Grand Cayman and Cayman Brac to travel to Little Cayman to learn science from real practicing scientists. We have also grown the internships and teaching resources for schools, helping to build capacity locally. Our challenge to manage the level of growth since 2016 is now focused on designing and implementing organisational sustainability plans. The plans will help us continue our growth for the next 5-10 years and move forward with the pace and determination to achieve our goal to unlock the secrets of coral reef resiliency.

As a non-profit organisation, CCMI achieves our mission due to your support. I would like to take this opportunity to thank everyone who has contributed to CCMI's achievements. Thank you!

Chris Humphries, CCMI Chairman

OUR PURPOSE

CAN CORAL REEFS BE SAVED?

In 2016, the United Nations (UN) Chronicle invited our President, Dr. Carrie Manfrino, to write about the future of coral reefs for the World Ocean Symposium, which was held in New York. That year, the UN reported that 70% of the earth's coral reefs are threatened or at risk. Manfrino wrote an urgent plea to the UN members indicating that "time is not on our side" but the UN's 2030 Agenda for Sustainable Development outlined a plan for the future protection of the ocean, including Sustainable Development Goal (SDG) 14. This SDG identifies a clear and measurable strategy for conserving the oceans. This global, time-sensitive approach is at the heart of CCMI's strategy. Our work, therefore, speaks to how we can save coral reefs because we believe we can, if we act now.

CCMI makes this vision a reality by undertaking cutting edge, impactful research and transforming this research into conservation and education initiatives which will serve to bridge the gap between knowledge and action. We are working with our collaborators and the scientific community looking to unravel the secrets to building resilience and resistance that will boost the potential of many coral species to survive in this precious ecosystem. We are yet to discover the full adaptive potential of marine species to climate stress - in the meantime, it is clear that societal level changes will be required to reduce human impacts on the entire ocean ecosystem. CCMI serves to be the protector and voice for coral reefs, seeking a future with vibrant oceans and healthy coral reefs by unlocking the secrets to coral resiliency.



<https://unchronicle.un.org/article/can-we-save-coral-reefs>





ROYAL EVENTS



ROYAL EVENTS

CCMI is incredibly privileged to be represented by our Royal Patron, His Royal Highness The Earl of Wessex. Every year, HRH The Earl of Wessex hosts a private dinner for CCMI guests to discuss CCMI's research themes and focus for the coming year.

NAVIGATOR'S COUNCIL DINNER

In 2017, 40 guests attended dinner at Windsor Castle. The evening celebrated the Navigator's Council and the support the Council brings to CCMI.

The Navigator Council is a group of engaged individuals who pledge multi-year unrestricted funds. The Council meets once or twice a year and receives up to date and detailed information on CCMI's projects of interest.

The evening also outlined the organisation's focus on increasing collaborating research partnerships, seeking solutions for coral reef resiliency urgently and effectively.

CCMI 20TH ANNIVERSARY DINNER

In 2018, HRH hosted a dinner at St James's Palace for 40 VIP guests, celebrating CCMI's 20th anniversary. The evening also showcased and launched CCMI's focus on coral resilience, with a pledge to be come a Centre of Excellence in Coral Restoration.

The research focus seeks to further our understanding of what makes reefs resilient and how the restoration process can develop to encompass more robust and resistant corals.

FOR INFORMATION ON BECOMING A NAVIGATOR OR ATTENDING ONE OF CCMI'S VIP EVENTS, PLEASE CONTACT KHOLDEN@REEFRESEARCH.ORG



Above: Navigators attending the 2017 Royal Hosted Dinner at Windsor Castle.



RESEARCH SNAPSHOT

OUR PARTNERS

BERMUDA INSTITUTE OF OCEAN SCIENCES (BIOS)

Gretchen Goodbody-Gringley PhD

CAYMAN ISLANDS DEPARTMENT OF ENVIRONMENT

Tim Austin PhD, John Bothwell, Sophie O'Hehir (MSc)

CENTRAL CONNECTICUT STATE UNIVERSITY

Jerry Jarrett Ph.D, biologist

FLORIDA ATLANTIC UNIVERSITY

Marguerite Koch, Ph.D, Brian LaPointe, Ph.D, Conall McNicholl, Ph.D candidate

HARVARD MEDICAL SCHOOL

Matthew Harris, Ph.D,

KEAN UNIVERSITY

Marilyn White, Ph.D, anthropologist

LOUISIANA STATE UNIVERSITY

Kristine DeLong, Ph.D, Gilman Ouellette Jr., Ph.D, Joanna Griffiths Ph.D candidate,

OHIO STATE UNIVERSITY

Susan Jones, Ph.D, entomologist

SMITHSONIAN INSTITUTE

Val Paul, Ph.D, Olivia Rhoades, Ph.D, Bethany Gaffey, Uriah Sun Courtney Cox, Ph.D, Laetitia Plaisance, Ph.D, and Steven Canty, M.Sc

UNIVERSITY OF FLORIDA

Daniel Veras (masters research), Paul Maneval (masters research), Tom Frazer, Ph.D, Lindsay Spiers, Ph.D candidate, Julie Meyer, Ph.D, Nicole Miller (masters research) and Anya Brown, Ph.D

UNIVERSITY OF IDAHO

Amanda Bentley Brymer, Ph.D, environmental social scientist

UNIVERSITY OF TECHNOLOGY SYDNEY

(CLIMATE CHANGE CLUSTER C3)

Emma Camp, PhD



Healthy Reefs

LONG-TERM MONITORING – THE CCMI OCEAN OBSERVATORY

Field research institutions provide a window into a deeper understanding of trends and changes across multiple spatial and temporal scales of an ecosystem. CCMI's facility has provided a resource for hundreds of visiting scientists and is a location where a long-term record of oceanographic and ecological data is available. Over the years, through an affiliation with National Oceanic and Atmospheric Administration (NOAA), we have maintained a Coral Reef Early Warning System (CREWS), and since 1999, CCMI has conducted annual Atlantic Gulf Rapid Reef Assessment (AGRRA) surveys on Little Cayman, making this record one of the longer records of coral reef health for the region. Data gathered through these surveys are essential to understanding changes in local reef ecology in relation to global and local factors.

AGGRA

In 2017, our field teams recorded fish population biomass (numbers and sizes of fish) and diversity of the three Cayman Islands. This survey was followed up in 2018 with a larger scale coral and fish survey which was conducted for the first time in 1999 (Manfrino et al. 2003). A team of six science divers and one boat captain from CCMI concluded reef surveys of 25 reefs across the country: eight reefs on each of the Sister Islands and nine on Grand Cayman. We employed the same AGRRA protocol as was used to survey the reefs in 1999, and re-visited the same sites as in 1999, so that we could provide an accurate assessment of the change in reef health over the intervening years. We measured and counted fishes, algae and corals to species level, as well as recorded coral health and mortality. To communicate the status of the Cayman Islands reefs, we adopted the Healthy Reefs Framework (<http://www.healthyreefs.org/cms/report-cards/>) which was developed to provide reports and assess trends across the Meso-American reefs.

