Rapid assessment of the health status of coral communities in Guadeloupe Island (Lesser Antilles)

Evaluación rápida del estado de salud de las formaciones coralinas de la isla de Guadeloupe (Antillas Menores)

Évaluation rapide de l'état de santé des communautés coralliennes de Guadeloupe (Petites Antilles)

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EXTENDED ABSTRACT

Caribbean coral reefs suffer from coral-algal phase shifts (Mumby, 2009). The increase in macroalgae load is due to several factors of natural (*Diadema* sea urchin epizootic) or anthropogenic origins. That includes overfishing (sea urchins, herbivorous fish like Scaridae and Acanthuridae) and coastal water eutrophication. This last phenomenon is mainly due to land and mangrove deforestation, fertilizer abuse, and poor sewage treatment… As a consequence, the health status of coral communities is widely associated with the cover of macroalgae.

A study around Guadeloupe Island was realized in 2022 and 2023 to determine the coral communities' health status. The study method also includes the presence of mud siltation able to threaten coral communities. The health status of coral communities was estimated using a visual method developed by Bouchon *et al.* (2004). It consists of classifying reef sites on a scale comprising four classes:

- the first class corresponds to a coral community in excellent condition: the coral colonies show practically no signs of tissue necrosis, and the surrounding algal community consists of an algal turf. No signs of siltation are present;
- the second class characterizes a reef in relatively good condition: the coral colonies show few signs of necrosis, macroalgae progressively invade the substrate between coral colonies that remain unaffected by them, and (or) signs of siltation on the bottom between the coral colonies appear;
- class 3 corresponds to a degraded reef: many coral colonies present plagues of dead tissues, macroalgae start to colonize and cover the corals, and (or) large siltation on the bottom is observable; the mud also deposits on the corals that have difficulties getting rid of it;
- class 4 applies to a very degraded reef: most of the corals are dead, and they, as well as all the substrate, are carpeted with macroalgae and (or) are covered with mud.

This classification reflects the degradation dynamics of Caribbean reefs under anthropogenic influence. Divers determined the health status of coral communities around the island from 0 to 20 meters. Guadeloupe national park has used this technique since 2018 and ÉcoRécif Environnement since 2017 in Martinique and Guadeloupe islands (Bouchon et al., 2017).

Overall, 134 reef sites were investigated. The results showed that 13 % of coral communities were in excellent condition (class 1), 58 % were in good condition but supported large macroalgae populations around the coral colonies (class 2), 28% had coral communities invaded by macroalgae or more or less covered with mud, coral colonies were partially covered by algae (class 3), and 1 % of the sites supported coral communities that had been destroyed (class 4).

Figure 1 illustrates these results. Statistical analyses (Kruskal-Wallis test) showed that the reef health status did not significantly differ between the Caribbean and Atlantic coasts and the Bay of Grand Cul-de-Sac Marin in the north of the island. Likewise, when considering three classes of depth, 0 to 6 m, 6 to 12 m, and 12 to 20 m, Kruskal-Wallis tests showed no significant differences in the reef health status according to the depth range investigated.

In conclusion, even though the study classified almost 60% of reef sites as in "good health," it is important to note that

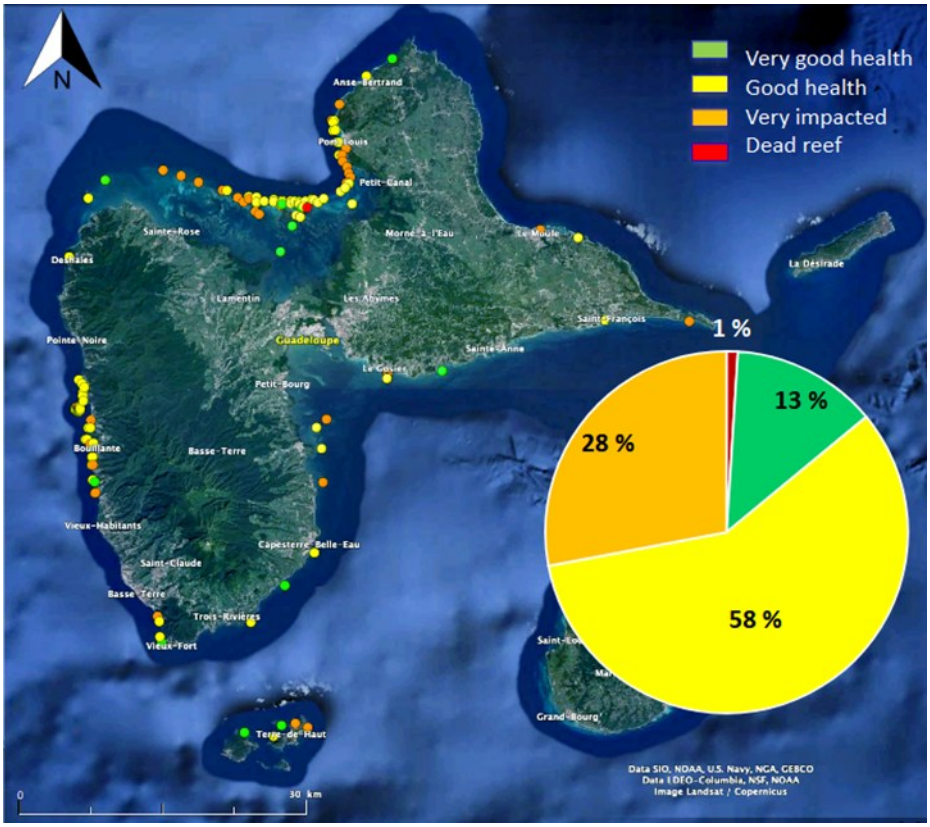

Figure 1. Spatial distribution of sampled sites and results

the second class corresponds to the beginning of coral-algal phase shift on the reefs. If the results of sites rated in class 2 or worse are pooled, 87% of the sites showed the presence of macroalgae and (or) siltation.

Moreover, these factors of reef degradation act in synergy with other coral hazards, like SCTLD disease or coral bleaching events that have recently threatened Caribbean coral communities (Gutierrez *et al.,* 2024). Such results should encourage environmental decision-makers and managers to fight against the nutrients and sewage contamination of coastal waters and against the erosion processes that led to heavy siltation, most particularly in the lagoons and bays.

LITERATURE CITED

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KEYWORDS: coral reefs, health status, coral communities, coral-algal phase shift, Guadeloupe Island