

Papahānaumokuākea Marine National Monument

Coral Disease and Bleaching

Management Issue

The incidence of coral diseases and coral bleaching in the Papahānaumokuākea Marine National Monument (PMNM or Monument) is currently low compared with reefs in other areas of the world. However, the possibility of new or increased levels of diseases or bleaching events, in combination with other threats to the health of Monument coral reefs, could be significant.

Description

There has been a worldwide increase in the reports of diseases affecting marine organisms. In some cases, these rises have been correlated to increases in global sea surface temperature, such in the case of massive coral bleaching events. In spite of the prevalence of coral disease, the factors contributing to disease outbreaks are poorly understood, and there is a lack of information on normal disease levels in the ocean. The Northwestern Hawaiian Islands (NWHI) are considered to be one of the last relatively pristine large coral reef ecosystems remaining in the world. As such, it provides a unique opportunity to document what may be the normal background levels of disease and bleaching in a coral reef system exposed to limited local human influences.



Coral growth anomalies removed from a diseased coral, French Frigate Shoals. Photo credit: James Watt

Coral habitat of the NWHI provides structure to sustain reef biodiversity, forms the base of the food web, and provides the islands with protection from storm events. Loss of this habitat due to coral diseases or bleaching has the potential to severely impact the marine community of these atoll systems. Managers need to understand the drivers for this phenomenon to assess impacts, identify resistant or resilient areas, and potentially identify additional management actions that can address coral bleaching or disease issues.

With coral reefs around the world in decline, the NWHI present a unique opportunity to characterize an intact coral reef ecosystem and to begin to understand the degree of natural variability in an ecosystem relatively free of local anthropogenic influences. Therefore, studying these remote ecosystems may also make an important contribution toward understanding the impacts of global stressors such as climate change on coral reefs.

Questions and Information Needs

- 1) What is the spatial extent and level of disease incidence in the Monument?
- 2) Are there species or areas that appear to be either more susceptible or more resilient to disease or bleaching?
- 3) Are diseases at stable levels or increasing in prevalence?
- 4) How many diseases exist and what are they?
- 5) What are the mechanisms by which diseases are spread?
- 6) What oceanographic characteristics confer resistance or susceptibility to bleaching?
- 7) What species specific characteristics confer resistance, resilience and susceptibility to bleaching?
- 8) How widespread are bleaching events in the Monument?
- 9) How far in advance can bleaching events be predicted using currently available tools?
- 10) What is the predictability of bleaching events in terms of duration and geographic scope?
- 11) How do bleaching events affect the ecosystem as a whole?
- 12) What role do the zooxanthellae play in a bleaching event and in coral recovery?
- 13) What percent of corals survive bleaching events of different severity in the Monument?

Scientific Approach and Actions

- Assess and prioritize research and monitoring of coral diseases and bleaching by developing and implementing a prioritized research and monitoring plan for the Monument

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For More Information -- <http://www.sanctuaries.noaa.gov/science/assessment>

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- Conduct comparative studies and meta-analyses using coral disease and bleaching data from other Indo-Pacific sites
- Coordinate meetings for updates with researchers
- Conduct targeted research to characterize types and spatial distributions of coral disease and bleaching in the PMNM
- Conduct monitoring to understand susceptibility of corals to disease and bleaching over time, by assessing survival of corals of different species, depths, geological areas, etc.
- Examine the accuracy of bleaching predictions using existing tools and data
- Examine existing habitat monitoring data to look for characteristics that have historically conferred resistance and cross reference those with bleaching data
- Collect, analyze and input research, monitoring and bathymetric data into appropriate databases to inform management decisions

Potential Key Partners and Information Sources

Hawai‘i Institute of Marine Biology; US Fish and Wildlife Service; State of Hawai‘i; NOAA/NMFS/PIFSC, Coral Reef Ecosystems Division; Native Hawaiian Cultural Practitioners; State of Hawai‘i Department of Land and Natural Resources; broader coral reef research community

Management Support Products

- Information on modes of coral disease spread
- Data indicating rate and location of coral disease spread
- Data indicating locations, species and depths where coral disease is less common
- Report characterizing the accuracy of bleaching event predictions
- Report describing characteristics that may relate to resistance or susceptibility to bleaching
- Produce scientific papers and reports on the extent, impacts and predictability of bleaching events
- Presentations on research results at conferences, symposia, meetings and workshops
- Maps of particularly sensitive areas

Planned Use of Products and Actions

- Protection of areas with lower incidence of coral disease (e.g. limit permitted activities in these areas)
- Limit spread by updating disease protocol when new information or spread is identified
- Draft a Bleaching Response Plan with information collected during research and monitoring activities
- Contribute to the data record on long term monitoring of coral bleaching in the NWHI
- Use data collected and analytical results from research expeditions to develop or enhance education and outreach products with information on coral disease and coral bleaching
- Utilize research results to inform management and implementation of the Marine Conservation Science and Habitat Management and Conservation Action Plans
- Restrict activity in sensitive areas to coral bleaching or disease

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Program References

PMNM Management Plan

- Action Plan 3.1.1: Marine Conservation Science
 - o Strategy MCS-1: Continue and expand research, characterization and monitoring of marine ecosystems for the life of the plan.
 - o Strategy MCS-2: Assess and prioritize research and monitoring activities over the life of the plan.
 - o Strategy MCS-3: Communicate results of research and monitoring over the life of the plan.

- Action Plan 3.2.3 Habitat Management and Conservation
 - o Strategy HMC-1: Within 15 years, develop and implement a strategy for restoring the health and biological diversity of the shallow reefs and shoals where anthropogenic disturbances are known to have changed the ecosystem.

- *Other Action Plans:*
 - o 3.3.2 - Alien Species
 - o 3.4.1 - Permitting
 - o 3.5.1 - Agency Coordination
 - o 3.6.2 - Information Management
 - o 3.6.3 - Coordinated Field Operations

PMNM Condition Report

- Coral disease is a threat to monument resources. Coral disease is noted as an issue in response to Question 6 and Question 13.

Other Documents

- Monument Goals 1, 2 and 5



Photo: Coral reef researcher documenting coral health in an area rich in Acroporid corals. This genus is known to be susceptible to several types of coral disease, and has a very limited distribution in the NWHI. Credit: James Watt

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