

XXXVII. *On the Formation of Islands.* By  
Alexander Dalrymple, *Esquire.* Com-  
*municated by C. Morton, M. D. S. R. S.*

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Read July 2, 1767. **T**HERE is not a part of natural history more curious, or perhaps to a navigator more useful, than an enquiry into the formation of islands. The origin of islands, in general, is not the point to be discussed; but of low, flat, islands in the wide ocean; such as are most of those hitherto discovered in the vast South-sea.

These islands are generally long, and narrow; they are formed by a narrow bar of land, inclosing the sea within it; generally, perhaps always, with some channel of ingress at least to the tide; commonly, with an opening capable of receiving a canoe; and frequently sufficient to admit even larger vessels.

The origin of these islands will explain their nature. What led me first to this deduction was an observation of Abdul Roobin, a Sooloo pilot; that all the islands, lying off the N.E. coast of Borneo, had shoals to the eastward of them.

These islands being covered to the westward by Borneo; the winds from that quarter do not attack them

them with violence. But the N.E. winds, tumbling in the billows from a wide ocean, heap up the coral with which those seas are filled. This, obvious after storms, is perhaps, at all other times, imperceptibly effected.

The coral banks, raised in the same manner, become dry. These banks are found of all depths, at all distances from shore, entirely unconnected with the land, and detached from each other: although it often happens they are divided by a narrow gut, without bottom.

Coral banks also grow, by a quick progression, towards the surface; but the winds, heaping up the coral from deeper water, chiefly accelerate the formation of these into shoals and islands. They become gradually shallower; and, when once the sea meets with resistance, the coral is quickly thrown up by the force of the waves breaking against the bank; and hence it is that, in the open sea, there is scarce an instance of a coral bank having so little water, that a large ship cannot pass over, but it is also so shallow that a boat would ground on it.

I have seen these coral banks in all the stages; some in deep water, others with few rocks appearing above the surface, some just formed into islands, without the least appearance of vegetation, and others, from such as have a few weeds on the highest part, to those which are covered with large timber, with a bottomless sea, at a pistol shot distance.

The loose coral, rolled inward by the billows in large pieces, will ground, and the reflux being unable to carry them away, they become a bar to coagulate the sand, always found intermixed with

coral; which sand, being easiest raised, will be lodged at top. When the sand bank is raised by violent storms, beyond the reach of common waves, it becomes a resting place to vagrant birds, whom the search of prey draws thither. The dung, feathers, &c. increase the soil, and prepare it for the reception of accidental roots, branches, and seed, cast up by the waves, or brought thither by birds. Thus islands are formed: the leaves and rotten branches, intermixing with the sand, form in time a light black mould, of which in general these islands consist, more sandy, as less woody; and when full of large trees, with a greater proportion of mould.

Cocoa nuts, continuing long in the sea without losing their vegetative powers, are commonly to be found in such islands; particularly as they are adapted to all soils, whether sandy, rich, or rocky.

The violence of the waves, within the Tropicks, must generally be directed to two points, according to the monsoons.

Hence the islands formed from coral banks must be long and narrow, and lie nearly in a meridional direction. For even supposing the banks to be round, as they seldom are when large, the sea, meeting most resistance in the middle, must heave up the matter in greater quantities there than towards the extremities: and, by the same rule, the ends will generally be open, or at least lowest. They will also, commonly, have foundings there, as the remains of the bank, not accumulated, will be under water.

Where the coral banks are not exposed to the common monsoon, they will alter their direction; and

and be either round, extend in the parallel, or be of irregular forms, according to accidental circumstances.

The interior parts of these islands, being sea, sometimes form harbours capable of receiving vessels of some burthen, and, I believe always, abound greatly with fish; and such as I have seen, with turtle-grass and other sea-plants, particularly one species, called by the Sooloos Gammye, which grows in little globules, and is somewhat pungent, as well as acid, to the taste.

It need not be repeated, that the ends of those islands, only, are the places to expect soundings: and they commonly have a shallow spit running out from each point.

Abdul Roobin's observation points out another circumstance, which may be useful to navigators; by consideration of the winds to which any islands are most exposed, to form a probable conjecture which side has deepest water; and from a view which side has the shoals, an idea may be formed which winds rage with most violence.