

THE LECYTHIDACEAE OF COSTA RICA.

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On account probably of the difficulty of obtaining good specimens, the Lecythidaceae of Costa Rica have been practically overlooked by former collectors. The species do not appear to be numerous, and it is likely that the present paper includes most of those to be found in that country, as well as in the neighboring Republic of Nicaragua. It should be mentioned, however, that one species of the genus *Grias* has been found in Panama and may occur also within the limits of Costa Rica. The four species described here belong to three of the genera admitted by Niedenzu in his elaboration of the family for the *Pflanzenfamilien*,^a and a careful comparison of the material at hand with Miers's descriptions^b has satisfied me beyond any doubt that we have to do with hitherto unnoticed forms, except in the case of *Couroupita nicaraguarensis*, discovered by Oersted some fifty years ago.

The species described here belong to the Lecythidoideae proper. They are mostly large trees, with showy, dense foliage. The leaves are alternate and exstipulate, entire except in one case, more or less coriaceous, and with short petioles. The inflorescence is racemose. The sepals and petals are 6 each. The stamens are united at the base in a ring that is extended on one side in a helmet-like blade (*androphorum*) inflexed above the ovary. The ovary is 2 to 6-celled. The fruit is a capsule, or *pyxidium*, more or less coriaceous or thick-walled and always polyspermous; its circumference generally shows 2 more or less marked circular lines, the inferior of which corresponds to the base of the sepals and has been called by Miers *calycary zone*, while the upper is the line of dehiscence of the operculum and indicates the junction of the floral disk with the vertex of the ovary. The space between these two concentric lines is known as the *interzonary band*. The seeds differ in the three genera in their structure and mode of attachment.

^a Engl. & Prantl, *Pflanzenfam.* 3: 26-41, 1892.

^b J. Miers, On the Lecythidaceae, *Trans. Linn. Soc.* 30: 157-318, *pl.* 33-65, 1874.

Of our three Costa Rican genera, *Couroupita* is an old and well-defined one, established by Aublet,^a while the two remaining have undergone a considerable number of changes as to their systematic position. Originally all the species divided now between *Lecythis* and *Eschweilera* were included in the first, created by Loeffling in 1758.^b Von Martius was the first to show, although in a confused way, the difference in the mode of suspension of the seeds, and to propose the second genus, which appeared for the first time in De Candolle's *Prodromus* ^c in 1828. Endlicher^d again brought together all the species under Loeffling's genus, and this view was generally accepted until Miers published his important memoir on the subject in 1874. This botanist showed conclusively the value of certain structural differences of the flower and the fruit for the rational limitation of *Lecythis*, and from the excluded species he formed his three genera *Eschweilera*, *Chytroma*, and *Jugastrum*, which were subsequently found to differ from each other to a much less extent than they do together from *Lecythis*, and which have in consequence been reduced by Niedenzu to mere sections of one single genus, for which the old name *Eschweilera*, given by von Martius, has been retained. Of the two Costa Rican species of that genus, one certainly belongs to the section *Eueschweilera*, while I place the second with doubt, until the flowers have been investigated, in the section *Chytroma*.

KEY TO THE COSTA RICAN GENERA.

- Seeds sessile and erect in the fruit; small trees..... 1. *Eschweilera*.
 Seeds hanging from long, mostly fleshy funicles.
 Fertile stamens both on ring and helmet of androphorum:
 fruit indehiscent; seeds small, ovate, surrounded by
 a juicy pulp..... 2. *Couroupita*.
 Fertile stamens only on ring; fruit dehiscent; seeds
 large, fusiform, hard-shelled, without pulp but with
 large fleshy funicles..... 3. *Lecythis*.

Eschweilera Mart.; DC. *Prod.* 3: 293, 1828.^e

Flowers perigynous; calyx adnate; petals ovate, caducous; fertile stamens borne only on the ring; ovary 2-celled, with few anatropous ovules in each cell; seeds shaped more or less like the segments of a sphere, showing the embedded raphe when dry.

Both our Costa Rican species seem to be small or medium-sized trees, with rather narrow crown and large coriaceous leaves.

^a Pl. Guil. 2: 708, 1775.

^b *Iter Hispan.* 159, 1758.

^c 3: 293.

^d *Gen. Pl.* 1235, no. 6332, 1836-1850.

^e As explained above, De Candolle's definition of this genus is not altogether clear, and this is the probable reason why Endlicher rejected it and reincorporated its several species in *Lecythis*. As early as 1837, however, von Mar-



ESCHWEILERA CALYCVLATA PITTIER.



ESCHWEILERA CALYCVLATA PITTIER.

KEY TO THE SPECIES.

Sepals free at base of fruit; leaves elliptic-ovate, abruptly acuminate, with thick salient nerves..... 1. *E. calyculata*.
 Calyx conerescent with fruit; leaves lanceolate, finely nerved. 2. *E. collinsii*.