View the report (<https://reefresearch.org/wp-content/uploads/2019/10/CCMI-Reef-Survey-Report-20-Years.pdf>).

This project was supported by the Darwin Plus Initiative and via an anonymous donor.

CREWS

In June of 2018, CCMI installed a new, modern, state-of-the-art oceanographic buoy on the north side of Little Cayman, thanks to funding provided by the Dart Foundation and the Edmund F. and Virginia B. Ball Foundation. Near real-time weather and ocean state information is easily accessible from a mobile phone or computer. This kind of oceanographic monitoring technology is extremely sophisticated, enabling researchers from around the world to tap into, track and further our understanding of ocean acidification, sea level rises and coral bleaching events, which are becoming more frequent globally. Instruments on the buoy measure weather including barometric pressure, rain, and wind speed and direction. All of this data is essential to understanding global and local trends, which can help guide research and conservation action.

Link to CREWS: <https://v2.wqdatalive.com/public/986>



Resilience

UNLOCKING THE SECRETS OF HERBIVORY

CCMI's primary resiliency project focuses on understanding the role of herbivorous fish toward maintaining healthy reefs. In 2016, we received a three-year Darwin Plus Initiative grant to determine which herbivorous fish are most essential to the health of our coral reefs. This project is a partnership between CCMI, the Cayman Islands Department of Environment, and the Smithsonian Institute, bridging local knowledge and global perspective to produce meaningful recommendations for the Cayman Islands and throughout the Caribbean, including a draft fish "Biodiversity Action Plan".

The variety of herbivorous fish on Cayman reefs forage on different algal species, which play an important but often competitive role with corals. In 2017, researchers surveyed 17 sites on the three islands. Only 316 urchins (*Diadema*) were identified at the 17 study sites. Urchins significantly reduce algae on the reef, and a mysterious mortality in the 1980s nearly wiped out the entire population. The field team counted 2,848 fish. Fish biomass and communities in 2017 are remarkably different between Grand Cayman, Little Cayman (high fish biomass) and Cayman Brac (low biomass). Video transects were recorded at each site so that a complete analysis of the benthic community could be compared between sites and between islands. Over 70 hours of feeding assays have been recorded and reviewed. Dr. Dell is in the early stages of analysing the information gathered, but early findings point to redband parrotfish and Bermuda chub (*Kyphosidae*) as being responsible for reducing two of the most problematic and dominant algae, *Lobophora* and *Dictyota*. In conducting these surveys, Dell also noted that an alga uncommon in Grand Cayman and Little Cayman, *Microdictyon*, was found to be smothering reefs on the north side of Cayman Brac, though it is rare throughout the rest of the Cayman Islands and the Caribbean.

It was previously unknown that Bermuda chub were playing such a major role in reducing algae on the Cayman Islands reefs.

The team began collecting samples for genetic analyses and for stable carbon and nitrogen isotope analyses of Bermuda chubs. Isotope data collected from fish fin clips will help better constrain diets of the Bermuda chubs. Genetics will help us understand which species of *Kyphosidae* are present in this area and how many of each species are present in Cayman waters.

Interviews with fishermen provide critical information on the fishing practices, target species and favoured locations of the fishing community, which we will use to determine impacts from fishing. Our first presentation of results from the Darwin grant took place in Guadeloupe, where Dr. Carrie Manfrino attended a regional conference hosted by the Caribaea Initiative (<http://caribaea.org/en/workshop-2018/>) and gave a keynote presentation. A second presentation of results from the project also took place at the American Folklore Society Meeting in Buffalo, New York, USA. Dr. Marilyn White and Hayley Kievman presented the results of the oral histories of the Caymanian fishermen. This project is supported by the Darwin Plus Initiative and an anonymous donor.

PARTNERSHIPS

As of December 2017, PhD candidate (University of Florida), Lindsay Spiers interned at CCMI and expanded her research from Belize to the Cayman Islands. This research investigated the feeding preferences of herbivorous long-spined sea urchins and the impact these animals have on reducing algae on coral reefs.



Protecting Biodiversity

MANAGING THE LIONFISH INVASION

CCMI has been finding innovative ways to improve lionfish management since this invasive species arrived in our waters in 2009. CCMI was awarded an IUCN Best 2.0 grant and backing from the Guy Harvey Ocean Foundation to support this project, which was successfully concluded in 2018. The work used an innovative acoustic telemetry design to study movements of lionfish in Little Cayman. Acoustic tags were surgically implanted by the research team in 30 lionfish during the first of two tagging phases. Data gathered from these tags indicate they have strong site fidelity. They did not move great distances on the continuous deep reef wall and stayed within 200m horizontally of where they were first tagged. However, many lionfish are making regular vertical movements to depths beyond recreational dive limits.

This is important from a management perspective, as it suggests that regular culling of areas can still be effective in controlling lionfish populations at depths inaccessible to recreational divers. The project includes a publicly accessible lionfish culling web map using the ArcGIS online platform, which is now embedded in the CCMI website. This interactive platform provides culling information (e.g. average catches, date of last cull per site, etc.) for local stakeholders. A webinar to share and discuss results was held in May 2018 with over 50 participants from 14 countries in and around the Caribbean region. It was interesting to learn that lionfish were declining in some countries and maintaining their levels or increasing in other countries.



Restoration

RESTORATION – BOOSTING CORALS IN THE WILD

CCMI was a pioneer in coral restoration when in 2012, we teamed up with the Cayman Islands Department of Environment to establish the first coral nursery in the Cayman Islands. The work informed new coral restoration policy, and we now have multiplied five individual corals into over 1000 individual fragments across three coral nurseries. The goal of coral restoration is to understand whether nature can nurture itself even with the current temperature stresses on our reefs. Corals are also being outplanted from the nursery back out to the wild to establish a viable, locally connected, sexually reproductive population that is resilient to bleaching, disease and storms.

In 2017, CCMI made a brand-new discovery; corals in our nurseries spawned and produced thousands of new gametes that, if fertilized and grounded on the sea floor, could regenerate reefs naturally. Researchers estimated that 52% of large and medium sized corals spawned, and 25% of smaller fragments spawned. This spawning is a positive indicator that the coral being reared in the nursery are maturing and have the potential for contributing to the regional wild population.

