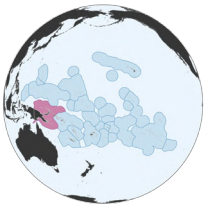


PAPUA NEW GUINEA

Co-authors¹

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Introduction

Maritime area	2,402,238 km ²
Land area	463,249 km ²
Mean land elevation	608 m
Coral reef extent	14,598 km ²

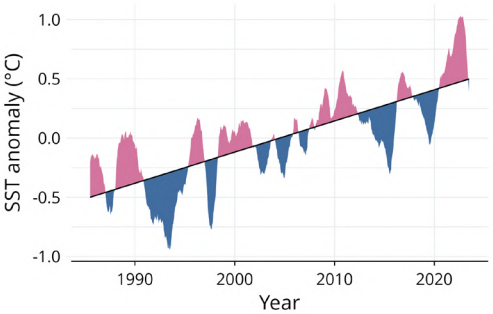
Coral reefs of Papua New Guinea cover approximately 14,598 km², which represent 22.37 % of the total coral reef extent of the GCRMN Pacific region, and 5.846 % of the world coral reef extent.

We estimated the human population of Papua New Guinea living within 5 km from coral reefs to be 964,040 inhabitants, in 2020. This represents 10.44 % of the total human population of Papua New Guinea living within 5 km from coral reefs. We estimated that the human population living within 5 km from coral reefs has increased by 55.02 % between 2000 and 2020.

Threats

Thermal regime

The long-term average of SST on coral reefs of Papua New Guinea between 1985 and 2023 was 28.55°C (Supplementary Figure 1). SST over coral reefs of Papua New Guinea have increased by 0.96°C between 1985 and 2023, which corresponds to a warming rate of 0.025°C per year (Supplementary Figure 1)

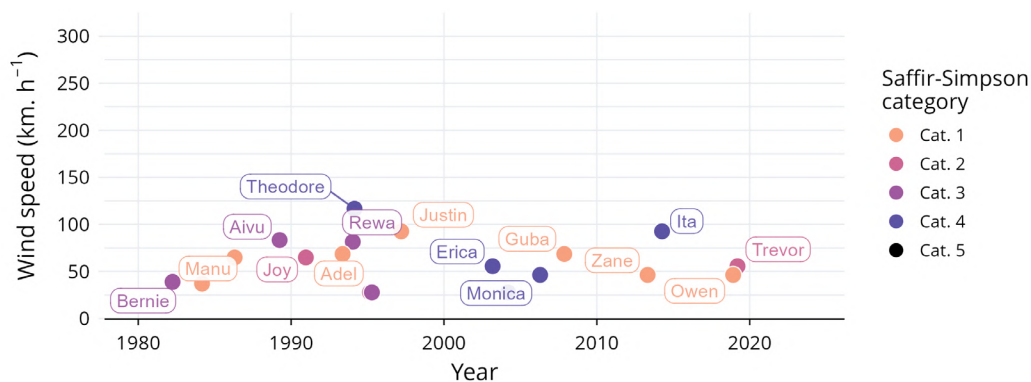


▲ **Figure 2.15.1.** Average Sea Surface Temperature (SST) anomaly from 1985 to 2023 over coral reefs of Papua New Guinea. The black line is the long-term trend in SST anomaly, values below this line are negative SST anomalies (*i.e.* cooler than long-term trend), and values above this line are positive SST anomalies (*i.e.* warmer than long-term trend). Average Sea Surface Temperature (SST) anomaly with null-SST anomaly (*i.e.* 0) as a reference line, instead of the long-term trend in SST anomaly, are provided in Supplementary Figure 3.