1. *Eschweilera* (*Eueschweilera*) *calyculata* Pittier, sp. nov. PLATES I, II.

A tree 8 to 15 meters high and up to about 40 cm. in diameter, with elongated crown; branchlets grayish, verrucose; leaves varying from 10 to 35 cm. long, and 4 to 12 cm. broad, glabrous, entire with slightly revolute margin, paler beneath, the petioles thick, 2 cm. long, blackish, the blades elliptic-oblong, broadly acute or rounded at base, rounded and abruptly acuminate at tip, the main and secondary nerves very salient underneath and the latter indicated on the upper face by a corresponding depression, these nerves rather distant, more so at the middle of the blade, 11 to 12 pairs on each leaf, arched and anastomosed together along the margin; the intermediary venules also richly anastomosed, showing a fine prominent net on both faces, although more marked below; raceme terminal, or sometimes axillar, with numerous alternate flowers, the rachis not angulose, more or less verrucose; flowers rather large, pale yellow, caducous; pedicels 1 to 2 mm. long; sepals ovate, coriaceous, verrucose without, longitudinally striate within, with a thin, sublobulate margin, 5 mm. in length and breadth, but twice as large in fruit; petals about 20 mm. long, 8 mm. broad, obovate; androphorum large; ovary 2-celled; style 1 to 2 mm. long, conical; pyxidium 7 cm. in diameter and about 6 cm. high, depressed-globose, thin-walled, rather smooth, with persistent sepals becoming twice larger than in flower, the interzonal band 3 cm. broad; seeds 3 to 5 in each cell.

Forests between Port Limon and Moin, H. Pittier, September, 1899, flowers (Instituto físico-geográfico de Costa Rica, no. 16008; U. S. National Herbarium no. 578009, type); clearings around Rio Hondo, H. Pittier, May, 1902, photographs only (U. S. National Herbarium).

Plate II is one-half natural size.

Not infrequent on the Atlantic coastal plain at elevations up to 100 meters.

2. *Eschweilera* (*Chytroma*?) *collinsii* Pittier, sp. nov. PLATE III. FIGURE 1.

Branchlets gray, obscurely striate longitudinally; petioles 1 cm. long, deeply canaliculate; leaf blade 19 cm. long, 5.5 cm. broad, smooth, lanceolate, broadly cuneate at base, narrowing insensibly into a long tip, shiny above, paler underneath; main secondary nerves very salient beneath, numerous, close together, running in an almost straight line to the marginal zone, where they merge into each other; intermediary nervules also straight, shorter; margin distinctly crenato-cuneate, the sinuses often marked by a black spot; racemes large, with alternate, deciduous branchlets, bearing 15 to 20 alternate flowers, these also all caducous except the terminal one on the last branchlet, the main and secondary rachis gray, longitudinally striate and covered with numerous brown, verrucose excrescences; pedicels 1 to 2 mm. long; flowers not seen; pyxidium terminal on last branchlet of raceme, 10 cm. in diameter, the interzonal band 4 cm.

thus had personally given a more accurate description of his genus, in the following terms: "Genus *Eschweilerae* non iis immititur characteribus, quos clarissimus De Caudolle indicavit, sed ita erit constituendum: Lobi calycis 4-6. Petala 4. Ligula uti in *Lecythide*. Ovarium bi-loculare, ovulis sub 20 adscendentibus. Stylus rectus. Pyxidium lignoso-coriaceum, operculo deciduo, tandem uniloculare. Semina abortu ovulorum subquatuor obovata vel oblonga, erecta, pulpae immersa." (*Flora* 2: Reibl. 89. 1837.) The type species of the genus is *Eschweilera parvifolia* Mart., from Brazil.

broad, the total height 9 cm., a short protuberance at insertion of peduncle, the operculum rather flat or broadly convex; seeds 1 to 3 in each cell, about 4 cm. long, 2.7 cm. in radial breadth, 1 to 2 cm. thick, with a rugose, granulated surface and a hard, coarse testa.