Since the project's inception, CCMI's staghorn coral nursery population has gone from a low diversity (five genotypes) to a relatively high diversity (14 genotypes) population in the Cayman Islands.



Over the last two years, we have managed a five-fold increase in coral material, increasing total linear extension and numbers of corals in nurseries. The number of species has increased from one to three, and a new nursery includes elkhorn (*Acropora palmata*) and mountainous star coral (*Orbicella faveolata*). *Orbicella faveolata* historically comprised 50% of the regional coral population and is a significant reef framework builder, but it is also slow-growing. One major result in 2017 was that despite high growth rates and survival in nursery settings, corals were not surviving over the longer-term once outplanted. We modified our experimental design to focus on removing the competitive interactions that corals are subjected to when taken from mid-water nurseries to outplanting sites which have proven to be 'dangerous' wild settings.

In 2018, the project was modified to focus on building more robust and resilient corals. We have tested methods to determine whether elevating corals above the substrate would lead to increased outplant success. We are predicting higher survival as a result of providing benefits similar to that seen in the midwater nurseries. Less competition, decreased predation and reduced potential for disease outbreak should improve survival.





THE MONACO SYMPOSIUM: CORAL REEFS

In October 2017, Dr Carrie Manfrino attended the Caribbean Round Table in Monaco. The group of influential scientists and policy makers had the following shared outcomes from the meeting: “Strategic reef restoration involves both active (e.g. coral outplanting) and passive (e.g. spatial planning) approaches.”

CCMI is already incorporating these approaches into our research, including selectively harvesting corals resistant to bleaching and ocean acidification (OA) conditions at CCMI.

The Caribbean Round Table was led by Dr. Andersson (Scripps) and Dr. Venn (Monaco Centre de Scientifique), with CCMI being represented by Dr. Emma Camp, Dr. Marguerite Koch and Dr. Manfrino. The work has culminated in a review of the “Ecologic and socioeconomic strategies to sustain Caribbean coral reefs in a high-CO2 world”.

CCMI’s travel to the Monaco round table was funded by Stuarts Walker Hersant Humphries.

CCMI’s 2017/18 restoration project was supported by the Ernest Kleinwort Charitable Trust, the Disney Conservation Fund, the Cayman Water Company and the Dart Foundation.

PARTNERSHIPS

In August 2017, a vast new expansion of the deep nursery took shape as the site for a research project for University of Florida master’s degree student, Daniel Veras Mena. Daniel is a Fulbright Scholar from the Dominican Republic who designed a sponge/coral nursery just west of the deep nursery in 50ft of water.

This project was designed to better understand interactions between *Acropora cervicornis* corals and sponges. His hypothesis was that corals might benefit from the metabolized organic material that is processed through the filtration system of sponges. The presence of sponges, therefore, may provide a boost to corals.



EDUCATION SNAPSHOT

LEADERS OF TOMORROW

PRIMARY TO TERTIARY REEF EDUCATION

CCMI continues to work closely with local schools to deliver a range of programmes for students aged 9-18 years old. Our Ocean Literacy goal is for every child in the Cayman Islands to become ocean literate by the age of 12.

By imparting to these students a passion for the ocean and an understanding of its importance to our lives and culture, we empower the next generation of environmentalists.

Programmes include tropical marine biology, marine ecology and coral reef conservation at one of the world's most beautiful coral reefs. CCMI's aim is to shape students' attitudes and behaviours about the ocean whilst having fun exploring Little Cayman.



MARINE ECOLOGY COURSES (MEC)

Marine ecology courses provide a three-day, two-night immersive residential course for primary and secondary students. In 2017, CCMI established a new monitoring and evaluation system to more clearly understand the attitudes and beliefs of students before and after the programme.

Ten groups were hosted in 2017 and eleven in 2018, for a total of over 350 students. The majority of schools return year after year, which speaks to the positive relationship that has been established.

CCMI also hosted three government schools in 2017 and 2018, at no cost to the students, thanks to funding from the BODA Trust. Schools were selected via an ocean literacy competition, resulting in the three-day residential course with CCMI. Providing scholarships has been an integral part of the MEC strategy since its inception, and this scholarship programme sees a minimum of 60 students per year from government schools, all of whom travel to Little Cayman for the trip of a lifetime.

Building Capacity - Scholarships for Local Students

CCMI has developed a full range of education programmes that are free of charge for local Caymanian students wherever possible, or they are heavily subsidised. Scholarships help to encourage STEM learning, shaping students into early-career scientists with inquisitive minds and passion for life in the underwater world.

Programmes include the Caribbean Marine Ecology Camp, the Young Environmentalist Leadership Course (YELC), our Ocean Scholars Intern Programme, and the Marine Ecology Course scholarships for primary school students. CCMI aims to provide scholarships for a minimum of 100 students per year but often sees up to 200 local scholars join us in Little Cayman when funding streams enable increased numbers of scholarships to be provided. We would like to thank Stuarts Walker Hersant Humphries for supporting our educational capacity building in 2017/2018. The support from Stuarts enabled us to concentrate on launching a new intern programme, further develop collaborations with the local community and inevitably, support many more scholarships as a result.

In 2018, CCMI launched the Ocean Science Scholars programme, supported by the Edmund F. and Virginia B. Ball Foundation, which provides a range of internships for Caymanian students (3-6 months), as well as scholarships to the Caribbean Marine Ecology Camp (a week-long residential course), furthering our commitment to identifying marine stewards of the future.

CCMI's Young Environmentalist Leadership Programme saw the successful training and mentorship of nine students in 2017 and 10 students in 2018. So far, we have offered 74 full scholarships funding all aspects of their diving certifications with the generous expertise of GoPro Divers. This year-long courses takes students from open water to rescue diver, provides work experience opportunities and introduces the students to the basics of marine ecology and the importance of coral conservation methodology. This programme was supported by Cayman National Bank and Foster's Food Fair IGA.



CONNECTING TO THE OCEAN

REEFS GO LIVE

The new Reefs Go Live programme helps CCMI teach directly to students, from ocean to classroom, building on all the residential courses and curriculum learning. Piloted in 2017 and launched in 2018, this innovative programme has proved extremely successful. Six livestreamed lessons were delivered in 2018, with a reach of over 60,000 on YouTube and Facebook. We delivered workshops in January 2018 and February 2019 to engage local teachers and provide resources to support the lessons. The lessons are closely linked to the National Curriculum of the Cayman Islands and tie in research findings from our restoration, resilience and healthy reefs projects. More information can be found here: (<https://reefresearch.org/what-we-do/education/reefs-go-live/>). This programme has been supported by Appleby, Derek Haines and his amazing fundraising adventures, Butterfield Bank, Island Heritage, Rotary Grand Cayman and the Edmund F. and Virginia B. Ball Foundation.



