

CORAL BLEACHING

REPORT CARD 2023

Summer 2023 was the most drastic marine heatwave on record for Little Cayman, three times more intense than any previous heatwave. Little Cayman experienced 17 degree heating weeks from July to December 2023. This has since been declared by the National Oceanic and Atmospheric Administration (NOAA) as the fourth global coral bleaching event on record. CCMI has closely monitored the impact of this period of prolonged record-breaking ocean temperatures on the coral reefs of Little Cayman.

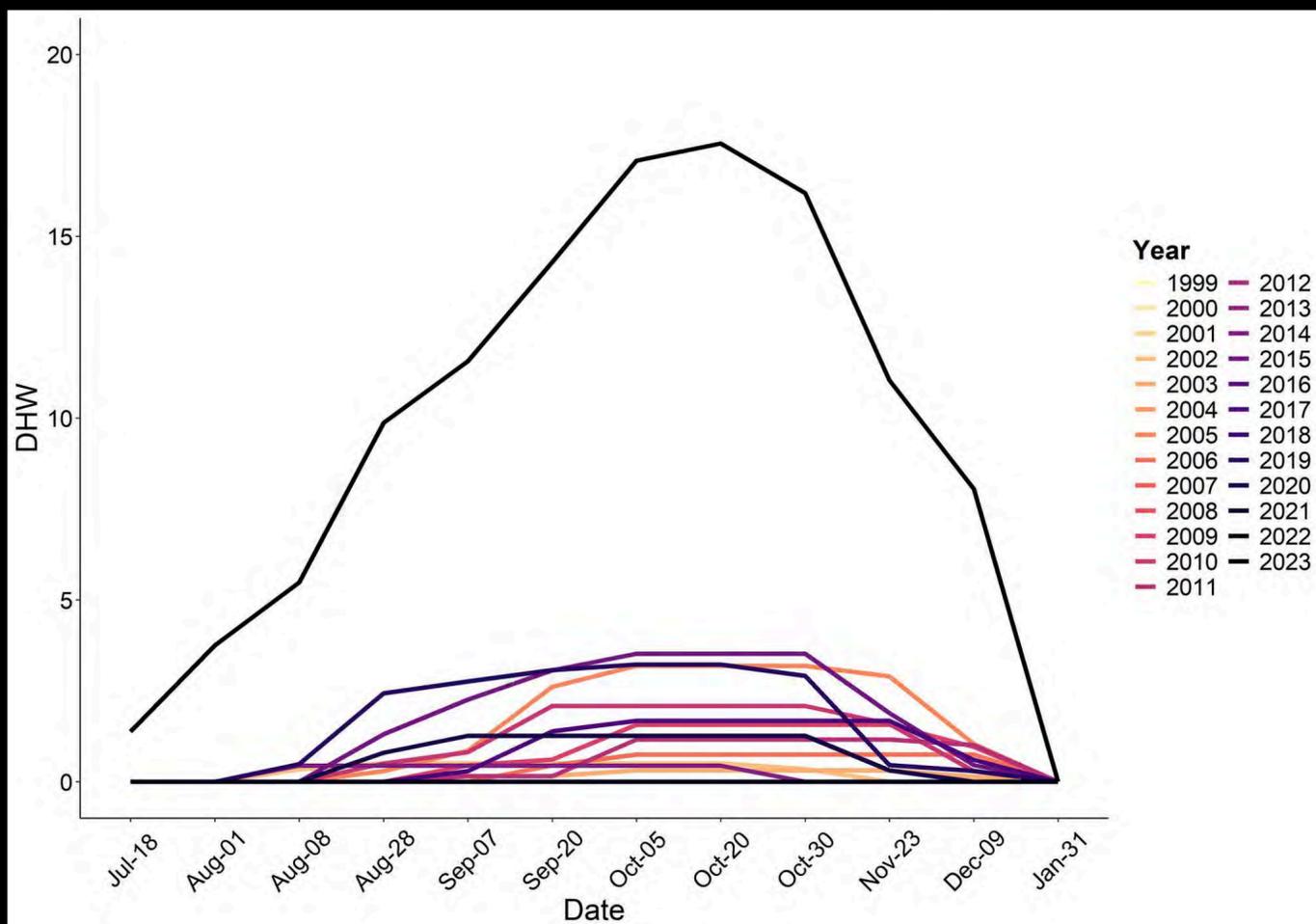


Figure 1: Degree heating weeks (DHW) between July and January from 1999- 2023

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REPORT CARD 2023

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During the latter half of 2023, the reefs of Little Cayman experienced extreme bleaching and