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On Coral-Reefs of the East-African Coast.

By Dr. A. ORTMANN, of Strassburg.

Since the publication of a more detailed treatise upon the subject of my investigations into the coral-reefs of the German East-African coast will still require some time, I venture to communicate herewith a brief account of the most important of the results which have been gained.

The entire East-African coast-region, so far as I explored it, from Zanzibar southward to Mikindani, is one of negative shore-displacement. I was able to collect proofs of this at the most widely different spots; just as, moreover, similar observations are already available for two localities (Zanzibar and Songa-Songa Isl.). It is probable that the same movement extends to the greater portion of the East Coast of Africa.

The development of the coral-reefs also corresponds to this negative movement: they accompany the coast throughout and are true shore reefs ("Strandriffe"). Their horizontal extension in the direction at right angles to the coast is in close connexion with the slope of the sea-bottom from the shore-line to deep water. Where great depths are found close to the shore (which occurs in our territory chiefly in the south, near Lindi and Mikindani) there is only a narrow shore reef; but where the sea remains shallow to a greater distance from the coast (*e. g.* in the Mafia and Zanzibar Channels) not only does the shore reef attain a greater breadth, but also isolated reefs are found further outside. I term the latter SHALLOW-WATER REEFS ("Flachseeriffe"). (J. Walther has adopted the name PELAGIC REEFS for similar formations in the northern part of the Red Sea: *cf.* J. Walther, "Die Korallenriffe der Sinaihalbinsel," Abh. K. sächs. Ges. Wiss. 24 Bd., 1888.)

I was nowhere able to observe a formation of barrier-reefs or atolls, and after a careful study of the English Admiralty charts their occurrence appeared to me to be improbable, even at spots which I did not visit. As TRUE barrier-reefs and TRUE atolls I regard, be it well understood, only those which respectively exhibit a channel or lagoon of great depth and rise from very deep water. I am firmly convinced that formations of this kind can only arise in a region of positive shore-displacement, and that those cases are of rare and unusual occurrence in which they appear in stationary regions. In this respect, therefore, I abide by the old theory of Darwin and Dana, in opposition to the views recently published by Guppy, who would deduce the existence of negative shore-displacements from the actual presence of atolls. The very absence of such reef-formations in our territory is an indirect proof that in regions with negative shore-displacement atolls and the like are not formed. I regard the atolls of the Straits of Jubal in the Red Sea, which are figured by J. Walther (*loc. cit.*) not as TRUE atolls, in the sense given above, but as atoll-like formations, resulting from the peculiar peripheral growth of the corals, which can be observed on a small and large scale in every coral-reef. Moreover the difference between

the two formations has already been pointed out by Langenbeck *, who has also endeavoured to show that Guppy's theories are untenable.

As regards the more special study of the reefs, I have chiefly devoted my attention to determining the way in which the reefs are composed of the various forms of corals, how the latter are distributed upon the reefs, and what is the nature of the bottom upon which they rest. I cannot here enter into details, but would lay special stress on two points only. The observation has already been noted in various quarters, that Stony Corals may be temporarily deprived of water and exposed to the sun and the open air without perishing. I made precisely the same discovery upon the reefs near Dar-es-Salaam. Certain forms (*Porites*, *Goniastrea*, *Acetabularia*, *Tubipora*) lie for hours during the ebb-tide, which is a very low one in that region, freely exposed to the air, but live and thrive exceedingly. That this faculty is wanting in other forms is shown at once by the fact that a number of species are met with in the company of those mentioned above, at the same altitude of the reef, but are there found only in holes and pools, so that they are always covered by water.

The following observation is also important. I found at certain points of the reefs near Dar-es-Salaam extensive banks of living corals, resting upon a foundation which was quite loose. The latter consisted of detritus (sand and gravel), which was held together by sea-wrack, and in this wrack were numerous corals, some of which were of but little thickness, while others formed large blocks, of which, moreover, entire banks were composed. All these blocks lay loose upon the bottom; I was able, provided their weight was not so considerable as to offer resistance, to lift them up or roll them over with ease. This observation is interesting in so far as it has been maintained by J. Walther (*loc. cit.*), that coral-reefs could only become established upon a firm (rocky) bottom; which may, indeed be correct enough so far as regards the forms mentioned by him (the umbrella-shaped Madreporae). There are, nevertheless, forms of corals (I am here alluding to species of the genera *Psammocora*, *Montipora*, and *Lophoseris*) which are capable of thriving upon a looser bottom in large blocks and forming banks. Such banks may then again furnish a basis for other corals.

In accordance with the negative shore-displacement I also found an old coral-bed above the present level of the sea. The one which I examined *in situ* is of quite recent date, yet older raised beds of this kind doubtless occur in the region in question. The coral structure is for the most part no longer recognizable in the fossil beds.

The coral-fauna of Dar-es-Salaam is closely allied, as might at once be conjectured from its geographical position, to that of the Red Sea (*cf.* Klunzinger). Yet we here already find a few Pacific types, which are wanting in the Red Sea.—*Zool. Anzeiger*, xv. Jahrg., no. 381 (Jan 11th, 1892), pp. 18–20.

* Langenbeck, 'Die Theorien über die Entstehung der Koralleninseln &c.': Leipzig, 1890.