GLOBAL REACH - VISITING COLLEGE PROGRAMMES

CCMI hosts over 10 university groups at the Little Cayman Research Centre throughout the year, many of which return year after year.

Wellesley College has travelled to CCMI's Little Cayman Research Centre to complete the laboratory portion of an undergraduate tropical ecology course for 10 years, and Dartmouth University has partnered with CCMI for over 15 years for a tropical field ecology study abroad course. CCMI and Rutgers University have partnered together for nearly a decade to provide undergraduates first-hand internship experience in lab and field research through the accredited Coral Reef Internship.

In 2017, Delaware University offered, for the first time, a month-long course in scientific diving and coral reef ecology, and Cedar Crest College included a week of field studies with CCMI. In 2018, the University of Delaware and Simpson College conducted undergraduate field coursework at CCMI as well.



EARTHWATCH AND DIVING WITH HEROS: CITIZEN SCIENCE

Citizen scientists, including those organised by Earthwatch and Diving with Heroes (a group of military veteran scuba divers), assist in research projects through CCMI. These recreational divers and snorkelers learn research methods and participate in data collection and analysis as part of ongoing research. Their enthusiasm and skills allow their time in-water to contribute to a greater purpose. In 2017, Diving with Heroes participants assisted in the collection of sponges for Daniel Veras Mena's masters research project conducted in the CCMI coral nursery. In 2018, they returned to dismantle this project. The Diving with Heroes participants assembled coral nursery frame structures and participated in the maintenance and cleaning of the nursery corals. They also joined in a cull of invasive lionfish, benefiting the biodiversity of reef life in Little Cayman. Earthwatch volunteers conducted the second and third years of coral bleaching surveys. The volunteers took part in snorkels at six different sites around Little Cayman and assessed the state of coral bleaching at each location using roving snorkel research methods. The data collected from their combined efforts of 175+ surveys throughout the year will be added into the coral bleaching database, which CCMI has been collecting for over a decade.

OUTREACH & INTERNATIONAL YEAR OF THE REEF (IYOR)

CCMI increased outreach activity in 2017, and since 2018 was the International Year of the Reef, CCMI used this worldwide initiative to build upon key engagement opportunities locally. CCMI relaunched the quarterly newsletter, the brand and the website in 2017, setting the scene for a more professional brand and improving the communications output.

The Reef Lecture series was relaunched in 2018, and it included four lectures during the year in Grand Cayman and 16 lectures in Little Cayman, speaking on topics such as coral restoration, herbivory and can we save coral reefs? A World Oceans Day event was held at the Camana Bay Cinema, which included a March for the Oceans and a Reefs Go Live broadcast for an audience of approximately 150 local residents. Digital resources were also expanded, and an active press release schedule has raised outreach communications and opportunities significantly in both years.

IYOR was supported by Dart, the Cayman Islands Brewery, Foster's Food Fair IGA, Harneys, and the National Gallery of the Cayman Islands





FUNDRAISING

FUNDRAISING

OVERVIEW

CCMI raises funds through three core revenue generating activities:

Earned revenue – these are fees from education courses and visiting scientists.

Unrestricted fundraising events – this includes the annual Festival of Seas Gala, the Navigator's Council and private donations from trusts, companies and individuals. Online donations make up a small yet growing percentage of unrestricted contributions.

Restricted funding – CCMI has an active grant writing team and an advancement team who secure sponsorship for programmes and campaigns.

CCMI is active in the UK, US and Cayman Islands. This diversity, coupled with the ability to earn revenue from paid programme activities, ensures a wide fundraising base that minimises risk and spreads the opportunity to grow the organisation sustainably. CCMI has grown to a medium-sized non-profit organisation, tripling our income in the last 10 years. Grants have been awarded through the US National Science Foundation, the Darwin Plus Initiation, the European Union's BEST 2.0 programme, as well as via private foundations such as Alexandria Bancorp Ltd, BODA Trust, the Edmund F. and Virginia B. Ball Foundation, the Ernest Kleinwort Charitable Trust, The Dart Foundation, the Prize Charitable Trust, the Donaldson Trust and the Disney Conservation Fund. The organisation benefits from a core group of private supporters, who often volunteer and provide in-kind benefit, crucial for an organisation of this nature. Opportunity to grow via online donations and alumni are still within the development stages.

In 2017, the advancement team was expanded to include a communications and grant coordinator, project manager and donor coordinator (including management of tax requirements for the US). CCMI conducts all communications, PR, event management, fundraising activity and grant writing in-house.

We outsource design, printing and web development/coding only. The team also provide a valuable part of the evaluation and monitoring of programme delivery, often acting as the guardians of project deliverables and developing relationships with funders to ensure transparency and effectiveness remain core to CCMI's operation.

Please see page 26 for an income breakdown by category.



2017/18 FUNDRAISING SUMMARY

FESTIVAL OF SEAS

The 2017 FOS took place at Kaibo, the perfect location for our 'Beach Ball'. The barefoot elegance of the evening celebrated the vibrant ocean. Highlights included auction items from the Explorer's Club and a Charlie Burchill signed guitar. This intimate event was set in a stunning location, pertinent to CCMI's cause, and 175 attendees raised circa US\$150,000 on the evening.

In 2018, the FOS, held at Grand Old House, celebrated CCMI's 20th anniversary and included an awards ceremony to highlight excellent contributions to marine conservation in the Cayman Islands. His Excellency the Governor, Mr. Martyn Roper, attended the evening and opened up the event with a welcome speech, an important part of his first week in office in the Cayman Islands. Alexandra Cousteau gave a keynote speech that resonated with many of CCMI's supporters.

Auction items, including a private performance by Paul Overstreet and an evening with His Excellency the Governor, provided much support on the evening. FOS raised US\$190,000, with 250 people in attendance.

We would like to thank our FOS sponsors (Page 35), attendees and auction item donors. Proceeds from the evening go directly to our projects often supporting seed money or key operational investment, such as a new truck (purchased in 2018).

ADDITIONAL GROWTH IN FUNDING REVENUE

In addition to the Royal Events (page 9) and the continued education (17) and research (10) activity at the Little Cayman Research Station, CCMI's growth in funding revenue came from private donors and trusts. Whilst CCMI has grown exponentially since 2005, the small management team remain close to the operation and project deliverables. This position of strength means we can communicate with donors and stakeholders responsively and accurately.



SAVE THE DATE:
Festival of Seas Gala: Coral Carnival, Grand Old House
16 November 2019.





FINANCIAL SUMMARY

FINANCIAL SUMMARY

CCMI 2017 ANNUAL FINANCIAL REPORT

On the financial side, 2017 was a year of change as well as a year of furthering the positive growth that was set in motion in prior years.

