

DIAGNOSTIC CASE REPORT

U. S. GEOLOGICAL SURVEY-BIOLOGICAL RESOURCES DIVISION
NATIONAL WILDLIFE HEALTH CENTER-HONOLULU FIELD STATION
P. O. BOX 50167, 300 ALA MOANA BLVD., Rm. 8-132
HONOLULU, HAWAII 96850

Tel: 808-792-9520, Fax: 792-9596, Email: thierry_work@usgs.gov

Case Number: 21907

Submitter Name:

Dr. Thierry Work
US Geological Survey
PO Box 50167
Honolulu, Hawaii 96850
United States

Species submitted (n):

Coral: *Fungia scutaria* (3)
Coral: *Montipora capitata* (2)
Coral: *Montipora flabellata* (18)
Coral: *Montipora patula* (44)

SPECIMENS SUBMITTED: Tissue-Fixed formalin

History: During August and October of 2012, there was a coral disease outbreak where unusual numbers of dominant rice corals (*Montipora patula* and *M. capitata*) at Anini and Makua were reported dying. Laboratory investigations revealed large numbers of corals manifesting semicircular areas of tissue loss infected with filamentous bacteria.

This year, Eyes of the Reef volunteer Terry Lilley reported lesions in blue rice coral (*Montipora flabellata*) in North Kauai that appeared similar to those seen earlier at Makua and Anini in 2012. As a result of these reports, USGS carried out a field investigation. We sampled 64 paired normal and lesion fragments from 32 diseased rice coral colonies including 22 *M. patula*, 9 *M. flabellata* and 1 *M. capitata*. Four sites on North shore Kauai were sampled including Charros, Wainiha, West (Waipa) and East (Back door) Hanalei Bay (Fig. 1). Colonies were photographed, paired lesion and normal tissues were collected from affected corals, and tissues were examined under the microscope to detect any potential organisms associated with tissue loss. Three additional colonies of a separate coral (*Fungia*) with bleaching from South Kauai (Poipu) were also sampled but will not be discussed further. This report will focus on the 30 colonies of *Montipora* from North Kauai with tissue loss disease (one colony had a growth anomaly and another had discoloration and will not be discussed further).

Findings: Charros is a shallow reef with strong currents and clear water. Wainiha is an embayment with moderate visibility (ca. 25-30 feet) and low currents. Back Door (East Hanalei) had good visibility (ca. 50 feet) and low currents. Waipa (West Hanalei) is a degraded reef with numerous recently dead urchins, bleached and dying cauliflower corals, bleached rice coral in the shallows, sedimentation, low visibility, and low currents.

Gross lesions in corals were circular to semi circular and occupied 5-80% of the surface of coral colonies. For 20 *M. patula*, lesions were often covered with flocculent grey-white material whereas a distinct orange margin was seen in lesions of 9 *M. flabellata*. The single *M. capitata* had a sediment-covered lesion (Fig. 2).

Of 30 corals with tissue loss, the most common microscopic finding was infection with filamentous bacteria (63%), followed by infection with fungi, ciliates, or microalgae (20%), and miscellaneous pathology comprising the remainder. For the most common diagnosis (filamentous bacteria), 14/20 (70%) *M. patula* and 5/9 (55%) *M. flabellata* were infected. Infections with filamentous bacteria were most common in Waipa (75% of corals sampled), Wainiha (62%) and equally common at Back door and Charros (57% each). Of the 30 paired normal tissue fragments examined, only nine (30%) appeared normal microscopically with the remainder having various degenerative pathologic changes.

Final diagnosis:

Comments: As in Anini and Makua last year, dominant rice corals including blue rice corals at 4 additional sites on North Kauai, manifest tissue loss mainly associated with infections by filamentous bacteria. At least two groups of bacteria are present (cyanobacteria and gliding bacteria). In this sampling, gliding bacteria played a more prominent role in Hanalei, Charros, and Wainiha whereas cyanobacteria seemed more prominent last year at Anini and Makua. Bacterial infections were at their highest level at the most degraded reef (Waipa) but were also common at all other sites including Charros where waters are clear and currents strong. Thus, the drivers of filamentous bacterial infections in rice corals in North Kauai involve more than mere sedimentation and water stasis as was suspected at Anini or Makua last year. That said, like at Anini and Makua, corals at the four sites investigated here are not in optimal condition given the high percentage of "normal" tissues manifesting various microscopic pathologies.

Management: Rice corals in North Kauai continue to manifest tissue loss associated with filamentous bacteria on a scale not seen elsewhere in Hawaii. The environmental drivers promoting this process are complex and poorly understood. So while additional research to better understand this phenomenon continues, our best short-term management option may be to improve environmental conditions on reefs to maximize the chances that corals can successfully reproduce and recover from such disease events. A coarse but appropriate analogy in humans was the implementation of clean drinking water and proper sewage disposal, both of which vastly improved the health and well-being of humans. There is a general consensus among coral biologists globally that land use patterns, degradation of coastal wetlands, and overfishing contribute to reef degradation. Perhaps these factors should be considered as part of a comprehensive coastal health management plan for the islands.

