

CCMI 

2023
AND BEYOND

WWW.REEFRESEARCH.ORG

CCMI HAS BEEN OPERATING FOR NEARLY 25 YEARS, AND IN THAT TIME, WE HAVE DEVELOPED A STATE-OF-THE-ART RESEARCH PROGRAMME AND A ROBUST CALENDAR OF EDUCATION AND OUTREACH. OUR MANDATE IS AT THE CENTRE OF ALL WE DO:

TO SUSTAIN HEALTHY OCEANS FOR THE FUTURE, WE NEED TO UNDERSTAND HOW TO PROTECT CORAL REEFS NOW.

INTRODUCING



THE CORAL FUND

In 2023, CCMI will officially launch the Coral Fund, which will underpin CCMI's development in terms of new infrastructure and project support. The goal over the next 2-3 years is to raise USD \$2.5 million to facilitate the next phase of CCMI's development as we continue to evolve as a regional leader in marine research and outreach. This campaign will include: USD \$2 million capital campaign to expand our physical facilities, which will enable us to conduct more research, education, and conservation simultaneously by supporting a new education and accommodations block; and USD \$500K to support key strategic projects, ensuring the new facility is utilised with full effect when it opens its doors.

CCMI HIGHLIGHTS

70m²

Coral outplanted to the wild

50+

PhD, MSc students and internships

100+

Published scientific papers

100+

Visiting scientists

1500+ km

Coral grown

1500+

Local scholarships

200,000+

Reefs Go Live reach

\$1,000,000

Invested in field research every year

THE BIG 4 2023 AND BEYOND

At CCMI, we are a team of scientists, educators, and communicators who recognise that coral reefs are critically important - yet threatened - ecosystems that require immediate protection. We are committed to understanding the impacts of natural and human-caused threats to biodiversity, including climate change, to create a meaningful pathway towards marine sustainability for the future. We have a clear strategic approach to our mandate, which includes the proven trifecta of research, conservation, and education. For 2023 and beyond, CCMI has a clear set of deliverables, which drives us as an organisation as well as driving our project development:

KEEPING IT REEL – Pushing the boundaries of coral reef science

CCMI's Reef Ecology and Evolution Lab (REEL) at CCMI is cutting-edge, discovering how corals can be resilient for the future. We will continue to invest in the best people and technology to push the boundaries of scientific discovery and are supported by National Science Foundation, RESEMBID, and Darwin Initiative Plus grants.

EXPANDING OUR HORIZONS – Growing our facility to expand our ability

We have a new US National Science Foundation grant to expand our wet labs, giving us the ability to conduct more experiments in-situ, as we seek to understand how corals can adapt to extreme environmental change. We will also launch exciting plans to expand our accommodation at CCMI in 2023, doubling our capacity. We must grow our facility so we can conduct more impactful research and education simultaneously.

NEXT GEN FOCUS – Investing in our students, the leaders of the future

In 2023, we will support more than 100 local residential primary and secondary school scholarships, internships, and early careers opportunities, supporting the next generation and raising the profile of coral reef protection for the future here in the Cayman Islands. We will also continue to develop our Reefs Go Live broadcasts, which reaches over 100,000 people around the world each year, as well as developing our international internships and fellowship programmes to give the best scientists the opportunity to study Little Cayman's reefs.

PLEDGE TO PROTECT CORALS – A pledge we live by

The entire CCMI team, including our amazing board of directors, pledge to protect coral reefs for the future by developing innovative and impactful research projects, collaborating with the best scientists in the world, sharing, engaging in, and supporting education and outreach that WORKS.

We need your help...

CCMI needs funders, volunteers, engaged schools and teachers, potential interns, fellows, and citizen scientists. Support us as we support coral reefs for the future.



RESEARCH UPDATE

CCMI'S RESEARCH MISSION IS TO UNDERSTAND AND PROMOTE THE RESILIENCE OF CORAL REEFS TO CHANGING ENVIRONMENTAL CONDITIONS.