mortality, with 95% of corals bleaching. This is comparably high levels of bleaching due to a number of factors including higher coral cover to begin with and the presence of more bleaching-susceptible species that have already been erased from other reefs.

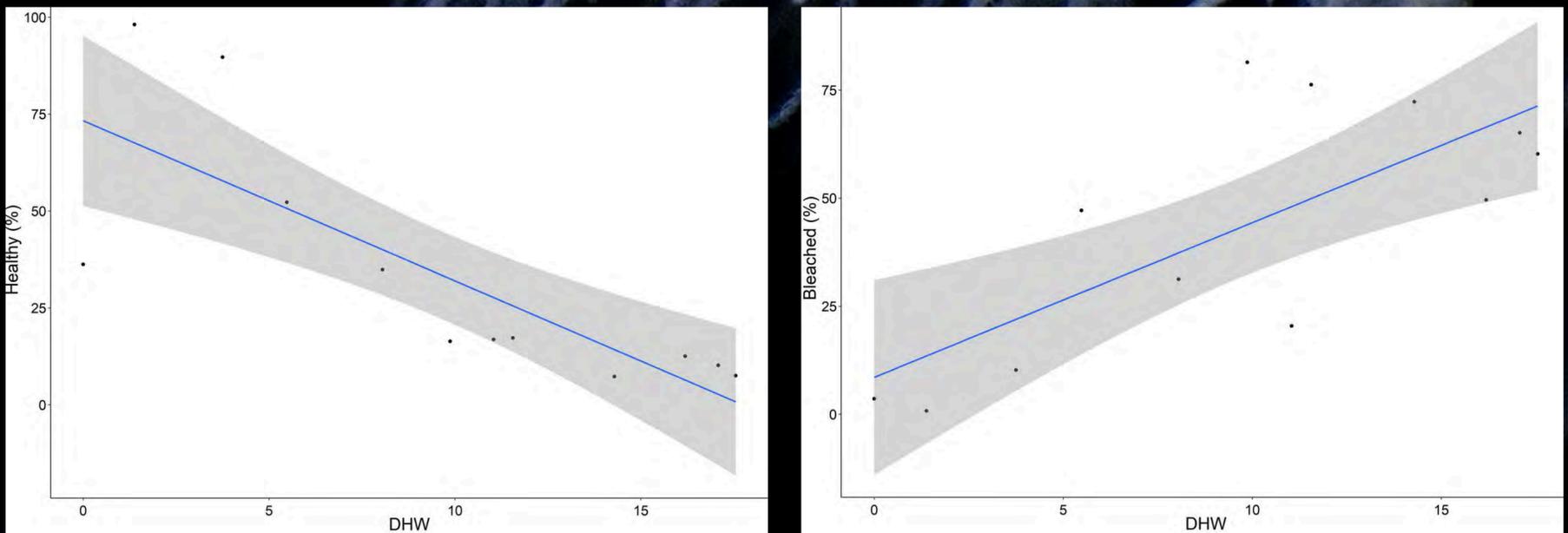


Figure 2: (Left) Percentage of healthy corals and (Right) percentage of bleached corals against degree heating weeks (DHW) over the 2023 marine heatwave

SPECIES VARIATION

The levels of bleaching and subsequent mortality varied between species and growth form. More than 50% of every species monitored bleached, except *Madracis*. However, some stress-tolerant species and one weedy species showed less than 25% subsequent maximum mortality following bleaching. *Colpophyllia*, *Favia*, *Mycetophellia*, and *Agaricia* showed almost 100% maximum bleaching and mortality.