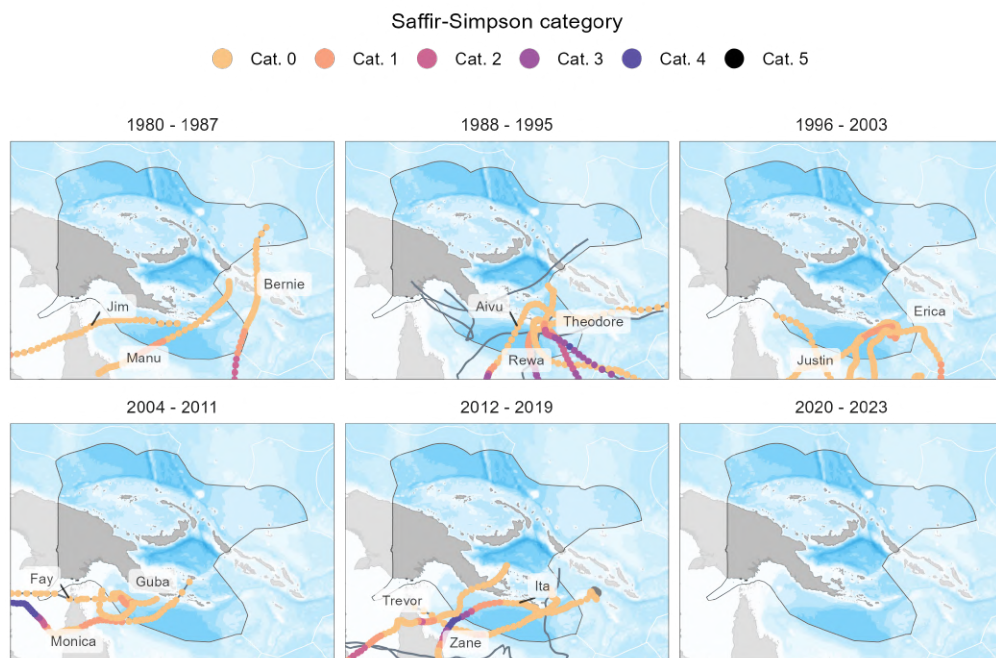
Cyclones

Between 1980 and 2023, a total of 41 tropical storms passed within 100 km distance from a coral reef of Papua New Guinea, and of these 1 were characterized by sustained wind speed greater than 100 km.h⁻¹ (Figure 2.15.2). The cyclone with the highest sustained wind speed over the studied period was the cyclone Theodore, in 1994, which passed 0 km from a coral reef with sustained wind speed of 117 km.h⁻¹.

¹ The term co-authors encompasses both individuals who contributed to writing the chapter and those who provided data. Therefore, inclusion in this list does not necessarily imply endorsement of the chapter's content. Specific contributions are detailed in the Author Contributions section.



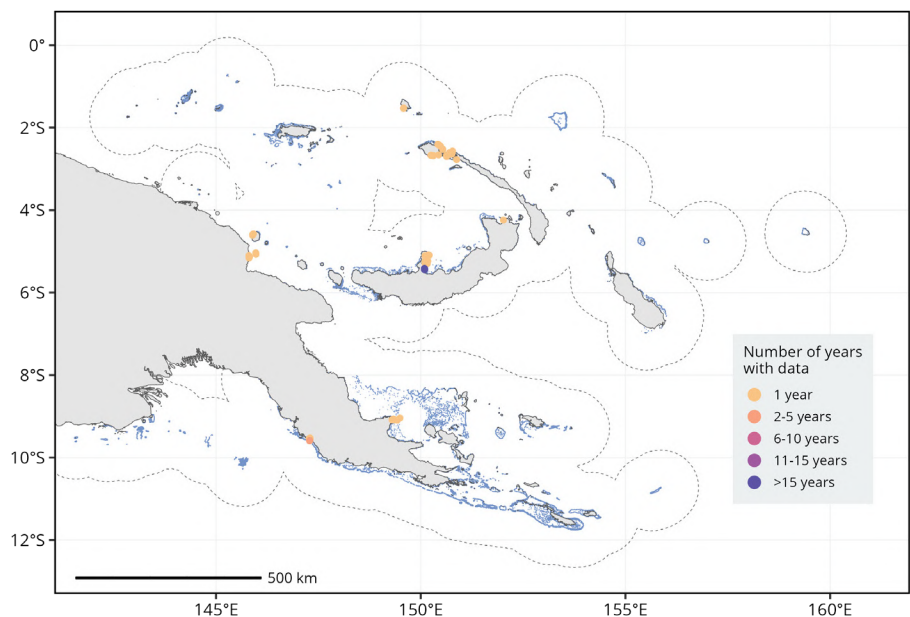
▲ **Figure 2.15.2.** Maximum sustained wind speed of tropical storms passing within 100 km of a coral reef between 1980 and 2023 in Papua New Guinea. Colors correspond to the cyclone's Saffir-Simpson category along its entire track. However, the values of sustained wind speed are extracted from the nearest tropical storm position from a coral reef. For this reason, some sustained wind speed values are below the lower threshold of category 1 Saffir-Simpson scale (*i.e.* 119 km.h⁻¹). Note that cyclones passing more than 100 km away from coral reefs of Papua New Guinea are not represented, although they may have had an impact.