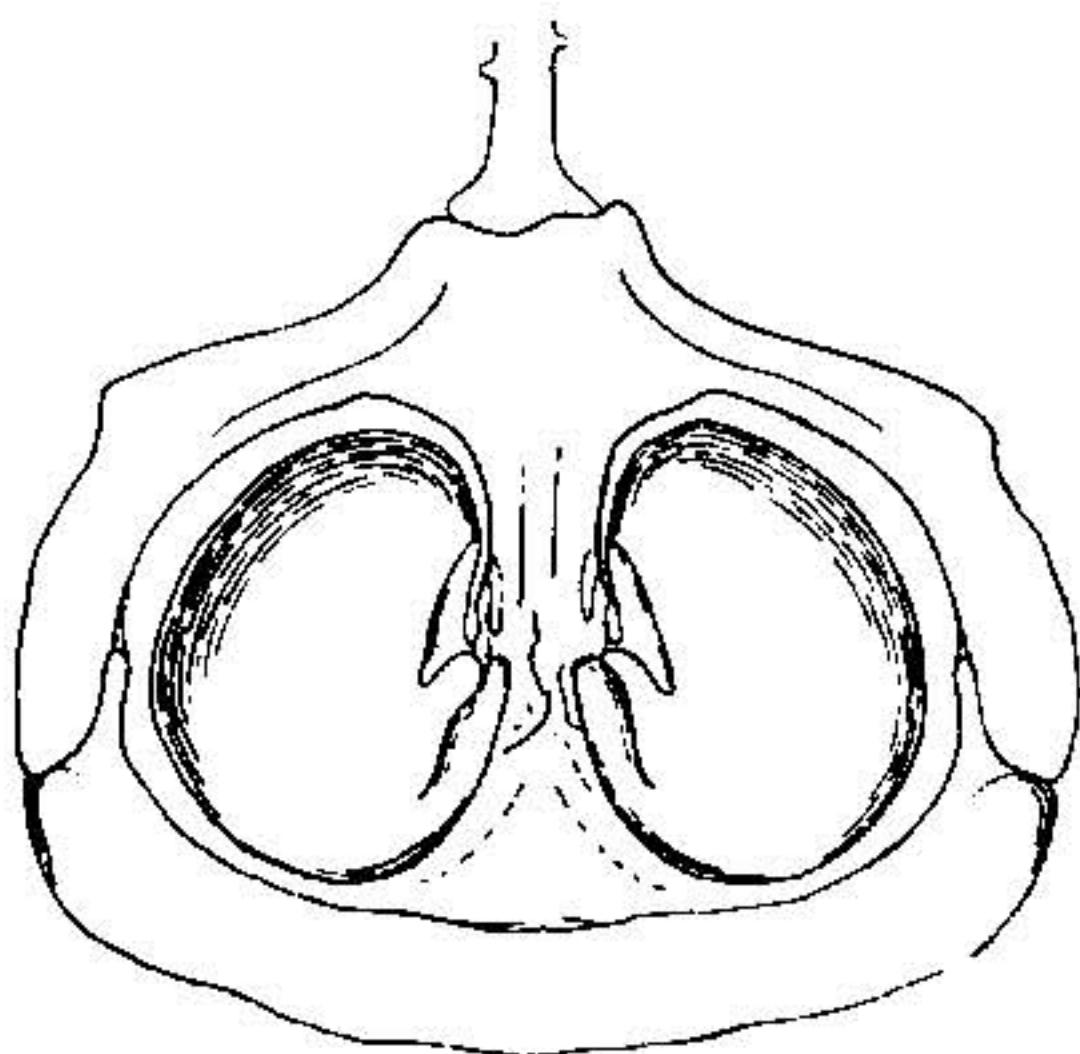


FIG. 1.—Fruit of *Eschweilera collinsii*. Longitudinal section. One-half natural size.

Our only specimen, consisting of a branchlet with attached leaf and fruit, and supplemented by a few good pictures of the latter, was collected in the forests of the plains of San Carlos, northern Costa Rica, April 15, 1903, Cook & Doyle, no. 95 (U. S. National Herbarium no. 473872). It is somewhat defective, although sufficient to show that it does not correspond to the description of any of the species hitherto published. Figure 1 has been somewhat schematically reconstructed from one of the photographs, to show the mode of suspension of the seeds, characteristic of the genus.

Plate III is natural size.

Couroupita Aubl. Pl. Guian. 2: 708. 1775.

Calyx adnate, sepals small; petals rather large; androphorum with fertile stamens both on the ring or disk and on the helmet or galea; ovary 6-celled, stigma 6-sulcate; fruit large, globose, with a small, adhering operculum and containing from 30 to 40 small, ovoid, velvety-pubescent seeds embedded in a viscous, fetid pulp.—High trees, with a lofty, thick trunk and a flat or elongated crown; leaves oblong-elliptic; inflorescence racemose; flowers generally much larger than in the other genera of the same tribe.

1. **Couroupita nicaraguensis** DC. Prod. 3: 294. 1828.^a

FIGURE 2.

"Leaves obtuse; margin of calyx lobulate," petals obtuse; greatest diameter of flower 7.5 cm., the 6 petals obovate, obtuse, alternate, the 3 exterior slightly smaller, 2 to 3.5 cm. long, 1.8 to 2.2 cm. broad; stamens very numerous upon both the disk and the galea, the anthers ovoid, 0.5 mm. long, 0.5 mm. broad, sessile upon dark appendages, these about 1 mm. long and distinctly claviform on the disk, a little longer, broad at base, and attenuate at tip on the galea.

De Candolle's description is limited to seven words, and we are scarcely able to do better now, the only material at hand consisting of a few specimens of the caducous parts of the flower, including the corolla and the adhering androphorum, collected by W. C. Shannon along the Ochozogo River, north of Rivas, Nicaragua, in March, 1903, and distributed by Capt. John Donnell Smith under no. 5004. De Candolle observes that the flowers of this species are smaller than those of *C. guianensis*, which we find to be true, and that it differs, moreover, by the brownish white color of the same and the bluish pulp inside the fruit.