CCMI HAS RAISED USD \$2.8 MILLION IN RESEARCH PROJECT FUNDING FROM JAN 2020-JULY 2022 IN THE FOLLOWING AREAS:

ADAPTATION

How do corals adapt to different conditions, primarily depth?

MORPHOLOGY – how they modify their shape, size, skeleton density, etc

PHYSIOLOGY – how they modify their metabolism, including how they get food, which symbionts they associate with, and cellular processes

GENOMICS – how they modify gene expression in response to environmental cues

How do adaptive responses differ among species and regions?

SPECIES – using several different species

REGIONS – comparing Cayman to Bermuda and Red Sea

Funded by the US National Science Foundation with a 2020-2024 grant for \$587K in collaboration with researchers from Israel. CCMI's adaptation work includes projects under the Women in Ocean Science Award (WIOSA) programme, supported by the Brian Melito and Jessica Colker Trust at \$50K per annum (2019 - 2022).



RESILIENCE

Can coral resilience to climate change be modified?

BASELINE – how different individuals with different histories have different levels of resilience

RESPONSE VARIANCE – how exposure to heat leads to increased resilience

MECHANISM – how genetic and physiological differences lead to these responses

PREDICTIONS & ASSISTANCE – how we use those responses to predict how resilient corals will be to future change, and how to heat to boost resilience to future change

Funded by the Heising-Simons Foundation with a 2022-2024 grant for \$1.2M (~\$280K to CCMI) in collaboration with researchers from Bermuda and US.

RESTORATION

How can we improve restoration success?

NURSERY – how frequency of maintenance alters survival and disease

OUTPLANTING – selecting more resilient individuals to improve success

INCREASING CORAL COVER – upscaling restoration to increase coral cover

UNDERSTANDING – benefits to ecosystem health by monitoring reef fish populations

Funded by EU RESEMBID with a 2022-2023 grant for \$291K. Also supported by AALL Foundation Trust, Disney Conservation Fund, Ernest Kleinwort Charitable Trust, Dart Cayman Islands, Stuarts Walker Hersant Humphries, and Consolidated Water for an additional circa \$100K per annum 2020-2022.

EXPLORATION

Offshore Seamount Biodiversity

CORAL COMPOSITION & CONNECTIVITY

REEF AND PELAGIC FISH COMMUNITIES

ENVIRONMENTAL DNA TO ID CRYPTIC SPECIES

BENTHIC MAPPING

Funded by UK Darwin Plus Initiative with a \$620K grant 2022-2024 and matched by a private donor grant from 2022-2026 for \$500K.



REEF HEALTH MONITORING

Since 1998, CCMI has been monitoring Little Cayman's reefs, using the Atlantic and Gulf Rapid Reef Assessment (AGRRA), to understand local reef health. AGRRA analysis in 2021 indicates that:

- New coral recruits declined by 83% (2006- 2021)
- Fish biomass has been higher inside of Marine Protected Areas (MPAs) compared to outside throughout the 23 years of surveys
- Fish abundance (density), biomass and species richness have all increased overall since 1999, indicating a rebounding fish population

AGRRA is supported by our Healthy Reef Sponsors, which is circa \$45K per annum. Sponsors include Aureum Re, Cayman Islands Department of Tourism, Island Heritage, and Foster's Supermarkets.

VISITING RESEARCHERS AND INTERNS (2022)

10 visiting researchers
6 graduate students
7 undergraduate interns

Home institutions include:

- Woods Hole Oceanographic Institute
- Massachusetts Institute of Technology
- University of North Carolina
- University of Alberta
- Montana State University
- Smithsonian Tropical Research Institute
- University of Massachusetts
- University of Florida
- University of Groningen
- University of Haifa

CAPITAL EXPANSION

In 2022, CCMI received a \$445K capital grant from the US National Science Foundation to support the expansion and development of our Reef Ecology and Evolution Lab to build an outdoor mesocosm to investigate the adaptation of corals to extreme environments.