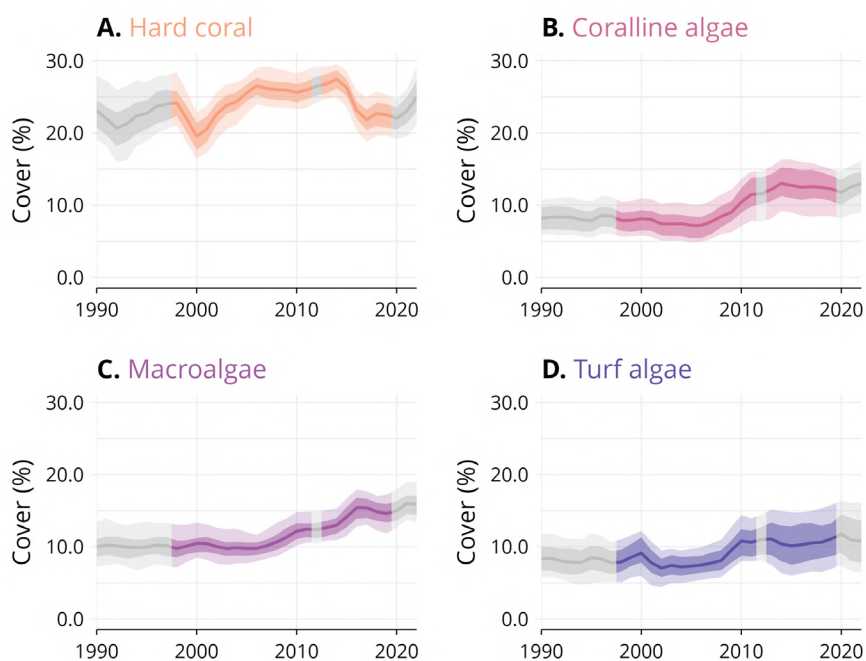
▲ **Figure 2.15.3.** Trajectories of cyclones passing within 100 km of a coral reef between 1980 and 2023 in Papua New Guinea. Points correspond to cyclone positions every 3 hours and are colored depending on the Saffir Simpson scale of the sustained wind speed. Gray points correspond to cyclone positions on which wind speed was not available. For readability, only the three most powerful cyclones are labeled and colored per time range (*i.e.* subplot). The trajectories of other cyclones are represented by gray lines only.

Temporal trends in benthic cover

The estimation of trends in the benthic cover of hard coral, coralline algae, macroalgae, and turf algae in Papua New Guinea was achieved through the integration of 4 datasets (Supplementary Table 1). These datasets represent a total of 91 monitoring sites, on which 267 surveys were conducted between 1998 and 2019.



▲ **Figure 2.15.4.** Spatio-temporal distribution of benthic cover monitoring sites across Papua New Guinea. Sites that were monitored for the longest period of time are represented on top of the sites monitored for fewer years. The scale bar provides distance at the equator and may not accurately represent distance over the entire latitudinal range of the economic exclusive zone. Dashed polygons represent a 100 km buffer around coral reefs. Note that only land and coral reef buffers of the country or territory are represented, not those of adjacent countries and territories. The distribution of coral reefs is shown in light blue.



▲ **Figure 2.15.5.** Modeled temporal trends for hard coral (A), coralline algae (B), macroalgae (C), and turf algae (D) cover from 1990 to 2022 in Papua New Guinea. The bold line represents the estimated average cover, lighter and darker ribbons represent 95% and 80% confidence intervals, respectively. Gray areas represent periods where no observed data were available. The raw data used to estimate these temporal trends are shown in Supplementary Figure 4.