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On the Copal of Zanzibar. Extract from a letter from JOHN KIRK, M.D., F.L.S., dated Zanzibar, March 20th, 1868.

[Read June 18, 1868.]

THE vegetation along the creek of Dan Salam* consists of many curious and, to me, unknown bushes, with heavy timber scattered here and there; among them was the *Trachylobium Mossambicense*, Kl., distinguished by its rounded head of glossy leaves, with white groups of flowers projecting from the points of the branches. This is the "M'ti Sandarusi" (Tree of Copal) of the natives; and from it one variety of Copal is obtained. On examining the tree more closely, the trunk and main limbs were seen to be covered with the clear resinous exudation, now brittle and hard; from the upper branches it dropped down on the ground below, but not in a fluid state. To judge by the appearance it presented, I should say that the resin soon dries and hardens after being exuded, but must be easily broken off by violence; pieces of various tint and form were collected, some with insects imbedded; but all presented a smooth polished exterior, quite free from any pitting or "gooseskin" found on all kinds dug up from the ground. This sort is known in trade as "Sandarusi ya m'ti," or Copal from the tree; it is exported in considerable quantity to India, but not to Europe. Having thus established the source of one sort of Copal to be the *Trachylobium*, and transmitted the resin with full herbarium specimens of flower and fruit (which, if

* [Dan Salam is stated in the letter to be a spacious creek opposite the southern end of Zanzibar Island.—Ed.]

I mistake not, are to this day desiderata in all our collections), let me briefly state my reasons for thinking that in this tree we have the source of the older Zanzibar Copal, the semifossil or bituminized resin known in the English market as "Animé," and which is the most valuable of all resins for the manufacture of varnish, exceeding anything produced on the west coast for hardness, elasticity, and polish.

There are three distinct kinds of Copal in the Zanzibar trade, subdivided by merchants into many classes, according to colour, form, surface, and other peculiarities known to those in the trade, and affecting the value variously in different markets: first, we have "Sandarusi-m'ti," Tree-Copal; second, "Chakazzi," or Copal dug from the soil, but modern (seemingly) in origin and obtaining a price like that of the former quality; the third is the true Sandarusi, like the second, dug from the soil, but hard, less soluble, and more than twice the value. This forms by far the greatest part of Zanzibar Copal, the export of which has sometimes reached 800,000 lbs. at a value of £60,000.

- I have already described the "Tree-Copal:" it is gathered directly from the tree, which is known along the coast from Mozambique to near Lamo, or from 3° to 15° south lat., but is most common between Cape Delgado and Mombas. The *Trachylobium Mossambicense*, Kl., is found along the creeks and on the maritime plain or the old sea-beach, but becomes very rare at a little distance inland, and quite unknown long before the change in geologic structure offers an explanation of its absence. It requires the near presence of the sea for its growth, and dies when far removed from its influence.

The second sort, or "Chakazzi" gum, is found in the ground at the roots of modern Copal-trees, or in the country where these exist; but it is also, I am told, to be got with true Copal. That it is found near the existing forests is certain; and there the true Copal is not known; and we must accept with caution the statement that it is also found in the interior, from this well-known fact, that our informants habitually mix the inferior coast-gum with the valuable produce of the interior. This "Chakazzi" is obviously the recent gum which has remained a short time in the soil after the death of the tree which produced it, yet long enough to take the impression of sand and stone, or other hard matter, as the hardest sealing-wax long left on a coin will take the impression, or as ice will flow down a valley.

The Tree-Copal, or "Animé" of the English markets, is undoubtedly the produce of forests now extinct; for there is no tree now growing at a distance from the coast which produces it. It is obtained all along the ancient sea-beach, the maritime plain which here fringes the continent to a depth of 20-40 miles in general. Some spots are richer than others, and some soils indicate good "diggings." When the rains which follow the north-east monsoon have softened the soil, the natives of the country commence to dig this from small pits, searching the soil as removed; but there is no system, and, like the gold-washings of Africa, so the Copal-regions yield not a fraction of what a little system and industry might produce. At present every clan-feud stops the search. The producer receives, even when successful, only a trifle from the Indian merchants, who again part with it, often paying enormous dues to the Zanzibar State, to the European and American traders. The supply, considering the extent over which it is scattered, seems unlimited; for at present, with most inadequate means and much discouragement to the labourers, the amount obtained is very great.

If we take into account the similarity of the recent and fossil resins in appearance, their near approach in physical properties, the fact that the recent gum, often being imbedded in sand, takes the characteristic surface-markings, and recollect that where now the good Copal is dug as a fossil the present Copal-tree, in all probability, once grew, when the sea was nearer to the hills than now, I think we may be satisfied that the *Trachylobium* was the source of the old Copal, which is the resin only modified by time and long exclusion from air and light under the ground.

Perhaps it may be asked, Is there not proof in the gum itself that the *Trachylobium* then existed? I have as yet found none: insects (all of them aerial) are often preserved; sometimes branches and leaves; but I have not seen evidence of the Copal-tree. When we remember that the resin soon hardens after being exuded, and that it runs from the underside of the main limbs, while the leaves, flowers, and fruit are at the extremities of the branches, we shall see that leaves of the underwood which sweep the lower branches are much more likely to be embalmed than the leaf of the tree itself, which, besides, is hairy, glossy, and unlikely to adhere. If a part of the modern tree were found in the old hard gum, the proof would be complete; at present some doubt remains.

I have sent not only full herbarium specimens, but also specimens of the recent gum, of the "Chakazzi," and of the valuable Copal, in which are many insects; and I would suggest that entomologists should assist us by their opinions whether these belong to existing species or not.

An Enumeration of the Palms of Sikkim. By THOMAS ANDERSON, M.D., F.L.S., Superintendent of the Royal Botanical Gardens, Calcutta.

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THE deep valleys of Sikkim, which are fully exposed to the moist winds blowing from the Bay of Bengal, are filled with a luxuriant vegetation abounding in tropical forms. Among these are several species of Palms possessing considerable interest from their occurrence in comparatively so northern a region. Dr. Hooker, the first botanical explorer of Sikkim, found ten species of Palms in that country*; and in the introductory essay to the 'Flora Indica,' p. 183, Drs. Hooker and Thomson again state the numbers at ten. By repeated explorations in the Teesta valley, I have been able to add five species to that number, but I have never found *Areca disticha* and *Licuala peltata*, both of which are included in the number of Palms in Sikkim given by the authors of the 'Flora Indica.' I have thus seen fifteen species of Palms in the forests of Sikkim, belonging to the genera *Areca*, *Wallichia*, *Caryota*, *Calamus*, *Plectocomia*, *Livistona*, and *Phoenix*,—also specimens of *Licuala peltata*, from Sikkim, in the Herbarium of the Botanical Gardens, Calcutta. *Calamus*, the most extensive genus of Palms in Asia, is represented in these forests by seven species, while the other genera, except *Wallichia* and *Phoenix*, which contain two species, are illustrated each by one species. *Calamus schizospathus* belongs to the non-scandent *Zalacca*-like section of the genus; but, exclusive of it, there are seven climbing Palms in Sikkim, as *Plectocomia Himalayana* is popularly a Rattan, and as powerful a climber as any *Calamus*.

The sudden diminution in moisture which takes place almost at the frontier between Nepal and Sikkim does not favour the

* Himalayan Journals, i. 143.