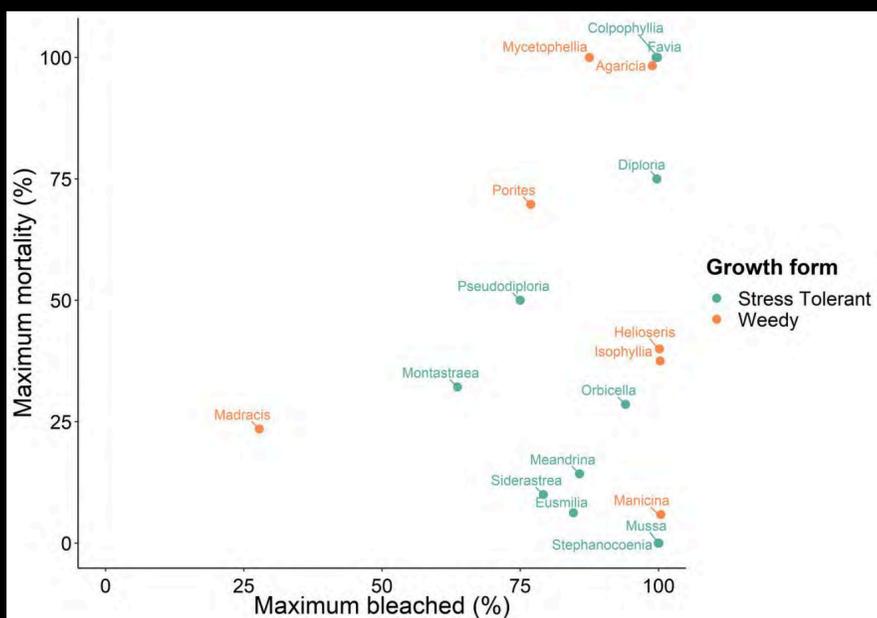


Figure 3: Bleaching and mortality variations amongst coral species, including stress tolerant and weedy species.

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CORAL MORTALITY

Following the initial bleaching, 50% of all corals surveyed subsequently died. However, stress-tolerant coral taxa and key reef building corals, such as *Siderastrea* and *Montastrea*, showed low initial mortality to bleaching induced stress.