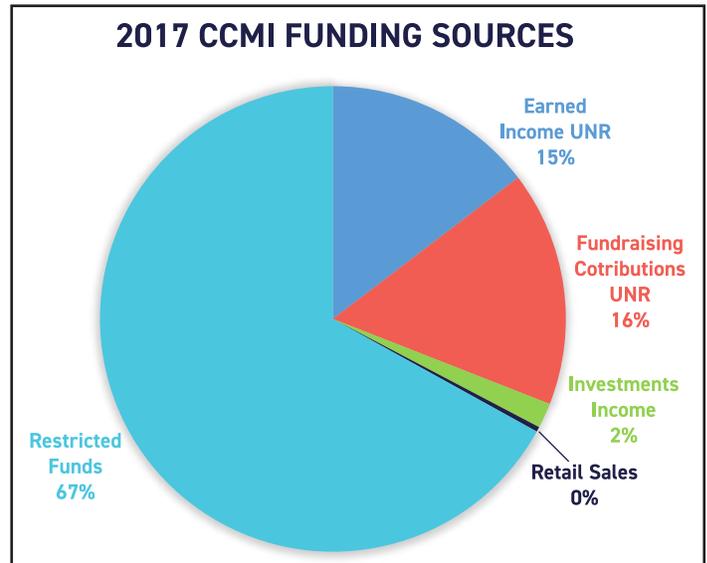
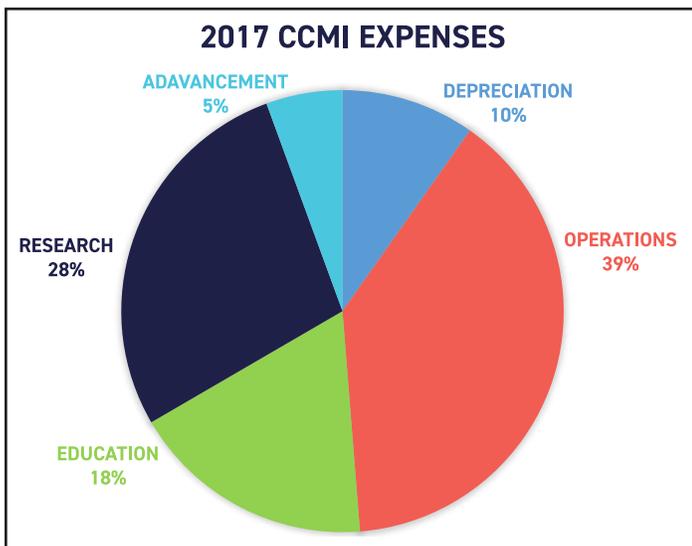
The main elements of financial management of CCMI are as follows:

1. Fundraising: The financial viability of CCMI relies on the ability to continuously fundraise in order to be able to not only carry out crucial research, but also to continue on an operational basis to maintain the research facilities.
2. Ensuring the projects deliver on time, on budget and according to the parameters of each grant.

2017 FINANCIAL SUMMARY

The change in net assets for the year was \$255K (2016: \$33.5K) supported by a \$213K increase in revenue compared to 2016 (2017: \$1.714m; 2016: \$1.501m) but only a \$15K increase in expenses during the same period (2017: \$1.459m; 2016: \$1.444m).

In 2017, 9.5% of total costs were for support services (2016: 14%), and the remaining 90.5% spent on the delivery of programs (2016: 86%).



Consistent with prior years, the earned income of CCMI is largely from university bookings, courses, visiting scientists, with minor revenue from retail sales and interest income. Earned revenue continues to play an important role for CCMI, ensuring a stable income, which results in unrestricted funds that can support operational overhead and management of the asset.

Contributions receivable as at 31 December 2017 increased by 90% compared to 31 December 2016, mainly due to grants receivable over the next 3-5 years including \$500K trust contribution and a \$300K Darwin Initiative grant for research.

The appointment of Berman Fisher in Grand Cayman in the second half of 2017 to provide new controls and accounting support services to help manage the enormous growth the organisation has had. Their services, essentially as the CFO, offer much valued professional oversight over the accounting function.

FINANCIAL SUMMARY

2018 ANNUAL FINANCIAL REPORT*

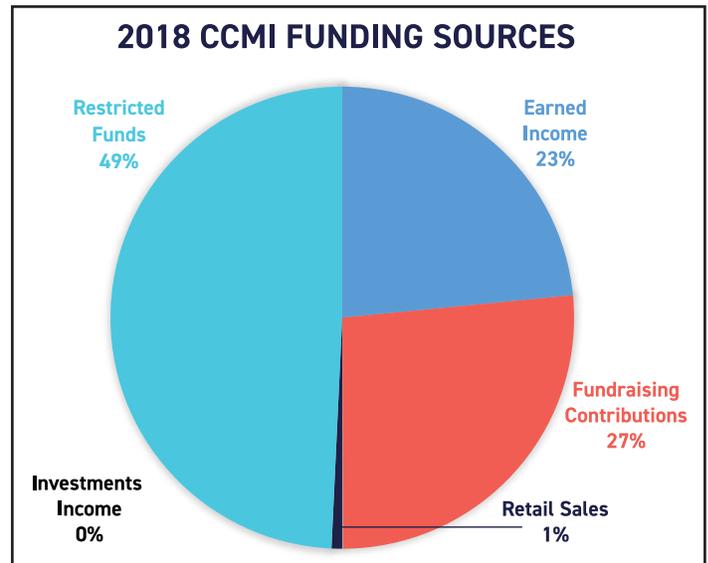
2018 saw a solid financial performance with the following elements contributing to a positive outlook as we head into 2019: **Please note 2018 figures are unaudited*

1. Unrestricted funds were increased to circa 50% of the total revenue, giving the organisation more financial leverage to initiate new projects.
2. Key grants that came to a natural end were renewed or replaced, mitigating risk and ensuring the relationship/donor pool is increasing for long-term sustainability.
3. Strong operational expense controls due to increased protocol implementation and tighter financial management have been achieved.

