# Long-term monitoring of white sea urchins (*Tripneustes ventricosus*) and variegated sea urchins (*Lytechinus variegatus*) in the marine seagrass beds in Guadeloupe Island (Lesser Antilles)

# Monitoreo a largo plazo de erizos de mar blanco (*Tripneustes ventricosus*) y erizos verdes (*Lytechinus variegatus*) en las praderas de fanerógamas marinas en la isla de Guadeloupe (Antillas Menores)

# Suivi à long terme de l'abondance des oursins blancs (*Tripneustes ventricosus*) et des oursins verts (*Lytechinus variegatus*) dans les herbiers de Phanérogames marines de Guadeloupe (Petites Antilles)

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**EXTENDED ABSTRACT**

The long-term fluctuations in the populations of white sea urchins (*Tripneustes ventricosus* (Lamarck, 1816)) and variegated sea urchins (*Lytechinus variegatus* (Lamarck, 1816)), primarily inhabiting the seagrass beds around the island of Guadeloupe, have been monitored by the National Park of Guadeloupe since 2025. This study presents results from three sites in the Bay of Grand Cul-de-Sac Marin, monitored annually since 2005. Two sites (Fajou Islet and Passe-à-Colas) have total protection status (core protection of the National Park), while the third site (Caret Islet) is in an area subject to fishing activities. The white sea urchin (*Tripneustes ventricosus*) is a species currently harvested in the Caribbean Islands (Pena *et al.,* 2010), while the variegated sea urchin (*Lytechinus variegatus*) is not consumed on the island.

Each site has three transects, each 50 m long, permanently installed on the bottom. They are marked by five stakes positioned every 12.5 m. A 50 m tape measure is laid out in a coast-to-shore direction for each radial. The tape measure can be repositioned in the same location during each field trip. Two divers are stationed on either side of the radial and push a 1 m long rod in front of them to cover a total area of 100 m². The numerical abundances of sea urchins found within the band transects are recorded. The test diameters of the white sea urchins are also measured, while only the variegated sea urchins are counted. The total sampling effort is 300 m² per site.

Data analysis of the results regarding white sea urchins detected the existence of a reserve effect on their abundance at the two sites located within protected National Park areas (Fajou Islet and Passe-à-Colas). The species is nearly absent from Caret, which is subject to fishing activities.

Depending on the year, important fluctuations were observed in the abundance of white sea urchins. However, at the Fajou Islet and Passe-à-Colas sites, the numerical abundance of white sea urchins has decreased significantly from 2016 to 2024. At Fajou Islet, a loss of 98% in individual abundance was noted. At the Passe-à-Colas and Caret Islet sites, a complete loss of 100% was noted.

Regarding the green sea urchin, the analysis of the results indicated a highly significant numerical abundance of green sea urchins at the Passe à Colas site, with an even greater abundance at the Fajou site compared to that of Caret, which is located outside the protected core of the park. In 2024, a loss of 85% of individuals was observed at the Fajou site. At the Passe-à-Colas site, there was a decline of 81% in abundance, and a decrease of 20% was noted at Caret Islet site.

Some hypotheses may explain these phenomena:

- a decrease in seawater quality may threaten adult survival (Payne, 1995);
- nutrients and organic pollution may affect the gametes and embryos of white sea urchins. The Bay of the Grand Cul-de-Sac Marin is a catchment basin that collects most of the pollution from the north coast of Guadeloupe Island;
- according to Payne (1995), global climate warming may also affect urchin biology: an increase in temperature above 28°C negatively impacts fertilization and embryogenesis, while a rise above 32°C induces a significant energy demand

for adult urchins to survive, potentially resulting in females ceasing to produce ovules. Temperature data loggers are installed in the Bay of Grand Cul-de-Sac Marin at 10 m and 23 m depths in the fore reef zone. In 2016, at a depth of 23 m, temperatures exceeded 28C on 247 days. That year marked the beginning of the decline in the abundance of white sea urchins at the Fajou Islet site and a decrease in the abundance of green sea urchins at the Passe-à-Colas site. The following years also showed temperatures exceeding 28°C, persisting for five to seven months, with peak temperatures reaching 30.7°C.

- the increase in predators of sea urchins, induced by the protection status of the National Park (such as helmet gastropods (Cassidae) and certain reef fish like triggerfish),
- sea urchin populations of the two species are predominantly adult, which may indicate a problem with larval recruitment.

In conclusion, long-term monitoring of white and green sea urchins in Guadeloupe reveals critical fluctuations in their populations. This emphasizes the need for continued research to understand the underlying environmental factors affecting their dynamics and to support conservation strategies effectively.

## LITERATURE CITED

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