

ART. XXII.—*A Fossil Sea Bean from Venezuela*; by EDWARD W. BERRY.

Geologists too frequently neglect opportunities for collecting fossils and this lack of appreciation is especially deplorable when working in remote parts of the world. All the more credit is therefore due Mr. C. F. Bowen for the fossil plants collected by him during a geological reconnaissance in Venezuela during 1919. These will be the subject of a subsequent contribution to the Proceedings of the U. S. National Museum. Meanwhile I desire to call particular attention to the remarkable fruit contained in the collection representing the leguminous genus *Entada*. It may be called in honor of the collector.

Entada boweni sp. nov.

Seed of large size, about 5.25 cm. in diameter, reniform in surface view and depressed elliptical in cross section. The surface view would be almost perfectly circular except for the pronounced sinus at the hilum. The sclerotest or hard lignified seed-coat is gone from the face of the specimen exposing the thick reniform upper cotyledon. The inner face of the lower cotyledon is shown in the upper left hand corner of the specimen where a portion of the upper cotyledon is broken away. Where the two cotyledons join the plumule or hypocotyl is conspicuous, indicating the incipient germination of the seed before it was buried by sediment. The outer surface of the cotyledon is slightly furrowed as in the existing sea bean. The central area is slightly collapsed exactly as would be the case in the modern bean if the cotyledons were somewhat softened and the central air cavity collapsed by pressure. Around the greater part of the edge of the seed the sclerotesta is preserved, being replaced by what is presumably marcasite. This test is thick and about 3 mm. in diameter around the edges. The specimen was collected from dark shales overlying a sandstone at Mesa Pablo about five miles south, 84° west of Escuque on the south side of the Caus River, inland from Lake Maracaibo, Venezuela. The age is Tertiary but has not as yet been more definitely determined, although it is probably Miocene.

The counterpart of the specimen if present in the shale

was not collected and I assume it carried the face of the test and the small fragment of the upper cotyledon which is missing.

I have dissected a number of seeds of the existing *Entada scandens* and their correspondence with the fossil is most remarkable, the only difference being the partially developed plumule or hypocotyl in the fossil which as I have suggested above was probably due to germination. The cotyledons appear to have become infiltrated with ferruginous salts before they had time to rot and were subsequently slightly flattened by pressure causing the escape of gas from the central intercotyledonary cavity on which the buoyancy of the seed normally depends.



FIG. 1.—Fossil *Entada* from the Tertiary of Venezuela.

There are not many plants growing in the American tropics that have the distinction of having their seeds used as snuff or tinder boxes by the natives of northwestern Europe. The seeds of the snuff box, sea bean (*Entada scandens*) are mentioned in Norse literature as early as 1632 as of inorganic origin and were often considered to have been formed by the waves and called solvent stones, the name indicative of some imaginary virtue. In both Norway and the Faroe Islands they were called Vette Nyre which Sterpin (1676) translates as Fairies or Magic Kidneys. It is therefore not a matter of surprise that they were used as charms. Molucca beans, as they were also called, were and probably still are, among the fisher folk of the Shetland and Orkney islands, considered an

efficacious remedy for dysentery. Naturalists before the close of the 17th century had recognized their leguminous nature and surmised that they had been drifted to Europe from the Antilles by the Gulf Stream, although in the popular mind even among the educated their marine origin and magic properties have lingered for over 250 years.

Entada scandens is probably the best known tropical plant distributed by ocean currents since its large lenticular dark kidney colored seeds have been for ages cast up by the waves on the eastern shores of the Atlantic from the Azores northward to Nova Zembla. Their seafaring qualities and vitality are remarkable as is the distribution of the parent plant, since it is found in all of the tropics and yet presents certain anomalies in its range that have puzzled botanists since the days of Hooker and Darwin. It is normally a climber with truly gigantic pods, more or less constricted between each seed cavity, and belongs to a genus with some 15 existing species about half of which are African. There are 3 or 4 in the American tropics, one or two in the southeastern Asiatic region and one in Madagascar. Most of these are not strand plants and although *Entada scandens* also grows in inland situations it is as a strand plant that it is principally known, since it frequents mangrove associations and the jungle behind tropical beaches.

Some botanists dispute the identity of the old and new world form but as regards the broader questions of distribution they may be considered identical since if specifically distinct they are so closely related as to demand direct filiation. Guppy, who has given us what is probably the best account of the question, finds some difficulty in its occurrence on both shores of Central America but this is the least of the difficulties since the littoral flora of the present day largely antedates the present geographical conditions. This question, in the case of *Entada*, as well as the home of the direct ancestor of *Entada scandens* would appear to be set at rest by this discovery of an almost identical form in the Miocene of Venezuela, since it antedates the latest seaway across Central America. The fossil is also so much like the existing sea bean that one is justified in assuming that it, like its descendant, was distributed by ocean currents, its occurrence in a clay lens in what appears to have been a rather widespread marine series of deposits adding some probability

to this conjecture. Not all strand plants are cosmopolitan and there is a certain amount of contrast between the American and West African tropics on the one hand and those of the Western Pacific and Indian oceans on the other. Many factors are involved not the least important of which is the age of the types. At least I judge this to be the most important since of the forms common to the two areas *Rhizophora*, *Sophora* and *Canavalia* have been found in the Eocene around the old Gulf of Mexico and now *Entada* turns up along the Miocene shore of the Caribbean. The occurrence of the *Nipa* palm in the Eocene of the new world points in the same direction.

Guppy considers the sea bean absent along the east coast of South America. Whether or not our information on this point is complete or not I do not know but if it is true it is in accord with my conception of the line of travel in the Tertiary which was from America eastward to West Africa despite the fact that the present North and South Equatorial currents would favor the reverse direction of migration.

Entada has not certainly been found fossil heretofore except in the case of subfossil seeds of the existing sea bean on the Scandinavian coast, which might well prove a stumbling block to future paleobotanists and climatologists were they unacquainted with their origin and means of transportation. Unger long ago described two different species of fossil pods and referred them to *Entada*. These were *Entada primogenita*¹ from the Miocene of Radoboj in Croatia and *Entada polyphemi*² from the Oligocene of Sotzka in Styria. They are both large and the second is suggestive of *Entada*, but as Schenk points out at length,³ they also resemble other leguminous pods and are inconclusive although not entirely improbable.

There can not be the slightest doubt regarding the botanical affinity of the present fossil since it agrees in every detail with the existing species. It adds another to the considerable list of plants of the sea drift that have been discovered in recent years in the American Tertiary tropical and subtropical floras.

Johns Hopkins University, Baltimore, Md.

¹ Unger, F., *Sylloge*. Bd. 2, p. 36, pl. 11, fig. 22, 1862.

² *Idem*, fig. 23.

³ Schenk, A., *Palaeophytology*, p. 702, 1890.