2018 FINANCIAL SUMMARY

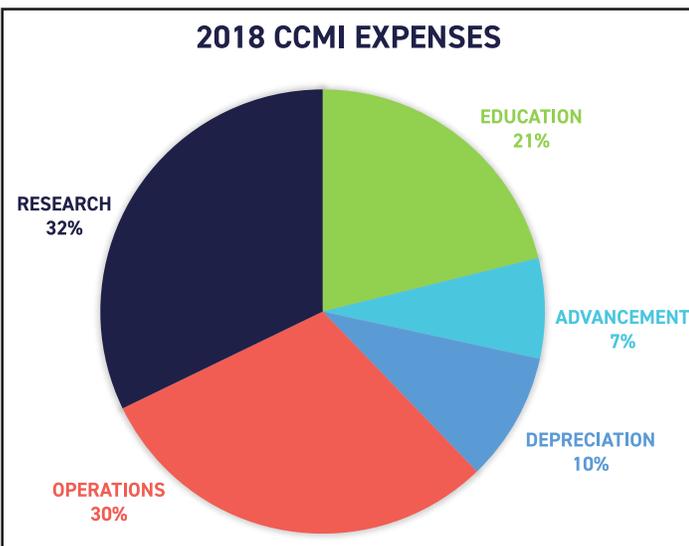
The change in net assets for the year was \$586K (2018: \$3.027m; 2017:\$2.441m) supported by a \$25K increase in revenue compared to 2017 (2018: \$1.784m 2017: \$1.759m) and a \$73K decrease in expenses during the same period (2018: \$1.347m; 2016: \$1.420m).

In 2018, 9.5% of total costs were for support services (2017: 9.5%), and the remaining 90.5% spent on the delivery of programs (2017: 90.5%).



Consistent with prior years the earned income of CCMI is largely from university bookings, courses, visiting scientists, retail sales and interest income. Earned revenue continues to play an important role for CCMI, ensuring a stable income, which results in unrestricted funds that can support operational overhead and management of the asset.

Contributions receivable as at 31 December 2018 increased by 47.4% compared to 31 December 2017, mainly due to a \$300K receivable from one research grant due over 2019 to 2021 and \$286K receivable from two educational grants which will run to 2020.



FINANCIAL SUMMARY

2017 AND 2018 IN-KIND SUPPORT

CCMI will keep working towards its goal of sustainable financial growth to support the research and educational programmes that has made the organisation the success story it is today. Much thanks must also go to the in-kind contributions received by many professional firms including KPMG for the annual audit, Stuarts Walker Hersant Humphries for legal services, Berman Fisher for discounted accounting support services, Copper Beech Communications for PR, communications and brand development support, Frans de Backer for videography support, as well as the Board of Directors and Officers who give their personal time voluntarily in support of CCMI's mission. CCMI would also like to thank the project technical advisors who donated many in-kind hours in expertise, specifically Pauline Simpson, Tim Kary, Tom Frazer, Greg Locher and Michael Maes.

2017 AND 2018 OPERATIONAL RESERVES

	Year End 2017 USD	Year End 2018 USD
Operational Reserve	\$149,833.00	\$101,941.25
Unrestricted Free Cash	\$97,857.00	\$164,456.75
End of year reserves on hand	\$247,690.00	\$266,456.00

Operational reserves in 2017 and 2018 - CCMI aims to maintain an operational reserve to meet basic operational costs (salary, insurance, mortgage, etc) for a period of six months. The operational reserve is supported by two elements: unrestricted cash on hand (in the bank) and the operational reserve which is restricted and set to \$100K (USD) as a minimum.

In 2018, CCMI bought a property (staff housing), which saw the ring-fenced restricted operational reserve drop in 2018, as agreed by the Board. This was to accommodate the new capital asset and any maintenance requirements. Reserves were bolstered during the year by a CCMI fundraiser (unrestricted funds). In 2018, whilst the restricted operational reserve has decreased, the on-hand cash has increased, netting out the change in restricted vs unrestricted operational reserves.





GOVERNANCE

GOVERNANCE

HOW WE ARE GOVERNED

CCMI leadership has a strong, demonstrable track record in research and conservation, led by Dr. Carrie Manfrino, President, with governance by a Board of Trustees and Chris Humphries, Board Chairman. The Board of Trustees in the Cayman Islands is that same as the USA Board. The Trustees of the UK Charity provide oversight for the CCMI UK (as outlined below).

The Board of Trustees is supported by a Research Council to steer research strategic development and core themes. The council also provides support to project development if required. The Board of Trustees is also supported by a group of special advisors, who from time to time support special areas of need, such as human resources (HR), technological development (specifically education related) and company governance.

STATUS

The Central Caribbean Marine Institute, has charity status in the Cayman Islands (CCMI Cayman – NP#3), is a UK registered charitable organisation (#1104009) and a US 501(c)(3) non-profit (#22-3609293).

GOVERNANCE CODE

As a company operating within multi-jurisdictions, CCMI has a strict code of governance that complies with the UK, US and Cayman Islands requirements. CCMI has an engaged board of trustees and management team all aligned and engaged with the company's very clear mandate, to protect coral reefs for the future. The shared mission and culture within CCMI therefore aligns with the UK Charity Commission's Governance Code (2017), the US with 501(c)(3) governance checks (IRS) and the Cayman Islands Non-Profit Organisations Law 2016.

Registration details:

Mailing Address in the United States:

CCMI, PO Box 1461, Princeton, NJ 08542

Mailing Address in the Cayman Islands:

CCMI, Box 37, Little Cayman, Cayman Islands KY3-2501

Mailing Address in the United Kingdom:

40 Bank Street, Canary Wharf, C/O Dominic McCahill, London E145DS

BOARD

2017/2018 US and Cayman Islands Board

Dr. Carrie Manfrino – President

Chris Humphries – Chairman

J.S. de Jager – Treasurer/Officer

Dr. Tom Frazer

Dr. Jack Gelfand

Special Advisors – Tim Kary, Michale Maes, Nicoela McCoy,
Frans de Backer

Board Secretary – Paul Simpson

2017/2018 UK Board

Dr. Carrie Manfrino – President

Chris Humphries – Chairman

Tim Ecott

Andrew Hersant

Kate Holden

Dominic McCahill

Principal Professional Advisors

Accounting: Berman Fisher

Audit: KPMG

Solicitors: Stuarts Walker Hersant
Humphries/Broadhurst LLC

Bankers: Bank of America, Fidelity, Cayman National
Bank, HSBC UK.





POLICIES

POLICIES

PUBLIC BENEFIT

CCMI was established in 1998 to protect the future of coral reefs through research, conservation, and education. We designed and developed the Little Cayman Research Centre, which opened in 2005, to facilitate these goals.

The facility has become a preeminent Caribbean marine institution, working on one of the most pressing issues facing the region: the protection and conservation of coral reef biodiversity.

Our work benefits the scientific community regionally and around the globe, as well as children who we engage in ocean literacy programmes and international students who we empower to reduce their impact on and improve the vitality of our oceans.

We have a research agenda that includes actionable projects that are essential to advance the science and deliver solutions needed to inform coral restoration efforts around the globe.

What makes CCMI different, however, is our commitment to transforming knowledge into impactful educational outreach.