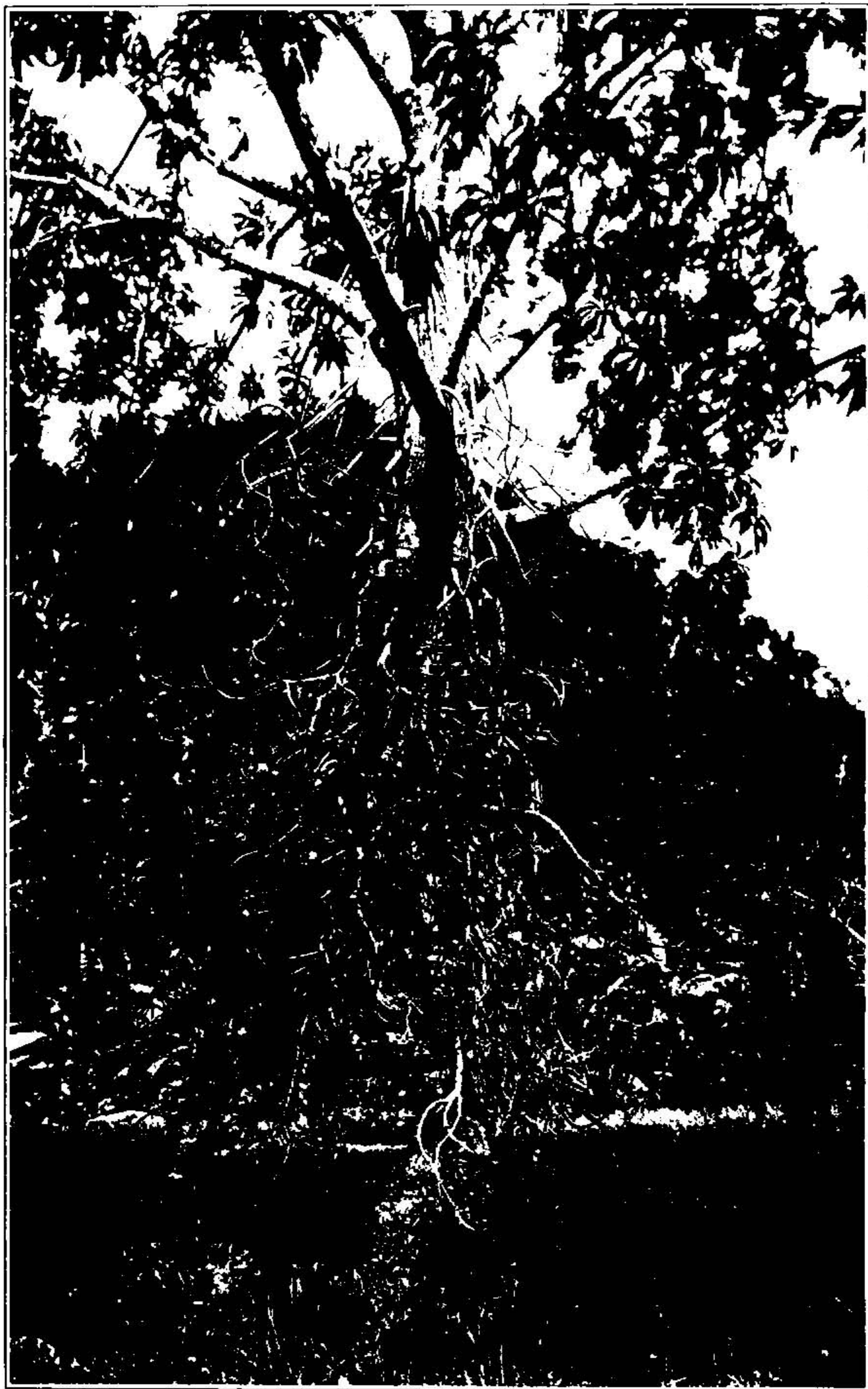
FIG. 2.—Stamens of *Couroupita nicaraguensis*. Middle stamen from the galea, the others from the disk. Much enlarged.

Oersted, who collected the only known specimens, does not give any description of the tree, but says: "While the Lecythidaceae play an important part in

^aThe specific name is spelled in the Prodrromus *nicaraguensis*, a needlessly long and cumbersome substitute for *nicaraguensis*.



FRUIT OF *ESCHWEILERA COLLINSII* PITTIER.



COUROUPITA GUIANENSIS AUBL.