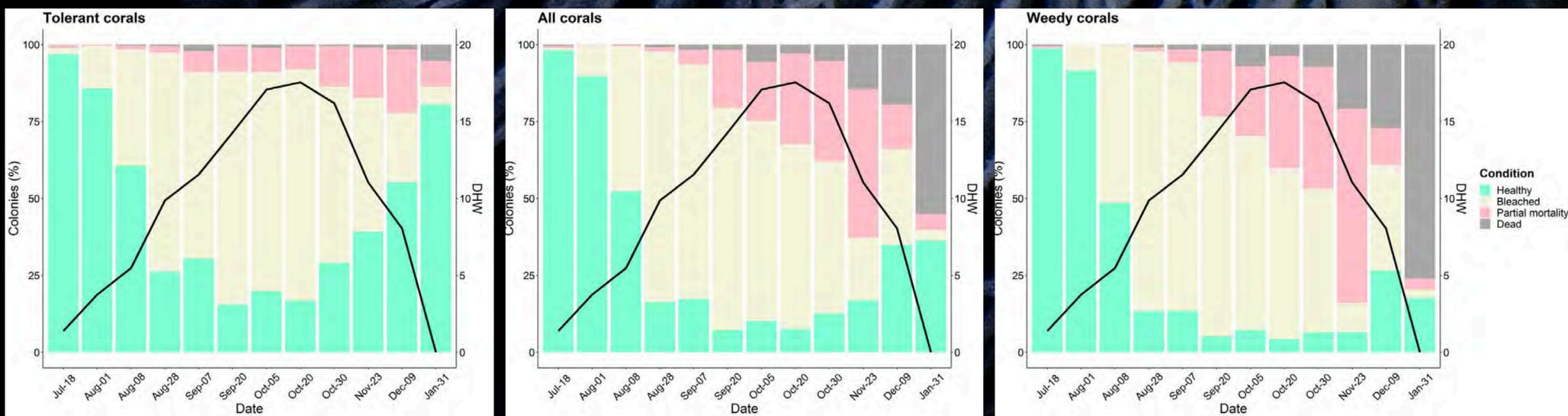


Figure 4: (a) percentage of healthy, bleached, partial mortality, and dead corals and degree heating weeks from July 2023 to January 2024. (b) percentage of healthy, bleached, partial mortality, and dead tolerant corals and degree heating weeks from July 2023 to January 2024. (c) percentage of healthy, bleached, partial mortality, and dead weedy corals and degree heating weeks from July 2023 to January 2024.

CHANGES TO THE REEF

Between mid-July 2023 and the end of January 2024, mean coral abundance declined consistently, reaching the lowest point in January 2024 due to bleaching-induced coral mortality and post-bleaching coral disease.

This decline in coral abundance is severe, and it is possible that this marine heatwave could change the nature of Little Cayman's coral reefs as we know them. However, these ecosystems are adaptable, and reefs such as those in Little Cayman, with higher coral cover, more coral species, protection, and healthy fish populations, may fare better in the long-term with regards to recovery.

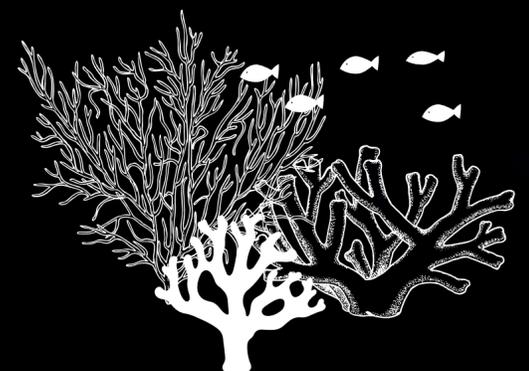
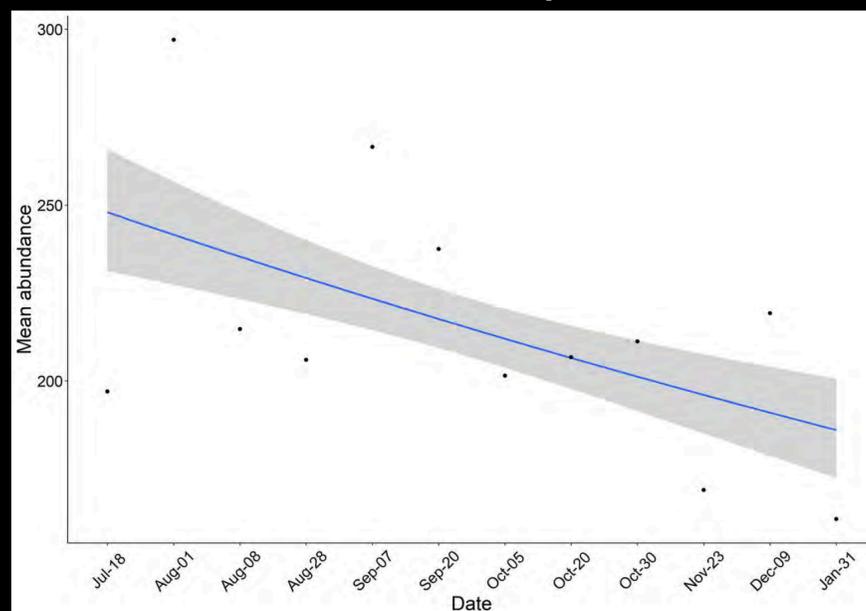


Figure 5: Mean abundance of coral in Little Cayman (n) from 18th July 2023 to 31st January 2024.