RESERVES POLICY

CCMI's reserves policy outlines three areas of reserve:

1. Contractual reserves – where CCMI has a contract that specifies how funds must be utilised (a grant, for example). These funds are treated as restricted funding and reported on accordingly.
2. Board and Management Initiatives – in accordance with the goals and objectives of the organisation, the board and management periodically set up reserves (restricted funds) for particular initiatives that they feel are key to the organisation.
3. Operational reserves – the organisation aims to maintain an operational reserve to meet basic operational costs (mortgage, salary, insurance, utilities etc) for a period of six months.

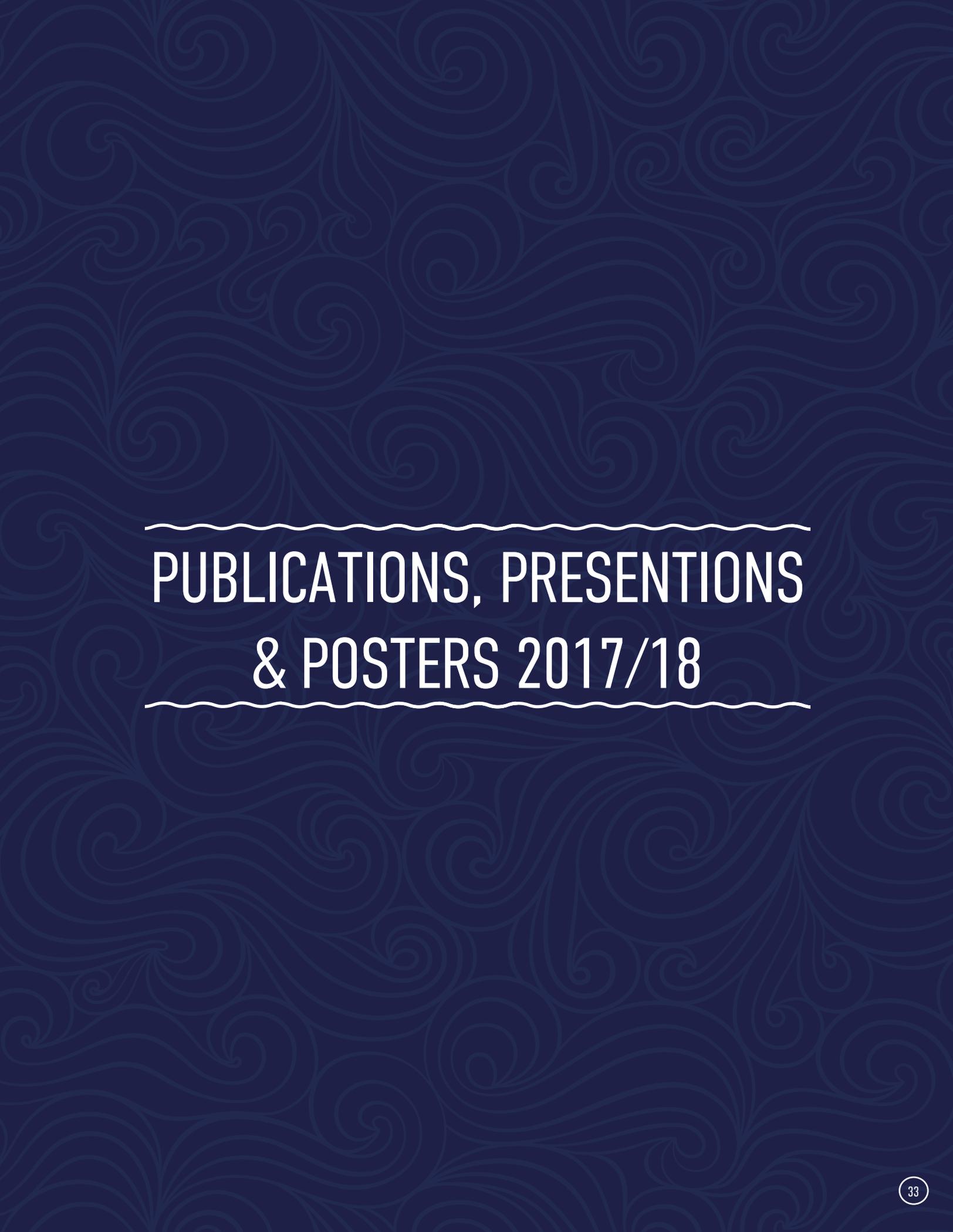


RISK MANAGEMENT

CCMI manages its risk via the annual audit process (financial), through governance reporting (financial and operational) and includes risk analysis in the company strategic development.

An overhaul of support systems was completed over the 2017/2018 period, to reduce risk and improve operational efficiency. We improved our functionality by introducing Slack and TeamWork. We also improved our online efficiency and donor tracking by introducing Bidpal/OneCause to our fundraising events and Classy to help manage online donations.

In 2019, further an overview of operational risk will be conducted, and human resource (HR) policies will be updated as well as a new programme operational risk assessment protocol.



**PUBLICATIONS, PRESENTATIONS
& POSTERS 2017/18**

Publications, Presentations & Posters 2017/18

Banks, S. & Foster, K. (2017)

Baseline levels of *Siderastrea siderea* bleaching under normal environmental conditions in Little Cayman, *Open Journal of Marine Science*, 7, 142-154, DOI: 10.4236/ojms.2017.71011.

DeBuysser, J., Butkowski, D., & Candelmo, A. (2017)

Catch Them If You Can: Assessment of invasive lionfish (*Pterois volitans*) behavior on Little Cayman, Cayman Islands to aid culling efficiency. Association for the Sciences of Limnology and Oceanography: Mountains to the Seas Conference. Honolulu, Hawaii. Feb 25 - Mar 3, 2017. Poster. [REU Intern]

Drury, C., Schopmeyer, S., Goergen, E., Bartels, E., Nedimyer, K., Johnson, M., Maxwell, K., Galvan, V., Manfrino, C. and Lirman, D. (2017)

Genomic patterns in *Acropora cervicornis* show extensive population structure and variable genetic diversity. *Ecology and evolution*, 7(16), pp.6188-6200.

Peach, K. E., Koch, M.S., Blackwelder, P.L., Manfrino, C., (2017)

Calcification and photophysiology responses to elevated pCO₂ in six *Halimeda* species from contrasting irradiance environments on Little Cayman Island reefs, *Journal of Experimental Marine Biology and Ecology*, 486, 114-126. 55 DOI: 10.1016/j.jembe.2016.09.008.

Johnson, R., Gulick, A., Bolten, A., & Bjorndal K. (2017)

Blue carbon stores in tropical seagrass meadows maintained under green turtle grazing, *Scientific Reports*, Article number: 13545.

