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TITLE: Linking reef ecology to island building: Parrotfish identified as major producers of island-building sediment in the Maldives

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ABSTRACT:

Reef islands are unique landforms composed entirely of sediment produced on the surrounding coral reefs. Despite the fundamental importance of these ecological-sedimentary links for island development and future maintenance, reef island sediment production regimes remain poorly quantified. Using census and sedimentary data from Vakkaru island (Maldives), a sand-dominated atoll interior island, we quantify the major sediment-generating habitats, the abundance of sediment producers in these habitats, and the rates and size fractions of sediment generated by different taxa. The estimated annual sediment production is 685,000 kg (or 370 m3), ?75% of which is produced on the narrow outer reef flat, despite composing only 21% of the total platform area. Approximately 65% of the platform acts solely as a sediment sink. Census data identify parrotfish as the major sediment producers, generating >85% of the 5.7 kg m?2 of new sand-grade sediment produced on the outer reef flat each year. Halimeda (macroalgae) produce a further 10%, most as gravel-grade material. Comparisons between production estimates and sedimentary data indicate that reef ecology and island sedimentology are tightly linked; reef flat and lagoon sediments are dominated by coral and Halimeda, although fine- to medium-grained coral sand is the dominant (?59%) island constituent. The generation of sediment suitable for maintaining this reef island is thus critically dependent on a narrow zone of high-productivity reef, but most especially on the maintenance of healthy parrotfish populations that can convert reef framework to sand-grade sediment.

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