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WHAT DOES THIS MEAN FOR LITTLE CAYMAN'S CORAL REEFS?

CCMI continues to monitor the impact of the coral bleaching event in Little Cayman. Although the recovery of Little Cayman's reefs is still unknown at this time, factors such as coral disease outbreaks and upcoming coral spawning will have substantial influence. As shown following the 2015 bleaching event (Figure 6), corals show improved recovery from disturbance without the added pressures from local threats such as pollution and overfishing. CCMI's Healthy Reefs data have indicated that Little Cayman's reefs can recover well from bleaching disturbance, as shown following the 2015 bleaching event. This evidence provides hope for the recovery of these reefs, but the next year or so will be pivotal.

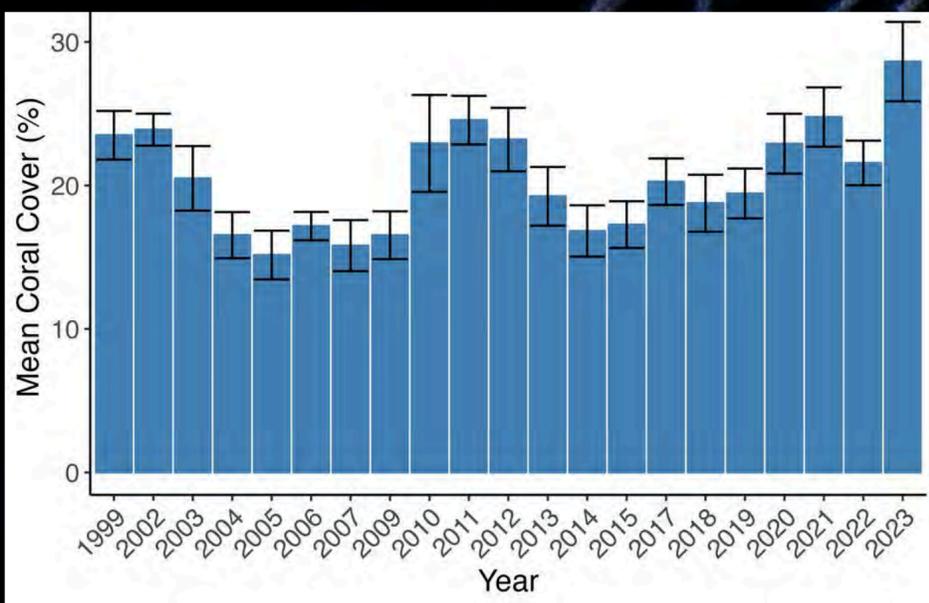


Figure 6: Mean percent coral cover (+/- SE) over time from 1999 – 2023.

The reefs of Little Cayman have always been unique in many ways. Twenty-five years of CCMI's monitoring data show above average health of corals with no reef sites recorded in poor health in 2022 or 2023 and stable levels of coral cover, despite regional decline.

Although no one can say for certain how these reefs will recover and fare in the future as climate change impacts intensify, we can say that historically they have shown stability while other reefs in the Caribbean have recorded decline. The comparably higher species diversity and coral cover suggest that this could be a crucial area of hope for re-seeding degraded reefs and increasing regional reef resilience through the challenging years ahead for coral reefs. Reefs, such as those in Little Cayman, could be essential in supporting recovery and adaptation across the region to maintain as much biodiversity as possible while global emissions are reduced.



The full-time presence of researchers at CCMI enables continuous monitoring of events like 2023's marine heatwave. Coupled with our long-term monitoring data, this puts CCMI in a unique and important position to not only document the impacts of climate change, but to also test possible solutions to mitigate loss for the future of coral reefs.

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ABOUT CCMI:

CCMI is dedicated to conducting and facilitating research, education, and outreach that will sustain marine diversity for future generations. Our vision is a world with vibrant oceans and healthy coral reefs. We will make 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. CCMI is a US 501(c)(3) nonprofit organization (ID# 22-3609293), a UK charity (#1104009) and Cayman Islands nonprofit (NP-03)

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