COUROUPITA GUIANENSIS AUBL.

the flora of South America, this is the only species that goes beyond the Isthmus of Panama. It is one of the most conspicuous trees in the forests between Granada and Tortuga (Nicaragua), where it attracts the attention of the passer-by by its lofty trunk, regular round crown, and large, globose fruits, hanging in close clusters. I found mature fruits in February. These are called by the natives 'zapotes del mico,' on account of their likeness to the true zapotes (*Lucuma*) and the readiness with which they are eaten by the monkeys. A closely allied species, *C. guianensis*, is known in Guiana under the name of cannonball tree." ^a

As will be seen from the present paper, our knowledge of the species of the family north of Panama has somewhat improved since Oersted's time, although much remains to be done. Complete specimens of *Couroupita nicaraguensis* has never to my knowledge been collected, and I am aware of the presence of that tree in Costa Rica only because it came under my observation in 1891 at Salinas Bay (where it is also known as zapote de mico) and in Nicoya in 1903. The round fruits, slightly swollen along the calycinal band, were about 10 cm. in diameter and filled with a nauseous pulp surrounding numerous seeds.

The flowers of the nearly related *C. guianensis*, which is the type of the genus, are about 10 cm. in diameter, with petals 4.5 cm. long and 3.5 cm. broad (Plate V). Its very much elongated racemes grow directly from the trunk and main limbs, as shown in Plate V (as well as Plate IV) taken at the Castleton Gardens in Jamaica by Mr. G. N. Collins. I do not remember having noticed any such arrangement in the Costa Rican zapote de mico, and the flowers escaped my attention.

Plate V is natural size.

Meirs ^b inclines to the belief that this species is identical with *C. odoratissima* Seemann. The above description settles the question in the negative. The leaves of *C. nicaraguensis* are obtuse and neither cuneate at the base nor abruptly acuminate at tip; the flower is 7.5 cm. in diameter, while it varies from 4 to 5 cm. in Seemann's plant; further, the anthers in our species are sessile on the appendages and not borne on capillary filaments, as is the case in the other one.

Lecythis Loeff. Iter Hispan. 159. 1758.

Flowers not quite epigynous, calyx and corolla with 6 (seldom 7) divisions; fertile stamens mostly on the disk; ovary 4 (or 5)-celled, style much longer than in the foregoing genera; pyxidium large, ovate, thick-walled, woolly; operculum deciduous; seeds typically 9, but oftener 4 to 9, in each of the 4 or 5 cells, elongate and longitudinally sulcate, with a woolly, thick shell, covering a large embryo, edible in the Costa Rican species.—Trees generally of great size, with hard wood, elliptic leaves, and large racemes of white, pinkish, or yellow flowers.

Lecythis costaricensis Pittier, sp. nov. PLATES VI, VII, VIII. FIGURES 3, 4.

A lofty tree, with shaft-like trunk about 25 meters high and 1 meter in diameter, and broadly spreading limbs; leaves oblong-lanceolate, subcordate at base and long-acuminate; margin serrate; petioles about 5 mm. long; inflorescence terminal; flowers not seen; pyxidium globose, 16 cm. in diameter on the calycary zone, 15.5 cm. total height, the basal part hemispherical, cup-shaped, obscurely 4-lobed; interzorary band about 5.5 cm. broad, of conical appearance; operculum dome-like, 2.7 cm. high, 9.5 cm. in diameter; calycary zone with 6 distinct protuberances corresponding to the sepals and each abruptly

^a Myrtaceae centroamericanae, Vidensk. Meddel. Kjöb. 1855: 16. 1856-57.

^b Trans. Linn. Soc. 30: 191.

contracted into a narrow, acute tip; walls woody and nearly 2 cm. thick; opening 5.5 cm. in diameter; inside divided in 4 cells by persistent septa reaching a little over halfway from the inside periphery to the center (figs. 3, 4); axis of pyxidium occupied by a thick, 4-winged columella connected at the base with the septa, thinner and quadrangular toward its upper end, and then spreading again in a 4-winged expansion concreescent with the base of the operculum (when mature the columella breaks just at the thinnest place below that expansion, thus losing the operculum); seeds fusiform, sulcate, 4 to 5 cm. long, 1.7 to 2 cm. in diameter, typically 9 in each cell, but oftener 6 to 8, attached in 3 rows (of 3 each) at base of columella, through a thick, fleshy funicle.

On the plains of San Carlos, at La Sedina, at about 100 meters above sea level. The tree that was especially noticed by Mr. O. F. Cook, Mr. G. N. Collins, and myself in April, 1903, grew on a wooded hill near the cacao plantations of the above-named finca and made itself conspicuous among the other forest trees by its larger dimensions. On the ground were found old shells and fresh seeds and opercules, and we also succeeded in obtaining a fresh fruit with its

