

varied may have been the altitude of different islands, or the separate peaks of particular mountain-chains, all may have been reduced to one uniform level by the gradual submergence of the loftiest points and the additions made to the calcareous cappings of the less elevated summits as they subsided to great depths.

Openings into the lagoons.—In the general description of atolls and encircling reefs, it was mentioned that there is almost always a deep narrow passage opening into the lagoon, or into the still water between the reef and the shore, which is kept open by the efflux of the sea as the tide goes down.

The origin of this channel must, according to the theory of subsidence before explained, be traced back to causes which were in action during the existence of the encircling reef, and when an island or mountain top rose within it, for such a reef precedes the atoll in the order of formation. Now in those islands in the Pacific, which are large enough to feed small rivers, there is generally an opening or channel in the surrounding coral reef at the point where the stream of fresh water enters the sea. The depth of these channels rarely exceeds twenty-five feet; and they may be attributed, says Captain Beechey, to the aversion of the lithophytes to fresh water, and to the probable absence of the mineral matter of which they construct their habitations.*

Mr. Darwin, however, has shown, that mud at the bottom of river-courses is far more influential than the freshness of the water in preventing the growth of the polypi, for the walls which inclose the openings are perpendicular, and do not slant off gradually, as would be the case, if the nature of the element presented the only obstacle to the increase of the coral-building animals.

When a breach has thus been made in the reef, it will be prevented from closing up by the efflux of the sea at low tides; for it is sufficient that a reef should rise a few feet above low-water mark to cause the waters to collect in the lagoon at high tide, and when the sea falls, to rush out at one or more points where the reef happens to be lowest or weakest. This event is strictly analogous to that witnessed in our estuaries, where a body of salt water accumulated during the flow issues with great velocity at the ebb of the tide, and scours out or keeps open a deep passage through the bar, which is almost always formed at the mouth of a river. At first there are probably many openings, but the growth of the coral tends to obstruct all those which do not serve as the principal channels of discharge; so that their number is gradually reduced to a few, and often finally to one. The fact observed universally, that the principal opening fronts a considerable valley in the encircled island, between the shores of which, and the outer reef, there is often deep water, scarcely leaves any doubt as to the real origin of the channel in all those countless atolls, where the nucleus of land has vanished.

Size of atolls and barrier reefs.—In regard to the dimensions of

* Voyage to the Pacific, &c., p. 194.