Foster, K.A. and Foster, G. (2018)

Demographics and Population Dynamics Project the Future of Hard Coral Assemblages in Little Cayman. *Open Journal of Marine Science*, 8, 196-213. DOI: 10.4236/ojms.2018.81010

Hsia, S., Ouellette, G., Kerans, C., & Manfrino, C. (2017)

Caves, Carbonates and Climate: Karst Landscape Development through Environmental Forcing, Little Cayman Island. University of Texas at Austin Jackson School of Geosciences Research Symposium, Austin, Texas, Feb 3, 2017. Poster. [REU Intern]

Lohr, K. E., McNab, A. A., Manfrino, C., & Patterson, J. T. (2017)

Assessment of wild and restored staghorn coral *Acropora cervicornis* across three reef zones in the Cayman Islands. *Regional Studies in Marine Science*, 9c, 1-8. DOI: 10.1016/j.rsma.2016.11.003.

Reumont, J. , Hetzinger, S. , Garbe-Schönberg, D. , Manfrino, C. and Dullo, C. (2018)

Tracking Interannual- to Multidecadal-Scale Climate Variability in the Atlantic Warm Pool Using Central Caribbean Coral Data. *Paleoceanography and Paleoclimatology*, 33: 395-411. DOI: 10.1002/2018PA003321

van Hartesveldt, N., & Foster, G. (2017)

Potential avenues for expediting recovery of long-dead *Acropora palmata* skeletons. AGU Chapman Conference on Extreme Climate Event Impacts on Aquatic Biogeochemical Cycles and Fluxes, San Juan, Puerto Rico. Jan 22-27, 2017. [REU Intern]

Yamazaki, A., Hetzinger, Steffen, von Reumont, Jonas, Manfrino, C., Tsunogai, U., Sano, Y. and Watanabe, T. (2017)

Decline in 20th century Caribbean nitrogen fixation archived by annual resolution coral record. [Talk] In: GeoBremen 2017. , 24.-29.09.2017, Bremen, Germany

VOLUNTEERS & SUPPORTERS



BODA TRUST
EDMUND F. AND VIRGINIA B. BALL FOUNDATION
THE HUMPHRIES FAMILY
OLIVER S. AND JENNIE R. DONALDSON TRUST
SUREFINE FUND, LTD.

VOLUNTEERS & SUPPORTERS

ABBY GUILMETTE

AIDA VAN WEES

AMANDA GOODWIN

ANDREA & STEVE HUGHES

ASH MCKNIGHT

BRIGITA NEMET

CATHERINE CHILDS

CATHY CHURCH

CHRIS & JOANNA HUMPHRIES

DEBBI TRUCHAN

DIANA SCHMITT

DOMINIC MCCAHILL

ELLEN CUYLAERTS & MICHAEL MAES

ERIN QUIGLEY

FIONA, BOB AND JEN MOSELEY

FRANS DE BACKER

GREG LOCHER

DR JACK GELFAND

JOE & SUSAN PLOPLYS

KATIE ALPERS

MARY JONES

MELISSA WOLFE

MIKE & MEREDITH GUDERIAN

MIKE & WENDY MANNISTO

MONICA WALTON

NADIA HARDIE

NATALIE URQUHART

NICOELA MCCOY

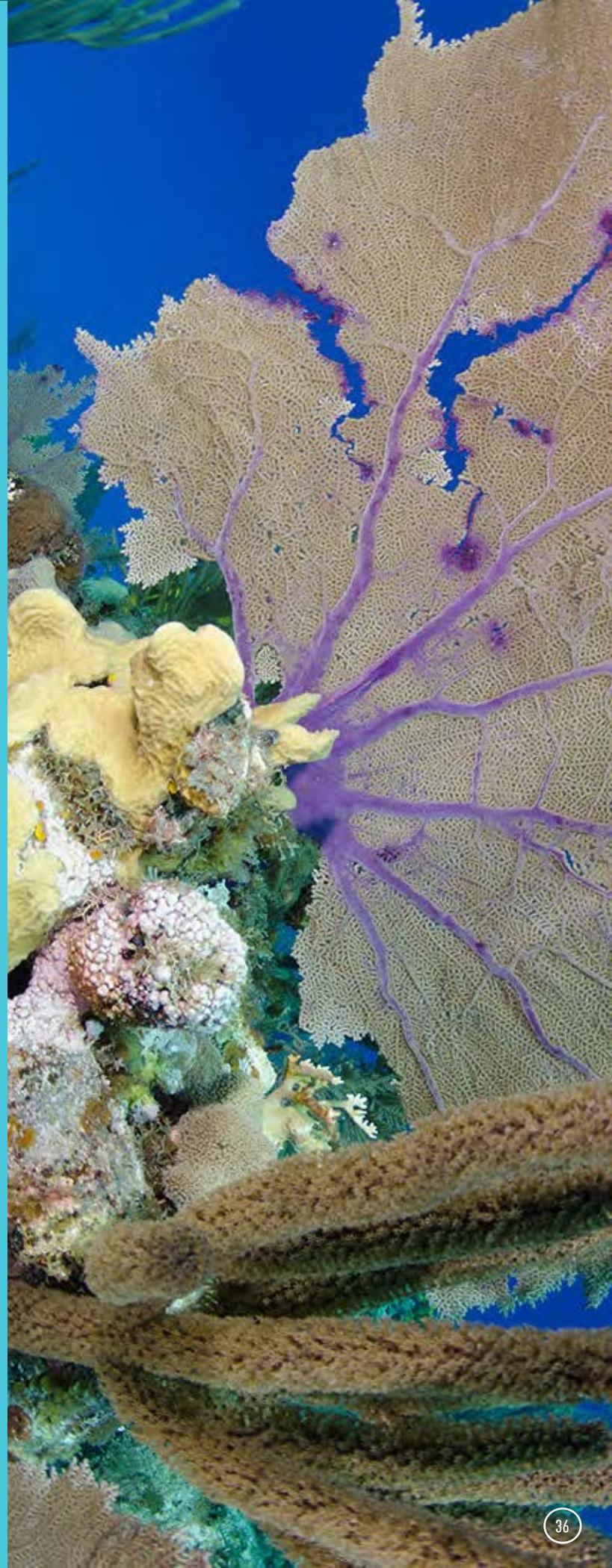
PAULINE SIMPSON

PETER HILLENBRAND

SIMON & CANDY WHICKER

SUE AND DAVE GUILMETTE

SUZY SOTO





*How can you help
coral reefs?*



Become a
sponsor
or project
donor

Volunteer
skills

Share
our work

Become
a CCMI
Navigator

Get
involved
with Reefs
Go Live

Become a
member

Want to get involved?

See our website for news and events

www.reefresearch.org