PUBLICATIONS

CCMI's research team published 4 peer reviewed papers in top scientific journals in 2021. In 2022 they expect an estimated 5 publications:

2022 Publications

Carpenter, G, Chequer, AD, Weber, S, Mass, T, Goodbody-Gringley, G (2022) Light and photoacclimatization drive distinct mesophotic coral communities in Little Cayman, Cayman Islands. *Ecosphere*

Donavan, M, Alves, C, Burns, J, Drury, C, Meier, O, Ritson-Williams, R, Cunning, R, Dunn, R, Goodbody-Gringley, G, Henderson, L, Knapp I, Levy J, Logan, C, Mudge, L, Sullivan, C, Gates, R, Asner, G (2022) From polyps to pixels: understanding coral reef resilience to local and global change across scales. *Landscape Ecology*

Publications In Review/Revision

Goodbody-Gringley, G, Chequer, AD, Grincavitch, C, Noyes, T, Dowell, R, Lundberg, A, Smith, A (In Revision) Recurrent culling of invasive lionfish hotspots on mesophotic reefs impacts long-term population densities. *Coral Reefs*

Bellworthy, J, Pardo, R, Scucchia, F, Zaslansky, P, Goodbody-Gringley, G, Mass, T (In Review) Physiological and morphological plasticity in *Stylophora pistillata* larvae following translocation between shallow and mesophotic reefs in Eilat. *Scientific Reports*

Scucchia, F, Wong, K, Zaslansky, P, Putnam, H, Goodbody-Gringley, G, Mass, T (In Review) Genetic and morphological similarities between shallow and mesophotic *Porites astreoides* corals support the Deep Reef Refugia Hypothesis for this species in Bermuda. *PLOS Biology*

Goodbody-Gringley, G & Chequer, A (In Prep) Quiet Oceans: Impacts of COVID-19 restrictions on local fish populations in GeorgeTown Harbor, Cayman Islands. *Scientific Reports*



EDUCATION UPDATE

CCMI'S EDUCATION MISSION IS TO DELIVER IMMERSIVE AND TRANSFORMATIVE EDUCATIONAL EXPERIENCES THAT PROMOTE OCEAN STEWARDSHIP, TRAINING THE NEXT GENERATION OF MARINE SCIENTISTS AND OCEAN CONSCIOUS CITIZENS.



The education programme at CCMI provides experiential learning to students and young adults from around the world. In 2022, our programmes (which were impacted by Covid restrictions) operated within an annual budget of circa \$350,000. Looking into 2023, our projected bookings indicate that this budget will nearly double as operations return to normal and we welcome back visiting university groups. CCMI also provides circa 100 scholarships and internships each year, predominantly for local students.

LOCAL PROGRAMMES

Marine Ecology Course (Ages 10-12)

Residential experience of and immersion in the marine environment to influence behaviors and attitudes, based on curriculum relevant ocean literacy principles.

Scholarships for \$50K awarded by the BODA Charitable Star Trust.

Young Environmental Leadership Course (Ages 16 – 22)

Scuba training to rescue level, introduction to marine science, career building workshops for those interested in a water sports or marine science career.

Funded by Cayman National Bank and Foster's Supermarkets for \$30K/yr.

Ocean Science Scholars (Ages 18-28)

4 x 3-month local internships with education or research team per year. Support for 5 x Caribbean Marine Ecology Camp scholarships (14-18).

Funded by the Edmund F. and Virginia B. Ball Foundation from 2021-2024 for \$200K.

INTERNATIONAL PROGRAMMES

Caribbean Marine Ecology Camp (Ages 13-18)

Introduction to marine science and scuba diving, at a fully functional research facility.

Visiting University Groups

1 – 3 weeks in duration, guided by university faculty and supported by CCMI education team. CCMI's visiting university groups include Dartmouth College, Wellesley College, Indiana University, Louisiana State University, University of Wisconsin-La Crosse, University of North Carolina, University of Delaware and Saginaw Valley State University.