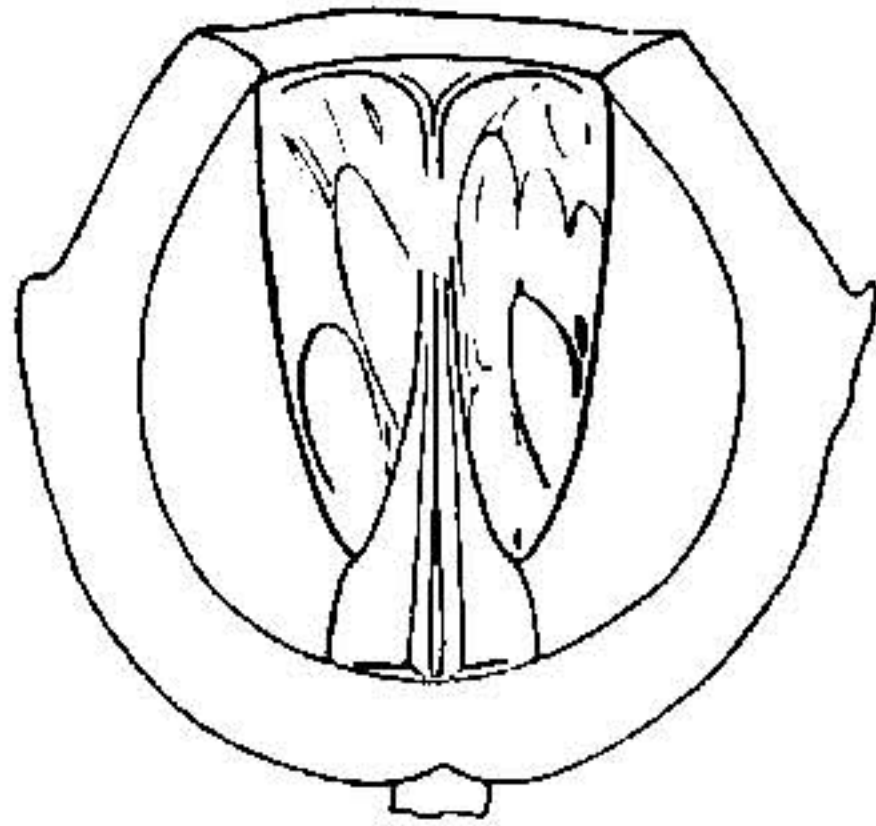


FIG. 3.—Fruit of *Lecythis costaricensis*. Longitudinal section. One-half natural size.