Report Date (mm/dd/yyyy): 5/6/2013

Necropsy report: Available upon request

Copies of this report sent to:



If you have questions regarding this case, contact Thierry M. Work MS, DVM, MPVM at 808-792-9520. Include above Case Number. Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

NOTE: Information in this report supersedes any information from previous reports regarding this case

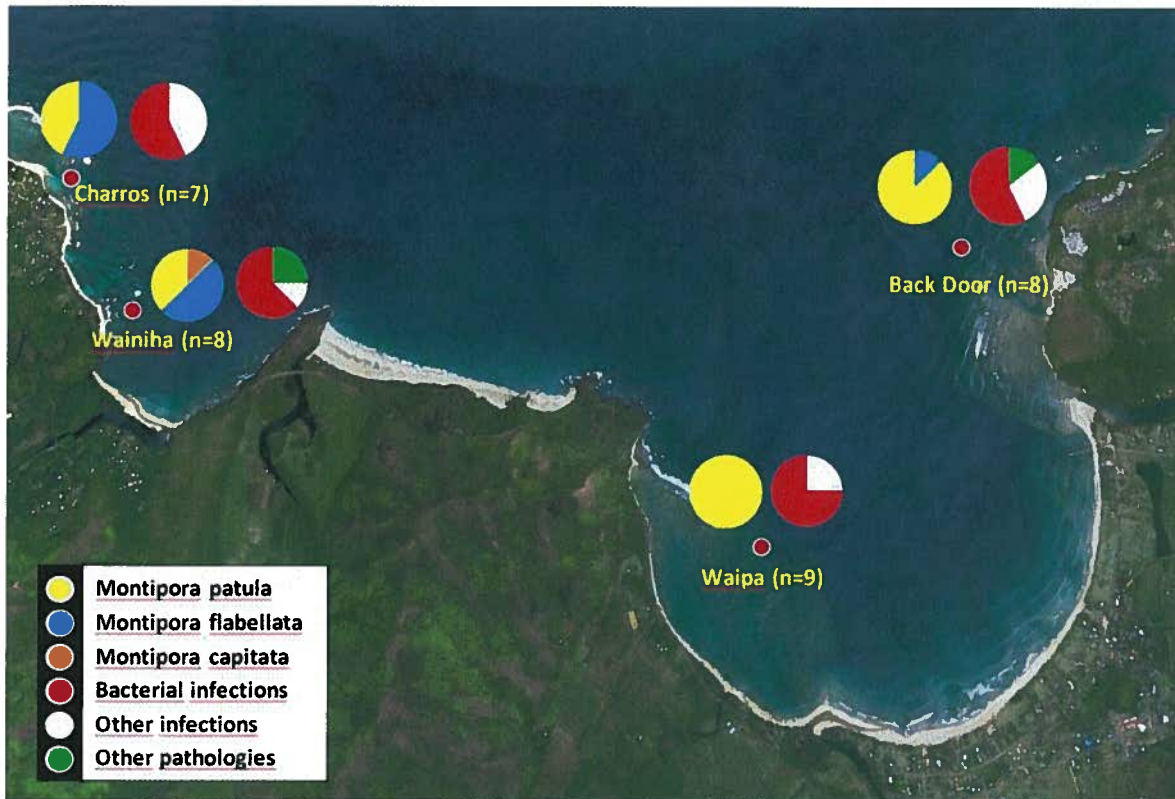


Figure 1. Locations in North Kauai surveyed for coral disease in April 2013 along with sample size (n). For each location, left pie chart is percent of each *Montipora* species sampled, and right pie chart is percent of diagnosis.

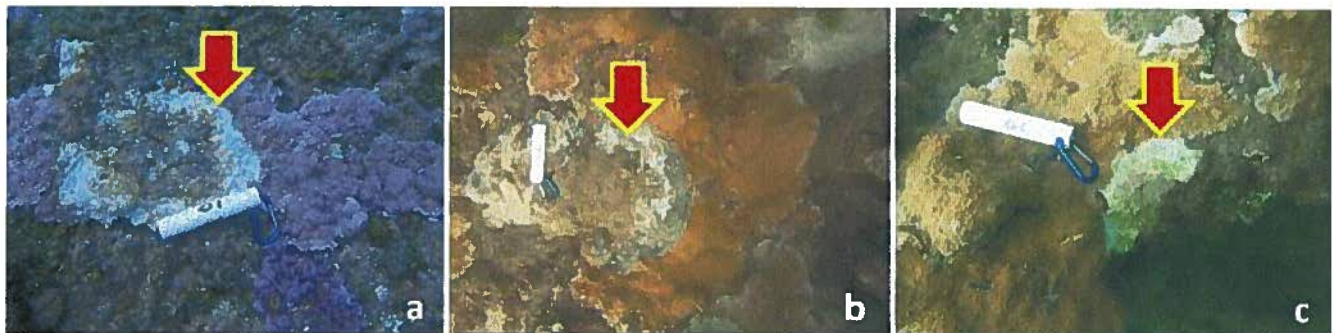


Figure 2 a. *Montipora flabellata* (a), *Montipora patula* (b), and *Montipora capitata* (c) with lesions (arrows). Note the distinct circular lesions of tissue loss revealing skeleton covered by algae or flocculent material (a-b) that on microscopy are associated with infection by filamentous bacteria. *Montipora capitata* (c) with microscopic evidence of tissue death of unknown cause.