REEFS GO LIVE

Live underwater broadcast aimed at primary students
Interactive Q&A in real-time with researchers in the ocean
Corresponding curriculum-based education worksheets
Recorded video available as an evergreen teacher resource
International reach of circa 50,000 viewers per year.

Funded by the Edmund F. and Virginia B. Ball Foundation from 2021-2024 for \$300K. Also supported by Stuarts Walker Hersant Humphries for \$15K in 2022.



TIMELINE

1998 – CCMI was founded by Dr Carrie Manfrino as a US non-profit. CCMI began our coral reef monitoring programme that tracks changes in coral reef and fish health.

2002 – CCMI was incorporated as a registered Cayman Islands Charity (#NP-3)

2003 – CCMI was determined as a US 501(c)(3) (#22-3609293)

2004 – CCMI was incorporated as a UK registered charity (#1104009)

2005 – HRH The Earl of Wessex, CCMI's Royal Patron, breaks ground on the Little Cayman Research Centre.

2007 – CCMI launches international programming, including visiting scientists and groups from Dartmouth, University of Florida, Wellesley College, Rutgers University, Keane University, University of North Carolina etc. CCMI was awarded our first \$500k multi-year grant.

2009 – CCMI partnered with the United States National Oceanographic and Atmospheric Administration (NOAA) to launch the Coral Reef Early Warning System (CREWS) as part of the Integrated Coral Observation Network (ICON). CCMI launched our Ocean Literacy programme.

2012 – CCMI was awarded a US National Science Foundation facilities grant to develop the climate change labs. CCMI also established the first ever coral nursery and coral restoration research programme in the Cayman Islands in partnership with the Cayman Islands Department of Environment.

2016 – CCMI held the “Can we Save Coral Reefs” International Symposium in London, convened by HRH The Earl of Wessex, hosting scientists, policy makers and advocates from all over the world. HRH The Earl of Wessex also visited the Little Cayman Research Centre.

2017 – CCMI attended the Fourth International Workshop on Bridging the Gap between Ocean Acidification Impacts and Economic Valuation, in Monaco, hosted by Prince Albert II of Monaco. CCMI also held a Navigator event, hosted by our Royal Patron, HRH The Earl of Wessex, at Windsor Castle.

2018 – CCMI launched Reefs Go Live programme, which reaches over 100,000 students per year (by 2022). 2018 also saw a 20-year coral reef monitoring follow up study across all three of the Cayman Islands. We celebrated the International Year of the Reef via a range of public outreach events, including a Royal hosted event at St James's Palace, London.

2019 – CCMI hosted HRH The Prince of Wales at the Little Cayman Research Centre, including a Reefs Go Live broadcast. CCMI also launched the Women in Ocean Science Award (WIOSA), to support early-career professionals.

2020 – CCMI hired new Research Director, Dr Gretchen Goodbody-Gringley, who was awarded a National Science Foundation grant, CCMI's first as lead PI/Institution. CCMI championed Little Cayman as a Mission Blue Hope Spot, as well as seeing 89% success with a new coral restoration outplanting concept.

2021 – CCMI provides the most local scholarships in one year since our inception and expands the Reef Ecology and Evolution Lab (REEL). CCMI is awarded a RESEMBID grant to support coral restoration, and a Covid-19 Adaptation Grant. CCMI presents Quiet Oceans for the UN.

2022 – CCMI is awarded a NSF grant to expand our wet labs. CCMI is also awarded a Darwin Plus Initiative Grant to explore research offshore sea mounts. CCMI presented at the ICRI and Reef Futures Conferences.



GET INVOLVED

Volunteer

Become a Navigator

Share Reefs Go Live

Sponsor

Donate

Engage with the Healthy Reefs outreach programme

THANKS TO OUR SPONSORS

GOLD



THE FRAWLEY FAMILY

SILVER

STUARTS
WALKER
HERSANT
HUMPHRIES



ALEXANDRIA



CAREY OLSEN



Deloitte.

SUPPORTERS



CONTACT

Contact Kate Holden: Kholden@reefresearch.org for more info. www.reefresearch.org