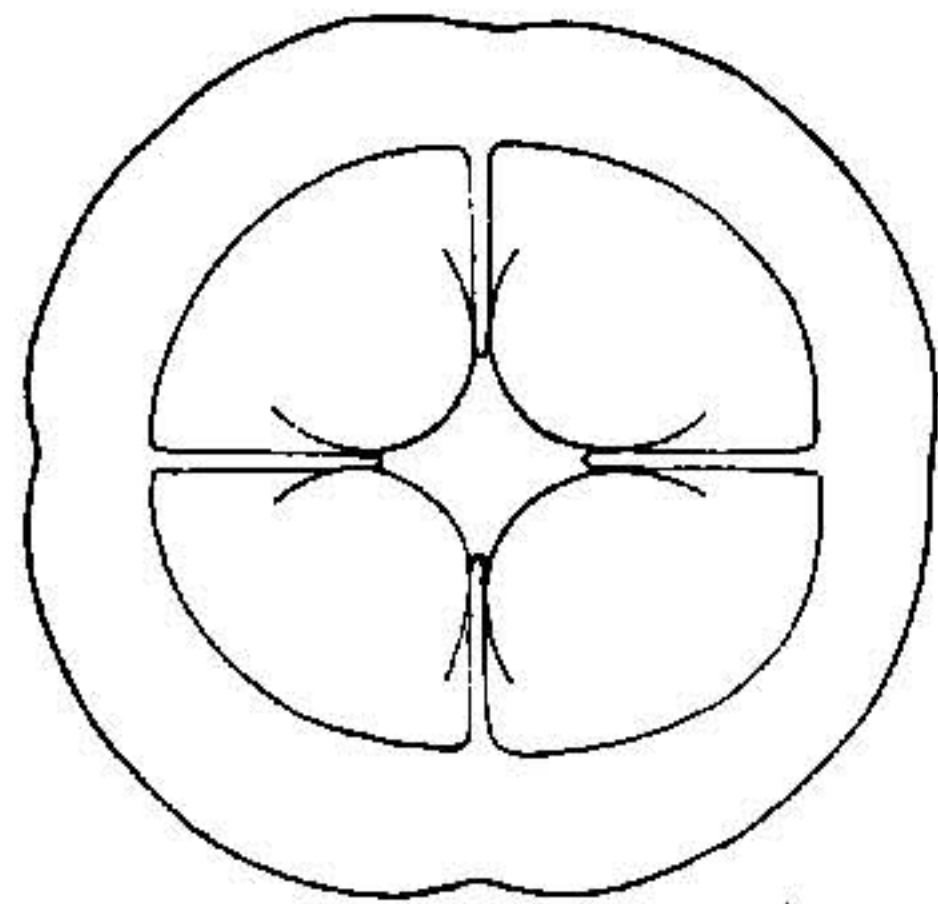


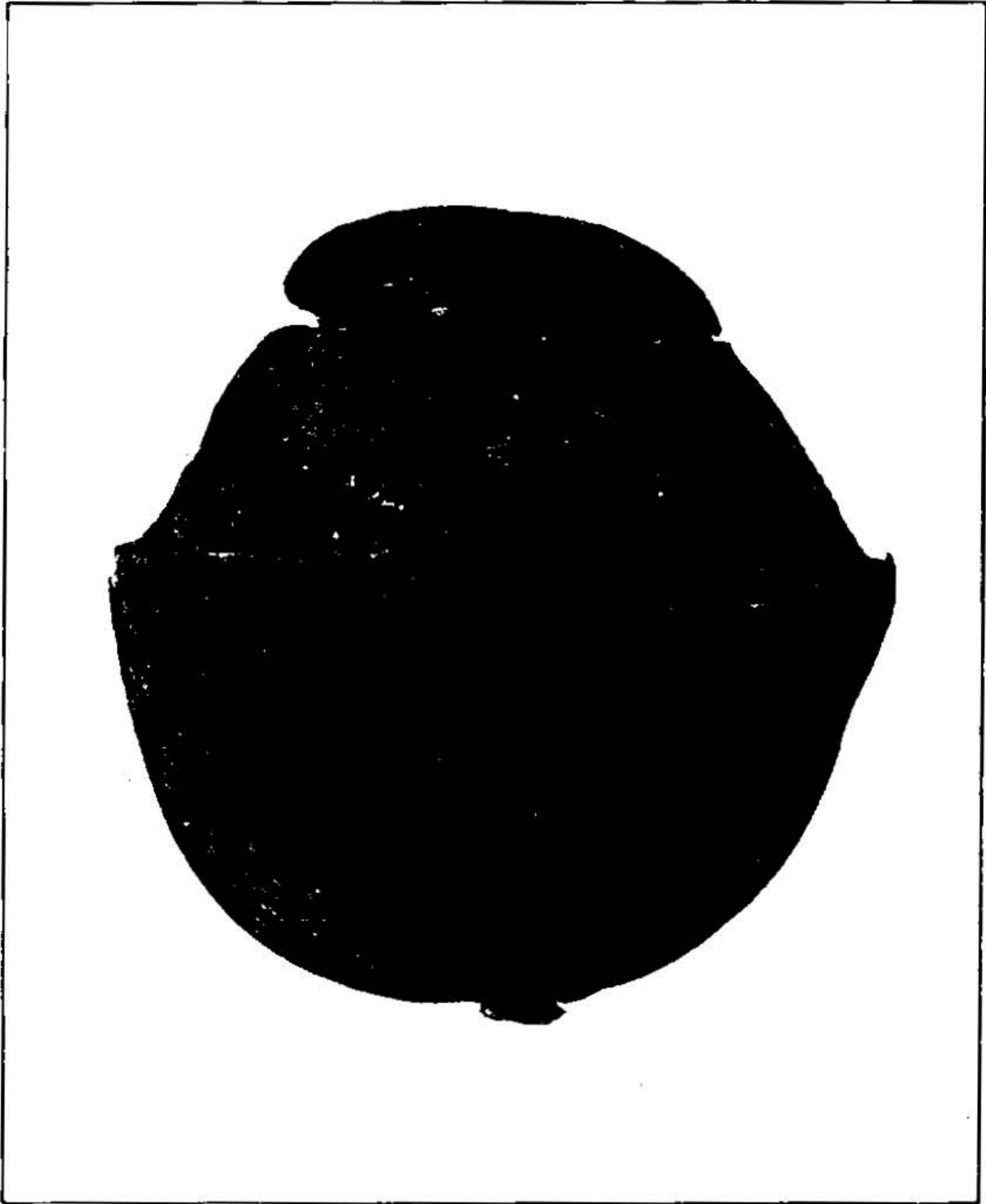
FIG. 4.—Fruit of *Lecythis costaricensis*. Transverse section. One-half natural size.

contents, that had accidentally fallen; these were carefully photographed by Mr. C. B. Doyle and belong now to Mr. Cook's collection.

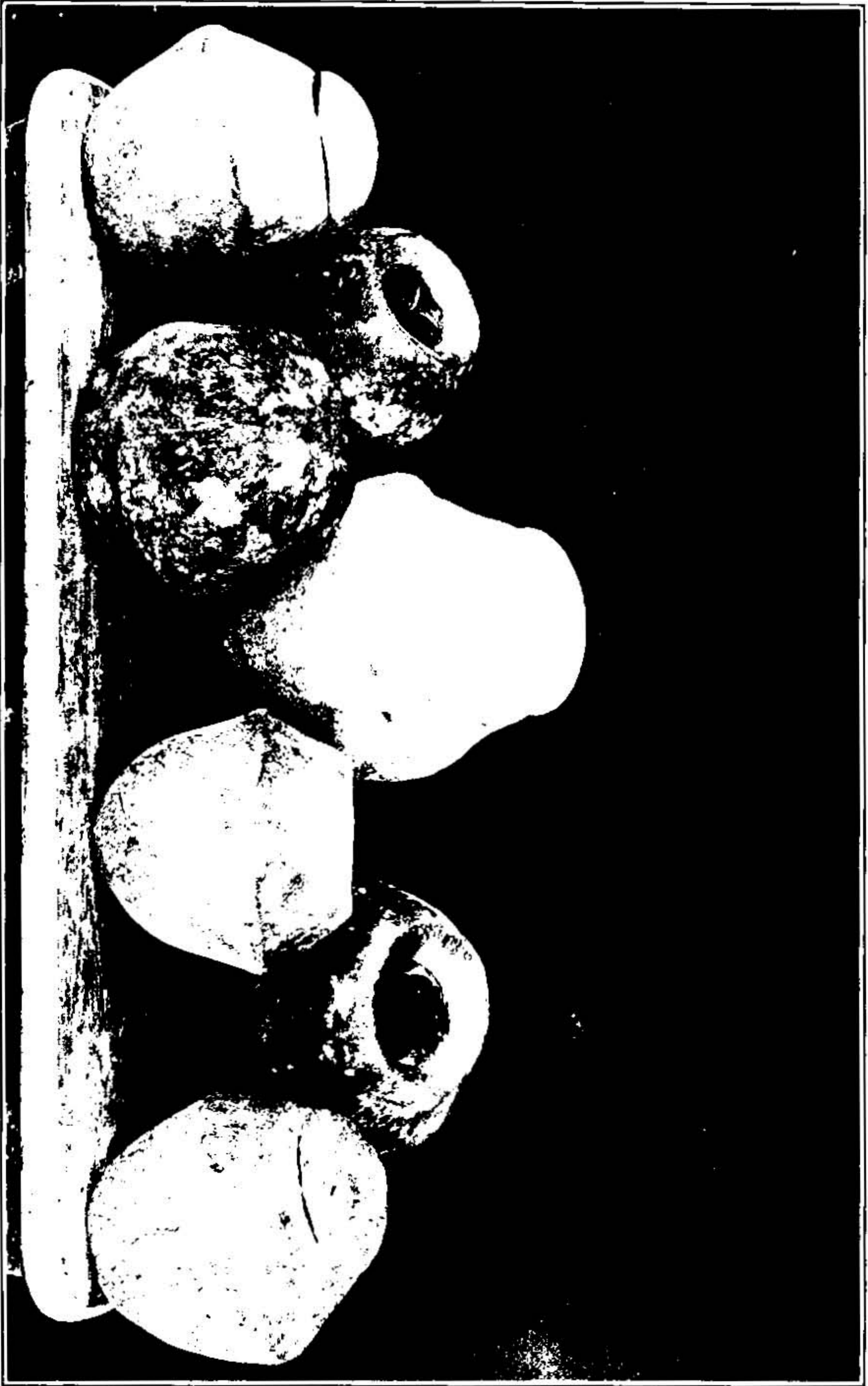
EXPLANATION OF PLATES.—Plate VI one-half, Plate VII about one-fourth natural size; Plate VIII natural size. In Plate VIII the smooth, light-shaded bodies attached to the seeds are the fleshy funicles.

From the general description of the leaves the specimen under consideration would come near *Lecythis lanceolata* Poir., but the fruit is widely different. The name of *L. ollaria* has often been given to the Costa Rican species, more for convenience's sake than for accuracy. Nobody truly knows what *L. ollaria* is, although it must be considered the type species of the genus; and it is not unlikely that Loeffling's imperfectly described Venezuelan species has been re-named by later botanists.

The species from Costa Rica is known among the natives as *cocobola*, while the fruit is the *olla de mono* or monkey pot. The hard wood is used in the making of carts, and the nuts are eagerly sought by squirrels, monkeys, and men. Their flavor is much finer than that of the Brazil nuts of commerce, but the supply of them is insignificant.



PYXIDIUM OF *LECYTHIS COSTARICENSIS* PITTIER.



PYXIDIA OF *LECYTHIS COSTARICENSIS* PITTIER.



SEEDS OF *LECYTHIS COSTARICENSIS* PITTIER.

The tree bears and is easily reproduced by seeds. Six of these, planted in the garden of the observatory at San José, all germinated after having been from twenty-eight to thirty-six days in the ground. For some reason they had to be removed with the exception of one, which had reached a height of about 30 cm. above the ground in three months. There is little doubt that the tree could be cultivated with no great difficulty in its native home, in the warm, humid plains of San Carlos, Sarapiquí, and Santa Clara, and in other tropical countries of similar climatic conditions. The output of the nuts would thus be increased, and these might become a valuable addition to the food products of our markets.